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State-Led Combined Heat and Power Initiatives

Issue Brief

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Foreword

This publication was written collaboratively by the U.S. Department of Energy Advanced Manufacturing Office (AMO) staff, AMO support contractors, and Combined Heat and Power Technical Assistance Partnerships (CHP TAPs) staff. Every effort has been made to confirm the accuracy of the provided information at the time of publication.

State-Led Combined Heat and Power Initiatives

States have many strategies at their disposal to increase adoption of clean energy technologies, including combined heat and power (CHP).[1] These strategies can include setting portfolio standards, offering financial incentives, implementing deployment programs, and leading other initiatives administered by state energy offices, public utility commissions, and other agencies. Each of these state-level strategies can be used to stimulate CHP market and technology development while addressing a variety of state-level policy priorities, such as:

- **Energy efficiency:** CHP can enhance energy efficiency through on-site power generation and productive use of waste heat, helping states meet energy efficiency targets. Additionally, because CHP facilities are close to the load, losses between generation and energy demand centers are lower than the transmission and distribution losses that occur when energy generation sources are more distant.

- **Greenhouse gas reduction:** CHP facilities use less fuel than centrally located utility-scale power plants. With the combination of electricity generation and the use of the resulting thermal output for heat, CHP can achieve thermal efficiencies of 60%–80%, depending on technology and design, compared to a 45%–55% efficiency for separate electricity and thermal energy production.[2] The result is lower emissions per unit of useful energy produced through CHP.

- **Cost savings:** CHP can provide low-cost heat and power, as well as the operational flexibility required to meet on-site energy needs cost-effectively. In addition, CHP can ensure high power quality, minimizing voltage fluctuations or outages that would otherwise disrupt operations and damage equipment at sites with continuous power needs, such as advanced manufacturing facilities and data centers.

- **Resilience:** When part of a district energy system or microgrid, CHP provides heat and power services close to sources of demand, reducing the risk of outages caused by operational, weather, or security issues and improving service restoration times when outages do occur. When appropriately designed, sized, and operated, certain "islanding-capable" CHP microgrids can significantly reduce grid dependence. Resilience is especially important for critical facilities such as hospitals, data centers, wastewater treatment plants, essential state and local government offices, and military bases.

- **Grid support:** CHP facilities can reduce existing and new demands on the electricity distribution system, improve reliability, and reduce costs of service to local customers who are not directly served by CHP.

State Portfolio Standards

A state's portfolio standards require that the state's electric utilities and retail electric providers meet a specified amount of load through eligible energy sources.[3] Portfolio standards can be used in both regulated and restructured electricity markets and are designed in different ways to meet various state policy objectives, whether encouraging the use of energy efficiency and alternative energy solutions or

[1] State policymakers, project developers, advocates, utilities, and others have various definitions of "clean" energy. This issue brief does not attempt to create one definition but rather recognizes that the primary audience for the guide is state regulators, who define clean energy as they see fit. CHP may or may not be considered for inclusion in a state's clean energy policies, depending on how specific CHP benefits, such as greenhouse gas reductions, support the state's goals and objectives.

[2] U.S. Department of Energy (DOE). "Combined Heat and Power Technology Fact Sheet Series: Overview of CHP Technologies." https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/CHP%20Overview-120817_compliant_0.pdf

[3] U.S. Environmental Protection Agency (EPA). *2015 Energy and Environment Guide to Action* (2015). https://www.epa.gov/sites/production/files/2017-06/documents/guide_action_chapter5.pdf

reducing carbon emissions to meet a state emissions reduction target. CHP can be incorporated into all three of the types of standards described below.

- *Renewable portfolio standards (RPSs)* are the most common form of portfolio standard and are usually focused on traditional renewable energy such as wind, solar, and biomass projects. This type of portfolio standard may incorporate other technologies and fuel types in addition to renewable energy and may have separate tiers or target mandates based on the form of generation. RPSs are often market-based; qualifying projects receive tradable credits, typically referred to as renewable energy credits (RECs), which can then be sold for compliance purposes. Connecticut is an example of a state with CHP (both fossil- and renewable-fueled) included in an RPS.

- *Energy efficiency resource standards (EERSs)* require utilities to reduce a certain amount of energy use every year. To accomplish this, utilities implement energy efficiency programs to help their customers save energy in their homes and businesses.[4] EERSs can be market-based and have a trading system of credits, although this is not as common as in RPSs. EERSs are typically defined as including end-use energy savings. Certain states include other types of energy efficiency, including distribution system savings and savings from CHP and other efficient distributed generation technologies.[5] Many states have a separate EERS and RPS, but some states combine components from an RPS and EERS into one comprehensive portfolio standard program. Washington is an example of a state with a renewable energy standard that also requires electric and natural gas utilities to meet certain energy savings requirements (i.e., EERS targets).

- *Alternative energy portfolio standards (APSs)* often set targets that require a certain percentage of an electricity supplier's capacity or generation to come from alternative or advanced energy sources such as CHP, coal with carbon capture and storage, coal co-fired with biomass, and municipal solid waste projects. These standards are often market-based, and compliance obligations are met through credit-eligible projects with alternative energy credits or other forms of credit that can be purchased by electricity suppliers.

State Portfolio Standards Activity

States with Clean Energy Portfolio Standards That Include CHP

Most portfolio standards are enacted through state legislation. As of January 2019, some form of portfolio standard is in effect in 39 states and 3 territories (the District of Columbia, Puerto Rico, and the U.S. Virgin Islands). Of the states and territories that currently have portfolio standards in effect, 38 specifically name CHP or waste heat to power (WHP) as an eligible resource in some portion of their portfolio standard guidelines. While a number of states recognize CHP in RPS policy, many RPS programs limit qualified CHP systems to WHP or renewable-fueled CHP. Additionally, most EERS programs do not set separate targets for CHP, which can limit the effectiveness of these policies in promoting CHP development.

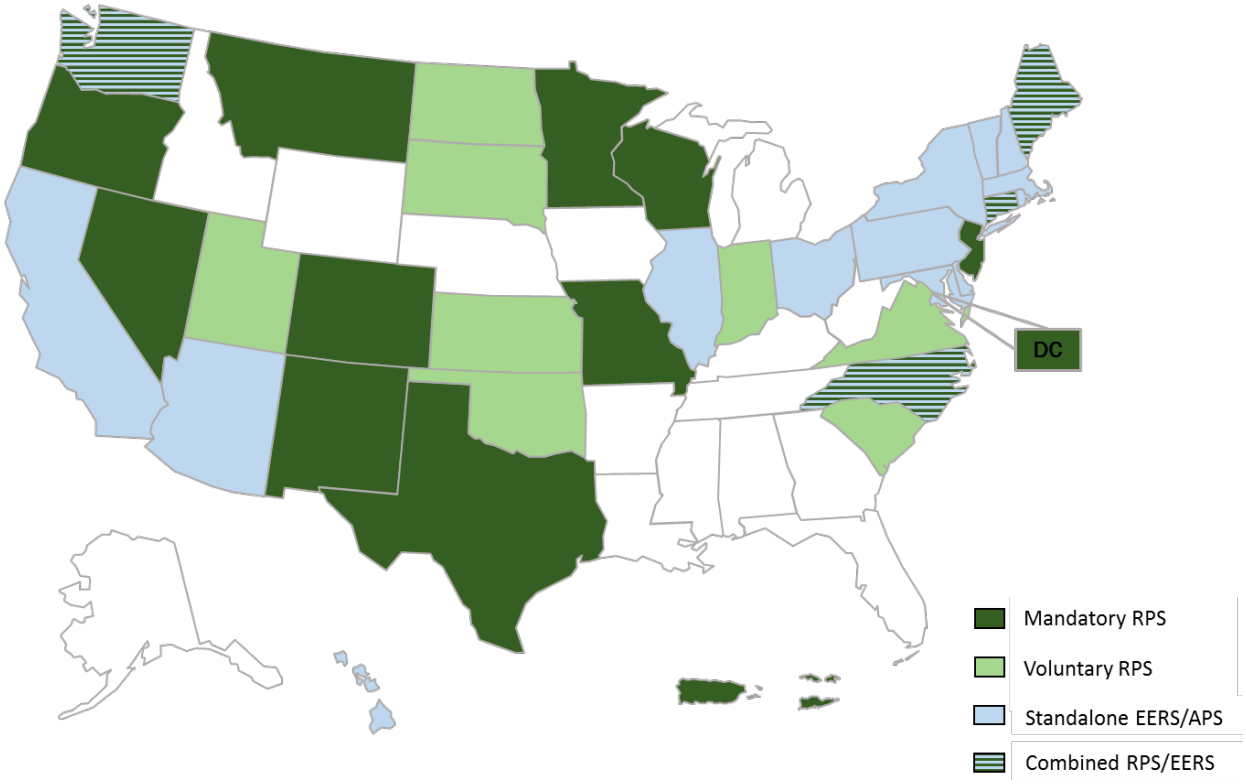
States with CHP-eligible portfolio standards

Connecticut RPS

In 2005, Connecticut included a third tier to its RPS resource requirements, establishing a new RPS Class III that must be fulfilled with CHP, demand response, and electricity savings from conservation and load management programs. Eligible CHP systems had to have been developed on or after January 1, 2006. In 2007, the Class III standard was expanded to include systems that recover waste heat. Eligible systems that recover waste heat or pressure from commercial and industrial processes had to be installed on or after April 1, 2007. Existing units that had been modified on or after January 1, 2006, could earn certificates only for the incremental output gains.

[4] ACEEE. *State Energy Efficiency Resource Standards (EERS)* (January 9, 2017). https://aceee.org/sites/default/files/state-eers-0117.pdf

[5] Database of State Incentives for Renewables & Efficiency (DSIRE). www.dsireusa.org. Center for Climate and Energy Solutions (C2ES). "Energy Efficiency Standards and Targets." www.c2es.org/us-states-regions/policy-maps/energy-efficiency-standards



Source: *Map prepared by ICF. August 2019.* ***Figure Notes:*** *In several states, CHP is eligible for an energy efficiency portion of an RPS. In the majority of states where CHP is eligible for an RPS, only renewable-fueled CHP can count toward the target. Additionally, there are states where the RPS targets have already been met. For example, the overall RPS target for Texas (10,000 MW) was met in 2009, and the target dates for the voluntary RPS programs in Oklahoma, North Dakota, and South Dakota passed in 2015.*

Clean Energy Portfolio Standard Trends

States continue to adjust eligibility and increase targets to reflect changes in technologies and policy goals. Through legislation or commission decisions, states occasionally expand their definitions of energy efficiency or renewable energy to include CHP and WHP. In 2012, the Ohio legislature expanded its RPS to include WHP as an eligible technology and its EERS to include CHP as an eligible technology. Additionally, the North Carolina Court of Appeals ruled in 2017 that CHP is classified as an energy efficiency measure under the state EERS.[6]

Portfolio standards continue to be relevant tools for policymakers seeking to increase renewable energy deployment and energy efficiency targets in their states. Several states increased their RPS targets in recent years to align with a national move toward increased renewable deployment, and more are looking to do so in the future. In 2018, the Connecticut legislature passed Public Act 18-50, increasing the RPS target from 24% of retail load generated by renewable energy by 2020 to 44% by 2030, while California passed SB 100, increasing the target of retail sales from renewable energy sources from 50% to 60% by 2030. These changes often include only renewable-fueled CHP; however, Massachusetts and Connecticut are among a few states that include all CHP.

State Portfolio Standard Design Features

CHP systems can offer three beneficial products: electricity generation, thermal energy production, and end-user energy savings through increased efficiency. CHP benefits and how they are evaluated vary by state, depending on the type of standard(s) a state has in place. States incorporate CHP into their

[6] North Carolina Court of Appeals. Decision No. COA16-1067 (August 2017). https://caselaw.findlaw.com/nc-court-of-appeals/1869497.html

portfolio standards using a diverse array of eligibility definitions, efficiency thresholds, targets, and crediting techniques.

Qualifying Resources

A key component of successful CHP policies and programs is how technologies and fuels are defined as "qualifying," i.e., counting toward compliance. These decisions may be crafted through legislation, through regulation, or by the state utility commission. Definitions of qualifying CHP resources vary by state. For instance, some states might allow only WHP systems to qualify for policies, while other states allow only renewable-fueled CHP to qualify, and still other states allow all types of CHP regardless of fuel type. All states with an RPS allow CHP systems using eligible renewable fuel types to qualify; however, the policy might not account for thermal production, thus treating CHP like an electric-only generator. There are 15 states that allow for fossil-fuel-fired CHP systems under an RPS, APS, or EERS. Some states, including Massachusetts (the APS) and Connecticut (the Class III tier for the RPS), have separate targets for energy efficiency that include CHP. Additionally, states may allow the thermal output of renewable-fueled systems to be eligible for credits.[7] States such as Colorado and Nevada allow only waste-heat-powered CHP systems to qualify under the RPS programs.[8] The call-out box discusses how CHP typically qualifies for credits under portfolio standards.[9]

Calculating Fuel and CO_2 Emissions Savings for CHP

CHP may qualify for program credits based on fuel savings, electric output, or CO_2 savings. While states employ a variety of specific calculations to award these credits, they follow a basic framework for determining fuel or emissions savings:

- CHP system thermal output displaces on-site fuel use (for boilers or other equipment), and CHP system electric output displaces fuel used for purchased grid electricity.
- Fuel use/emissions from the CHP system are subtracted from the fuel use/emissions that would result from separate heat and electricity production (on-site boilers + grid electricity).

For more information, see:

U.S. Environmental Protection Agency. *Fuel and Carbon Dioxide Emissions Savings Methodology for Combined Heat and Power Systems* (2015). https://www.epa.gov/chp/fuel-and-carbon-dioxide-emissions-savings-calculation-methodology-combined-heat-and-power

Efficiency Thresholds and Performance Metrics

To ensure state policies and programs are encouraging technologies that achieve objectives, states commonly set an efficiency threshold for CHP systems or use alternate performance-based metrics. Such requirements help ensure that only well-designed and well-operated CHP systems qualify and encourage only those systems that are correctly sized to the thermal load and waste very little thermal energy.

Massachusetts APS

CHP systems using renewable fuels and natural gas qualify for the Massachusetts APS. Qualifying CHP systems had to have begun operation (including incremental additions) on or after January 1, 2008. Existing units can receive credit for their added incremental useful thermal energy or useful electrical energy. The APS provides credit for both the electric and thermal output from the CHP system.

States can also use performance-based metrics to ensure that CHP projects contribute to energy policy priorities. As an overlay or as a stand-alone policy, progressive incentives for greater energy efficiency requirements can serve as a market driver for systems with greater efficiency.[10] For example, the Massachusetts APS uses a performance-based approach by providing qualifying resources one credit per

[7] RPS Collaborative and Clean Energy States Alliance. *Renewable Thermal in State Renewable Portfolio Standards* (July 2018). https://www.cesa.org/assets/Uploads/Renewable-Thermal-in-State-RPS-April-2015.pdf

[8] In these states, topping cycle CHP generally does not qualify.

[9] EPA. *Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems* (February 2015). https://www.epa.gov/sites/production/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf

[10] EPA. *Clean Energy-Environment Guide to Action: Policies, Best Practices, and Action Steps for States—Chapter 5. Energy Supply Actions* (April 2006). www.epa.gov/statelocalclimate/resources/action-guide.html.

megawatt-hour of net source fuel savings, which encourages highly efficient CHP. Minimum efficiency thresholds and performance-based metrics vary by state, depending on market conditions and policy objectives for CHP.

Separate, Distinct Targets for CHP and Other Technologies

Establishing separate targets or tiers for different categories of resources ensures that certain classes of resources are not encouraged to the detriment of others. Setting separate targets for different resources can also diminish competition between technologies. If a policy goal is to encourage diversity of supply, this can also help achieve that goal.

Two state implementation approaches for portfolio standards that have proven effective are:

- To establish a separate tier for CHP and related energy efficiency technologies and require a specified percentage of the target to be met by each of these tiers. *Examples: Connecticut's Class III and Pennsylvania's Tier II.*
- To establish a separate portfolio standard program (distinct from the RPS) that is devoted to CHP and/or other energy efficiency technologies. *Example: Massachusetts' APS.*

State Financial Assistance for Combined Heat and Power

Financial incentives help to further potential CHP projects that may not otherwise advance. In certain states, projects may not make it past the early stages of development without receiving a financial incentive such as a grant, loan, or tax credit. Several states offer one or more of these incentives.

State Incentive Programs

Establishing programs that provide grants or project incentives is one of the most direct strategies for states to incentivize CHP deployment. These programs award money directly to developers and end users who are installing CHP, which helps to reduce or remove one of the largest barriers to CHP deployment—financing issues. States typically offer incentives in one of two ways: a capacity-based incentive ($/kW) or a production incentive ($/kWh). State incentive programs vary by program focus (e.g., resilience or energy efficiency), amount of overall funding available, eligible project size, eligible fuels, and minimum efficiencies. State legislation often spurs creation of energy incentive programs, while the actual program details are often designed and implemented by state energy offices. For example, Maryland, New Jersey, and New York have promoted CHP incentives and other deployment strategies through administrative agencies.

Maryland

Maryland's state energy agency, the Maryland Energy Administration, administers a CHP grant program. The grant program provides grants ranging from $425 to $575 per installed kilowatt, depending on the size of the system, with a per-project funding cap of $500,000. The program is open to any eligible commercial, institutional, or industrial facility and prioritizes critical infrastructure facilities, including healthcare, wastewater treatment, and essential state and local government facilities.

New Jersey

New Jersey's Economic Development Authority provides a financial incentive program for CHP that offers between $350 and $2,000 per kilowatt, based on system size, fuel use, and technology type. In addition, the program offers a 10% bonus for new islanding and black-start-capable CHP installations at critical facilities. In addition to the current financial incentives, the state's previous Energy Resilience Bank program, which concluded in 2016, offered various combinations of grants and loans. This program focused on CHP systems

providing energy resilience capabilities to critical facilities, largely in response to the outages and associated economic loss caused by Hurricane Sandy in 2012.

New York

The New York Energy Research and Development Agency (NYSERDA) has administered a variety of CHP programs dating back to the early 2000s. Most recently, NYSERDA administered a CHP program (PON 2568) that supported several policy priorities, including resilience benefits, greenhouse gas reductions, energy efficiency, and load management. Under this incentive program, NYSERDA offered up to $2.5 million per installation for systems up to 3 MW in size. For systems under 1 MW, the agency partnered with vendors to vet and promote a range of pre-packaged, pre-approved CHP systems. For systems larger than 1 MW, NYSERDA allowed custom-engineered approaches. The program was successful in meeting its goals of building support and reducing barriers for CHP in the state and establishing a stable CHP marketplace.

In addition, many states have begun to encourage utilities to offer their own CHP incentive programs, either as separate CHP programs or as part of the utility's larger commercial and industrial energy efficiency program offerings. This is most often conducted by enacting legislation or regulations allowing CHP to count toward state or utility energy efficiency targets.

Loan Programs

As an alternative to grant programs, states can set up programs to offer low-interest loans to developers and installers of CHP and other clean energy technology systems. While less typical for CHP-specific projects, loans are a common way for states to incentivize clean energy deployment by lowering upfront capital costs and creating a mechanism for end users to secure funding. As of 2019, six states offer loan programs that specifically call out CHP as an eligible technology. Additionally, several states offer loan programs for renewable-fueled electric generating systems and energy efficiency technologies. The Alternate Energy Revolving Loan Program, offered through the Iowa Economic Development Authority, provides zero-interest loans, up to $1 million, for the development of alternate energy projects, including CHP.[11]

Tax Incentives and Exemptions

In addition to offering grants and loans, states can alter their tax codes to offer incentives to CHP developers and end users. States most commonly allow CHP systems to qualify for tax exemptions, providing tax breaks or reductions for new equipment, upgrades, or fuel purchases. Like loans, these exemptions are typically offered more broadly for new electric generation systems, renewable energy installations, and energy efficiency upgrades. However, some states and territories, such as Florida and the District of Columbia, offer CHP-specific tax exemptions and incentives.

Other State-Led Combined Heat and Power Initiatives

In addition to clean energy portfolio standards and financial incentives, certain states take other actions that provide technical, logistical, and educational assistance for the development of certain energy technologies. As with portfolio standards and financial incentives, state deployment programs aim to stimulate development of markets and technologies to drive advances in the economic competitiveness of clean energy resources in comparison with conventional electricity generation.

State Energy Plans

Most states prepare energy plans, which are documents that "help to guide and build consensus among stakeholders in moving toward a shared goal of meeting future energy needs in a cost-effective and sustainable manner."[12] These documents are typically prepared by the governor's office or a governor-appointed

[11] Iowa Economic Development Authority. "Alternate Energy Revolving Loan Program." https://www.iowaeconomicdevelopment.com/energyloans

[12] National Association of State Energy Officials (NASEO). "Statewide Comprehensive Energy Plans." https://www.naseo.org/stateenergyplans

commission to make a statement about the types of policies that an administration would like to enact. Other state energy plans are mandated by legislation and are used as official guiding documents for the state. While these plans are not enforceable policies, they are often influential documents that CHP developers, stakeholders, and advocates can reference when requesting assistance from legislators and state energy offices. Currently, 12 states and the District of Columbia include CHP explicitly in their state energy plans. While some of these plans mention CHP only as a potential energy efficiency or resilience solution, others, such as Virginia, provide concrete actions or goals on which the state can act.

Virginia Energy Plan

On October 2, 2018, Virginia's governor released the 2018 Virginia Energy Plan, which provides a strategic vision for the Commonwealth's energy policy over the next 10 years. With a focus on modernizing the electric grid and promoting innovative technologies, the plan sets goals for renewable energy generation, energy efficiency, and electric vehicles. The plan recommends that Virginia establish a target of 750 MW of CHP in the state by 2030. The plan also recommends that the Virginia Department of Mines, Minerals, and Energy develop a roadmap for CHP deployment in order to meet this target.

Public Utility Commission Actions

In addition to legislature and state agencies, public utility commissions (PUCs) have the authority to create rules and statutes that govern the utilities and other electricity providers in the state. State commissions often issue decisions and regulations that impact the CHP market and may occasionally initiate proceedings focused exclusively on CHP. For example, in 2018, the Pennsylvania Public Utility Commission hosted several CHP working groups, which led to the issuance of a policy statement that directly addresses viability of increased CHP implementation in Pennsylvania.[13] Further, in 2018, the National Association of Regulatory Utility Commissioners issued a "Resolution on Standby Rates for Partial Requirements Customers," which encourages regulators to consider the impact of standby rates on CHP and WHP.[14]

Additional State Energy Office Actions

State energy offices can also take a variety of actions to promote the use of CHP. Most typically, these actions are led by energy offices that are interested in learning more about CHP, engaging CHP stakeholders, or otherwise promoting CHP in their states. For many states, this entails offering technical assistance to end users that are interested in CHP. The energy offices in Alaska, Michigan, Missouri, and Oregon offer this type of

Missouri Division of Energy

In recent years, the Missouri Division of Energy has focused on promoting the efficiency and resilience benefits associated with CHP. In 2015, this state agency prepared a comprehensive energy plan that included recommendations for increasing CHP deployment throughout the state. The state is focusing CHP outreach efforts on the institutional sector, enabling feasibility assessments at these facilities and hosting workshops, such as the Eastern Missouri CHP Summit in 2018. The Division of Energy is also a member of the DOE Packaged CHP Accelerator and CHP for Resiliency Accelerator.

CHP Roadmap for Michigan

In February 2018, the Michigan Agency for Energy (MAE) published a study exploring various approaches to increase CHP capacity in the state. The *CHP Roadmap for Michigan* aims to provide "a roadmap for Michigan to make CHP a significant part of its future energy mix," including recommendations to reduce barriers and drive adoption in the state. To assist in data collection, the MAE and its partners engaged with over 300 individuals; efforts included detailed interviews with representatives of firms active in Michigan's CHP market.

[13] Pennsylvania Public Utility Commission (PUC). "Combined Heat and Power (Cogeneration)." http://www.puc.state.pa.us/utility_industry/natural_gas/chp_cogeneration.aspx

[14] National Association of Regulatory Utility Commissioners (NARUC). *Resolutions Passed by Board of Directors at the 2019 Winter Policy Summit of the National Association of Regulatory Utility Commissioners* (February 2019). https://pubs.naruc.org/pub/AE6661DB-FCC0-663C-B336-2BAFA94A296D

assistance, including feasibility studies and screenings, which reduces the upfront costs for end users exploring new systems while also engaging interested parties. Several energy offices also create opportunities for stakeholder engagement by holding workshops and meetings to bring groups and individuals together.

Conclusion

States can use portfolio standards, financial incentives, and deployment activities to successfully increase CHP's use. A number of states explicitly include CHP as an eligible resource in their standards, programs, and policies. There are several implementation approaches that policymakers can consider when including CHP in portfolio standards and similar policies. While this issue brief does not explore the merits or problems of any one strategy, it identifies how such policies can be successfully implemented to encourage CHP and provides several examples of ongoing policies and programs.

Most recently, states and territories have been enacting clean energy standards and other policies that require 100% renewable or carbon-free energy. Historically, high-efficiency CHP systems have been viewed as a strong approach for reducing carbon emissions compared to the electric grid. As more states implement high targets for renewable generation and increasingly electrify and decarbonize the grid, CHP can continue to help meet these goals by supporting renewables' integration and increasing electric grid efficiency.

A state-by-state summary of state-led initiatives related to CHP is presented in the table below. The table includes states and territories that enacted, initiated, or continued implementing CHP-specific policies, regulations, and programs between January 2015 and June 2019, including those that have since been discontinued. These state-level actions include legislation, portfolio standards, regulations, rulings, financial incentives, programs, and state-sponsored events that have direct impacts on CHP adoption. States not included in the list have not implemented any CHP-specific policies or initiatives since 2015.

State CHP Actions, 2015–2019

State	Portfolio Standard*	Financial Incentives	Loan Program	Tax Incentive	Energy Plan	PUC Action	Other**
Alabama			•				
Alaska							•
Arizona	•			•			
California	•				•		•
Connecticut	•	•	•		•		
District of Columbia				•	•		
Delaware		•					
Florida				•			
Hawaii	•						
Illinois	•	•					
Iowa			•		•		
Kentucky							•
Louisiana						•	•
Maine	•				•		
Maryland	•	•					•
Massachusetts	•	•			•		•
Michigan						•	•
Minnesota					•		•
Missouri			•		•		•
Montana				•	•		
New Hampshire	•						
New Jersey		•		•			•
New Mexico				•			
New York	•	•			•		•
North Carolina	•				•	•	
Ohio	•		•				•
Oregon		•					•
Pennsylvania	•					•	•
Rhode Island	•				•		
Texas							•
Utah							•
Vermont		•		•			
Virginia			•		•		
Washington	•						•

*Includes only mandatory portfolio standards that explicitly allow both fossil-fueled and renewable-fueled CHP.

**Includes a variety of efforts such as technical assistance programs, stakeholder meetings and workshops, critical infrastructure and resilience rules, and participation in DOE CHP Accelerator programs.

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