United States Environmental Protection Agency

Energy and Environment Guide to Action

State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power

2015 Edition

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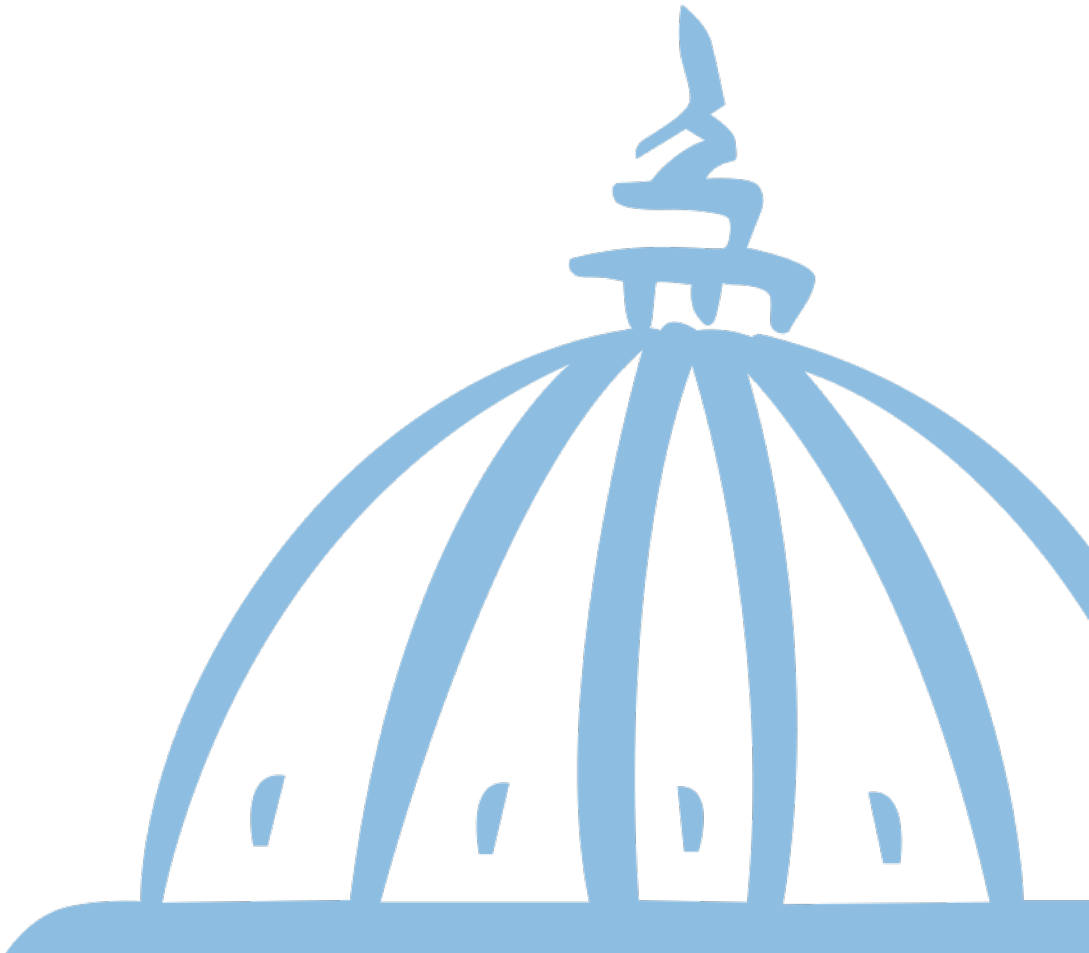

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Contents

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Preface

EPA's State Climate and Energy Program is pleased to release the 2015 *Energy and Environment Guide to Action: State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power*. The *Guide to Action*, which EPA first released in 2006, is a cornerstone resource of EPA's State Climate and Energy Program, a voluntary program that helps states develop policies and programs that can reduce greenhouse gas emissions, lower energy costs, improve air quality and public health, and achieve economic development goals. The *Guide to Action* provides in-depth information about over a dozen policies and programs that states are using to meet their energy, environmental, and economic objectives with energy efficiency, renewable energy, and combined heat and power. Each policy description is based on states' experiences in designing and implementing policies, as documented in existing literature and shared through peer-exchange opportunities provided to states by EPA's State Climate and Energy Program.

The *Guide to Action* is intended for use by state energy, environment, and economic policy-makers and regulators. States are encouraged to use the *Guide to Action* to help design and implement energy efficiency, renewable energy, and combined heat and power, which may help meet the state's own energy, environment, and economic policy objectives. Any comments, questions, and corrections related to the *Energy and Environment Guide to Action* and EPA's State Climate and Energy Program can be directed to the contacts provided on page ES-17.

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Key Acronyms and Abbreviations

A

AC	alternating current
ACC	Arizona Corporation Commission
ACEEE	American Council for an Energy-Efficient Economy
ADAGE	Applied Dynamic Analysis of the Global Economy
AEPS	alternative energy portfolio standard
AERLP	Alternate Energy Revolving Loan Program
AESP	Association of Energy Service Professionals
AMI	advanced metering infrastructure
APPA	American Public Power Association
APSC	Arkansas Public Service Commission
ARRA	American Recovery and Reinvestment Act
ASAP	Appliance Standards Awareness Project
AVERT	AVoided Emissions and geneRation Tool

B

BCAP	Building Codes Assistance Project
BPA	Bonneville Power Administration
BTO	Building Technologies Office
Btu	British thermal units

C

CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CALMAC	California Measurement Advisory Council
CARB	California Air Resources Board
CCEF	Connecticut Clean Energy Fund
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CEFIA	Clean Energy Finance and Investment Authority (Connecticut)
CEO	Colorado Energy Office
CES	clean energy standard
CGB	Connecticut Green Bank
CHP	combined heat and power
CHP TAP	Combined Heat and Power Technical Assistance Partnership
CHPA	Combined Heat and Power Association
CHPP	Combined Heat and Power Partnership
CL&P	Connecticut Light & Power
CO_2	carbon dioxide
COBRA	Co-Benefits Risk Assessment
ComEd	Commonwealth Edison Company
Con Edison	Consolidated Edison Company
C-PACE	Commercial Property Assessed Clean Energy (Connecticut)
CPCN	Certificate of Public Convenience and Necessity
CPUC	California Public Utilities Commission
CSC	Climate Showcase Communities
CT DEEP	Connecticut Department of Energy and Environmental Protection
CVR	conservation voltage reduction

D

DC	direct current
DCEO	Department of Commerce and Economic Opportunity (Illinois)
dCHPP	CHP Policies and Incentives Database
DEED	Demonstration of Energy and Efficiency Developments
DG	distributed generation

DGA	Department of General Administration (Washington)
DGS	Department of General Services (Maryland)
DOE	U.S. Department of Energy
DOER	Department of Energy Resources (Massachusetts)
DPU	Department of Public Utilities (Massachusetts)
DSIRE	Database of State Incentives for Renewables and Efficiency
DSM	demand-side management
DWR	Department of Water Resources

E

ECPA	Energy Conservation and Production Act
EDA	Economic Development Administration
EEAC	Energy Efficiency Advisory Council (Massachusetts)
EEI	Edison Electric Institute
EEM	energy-efficient mortgage
EEPS	Energy Efficiency Program Sponsors
EERS	energy efficiency resource standard
EEU	energy efficiency utility
eGRID	Emissions and Generation Resource Integrated Database
EGU	electric generating unit
EIA	U.S. Energy Information Administration
EIM	energy improvement mortgage
EISA	Energy Independence and Security Act
EISPC	Eastern Interconnection States' Planning Council
EM&V	evaluation, measurement, and verification
EMP	Energy Master Plan
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act
EPC	energy performance contracting
ERAM	Electric Rate Adjustment Mechanism
ERB	Energy Resilience Bank (New Jersey)
ESC	Energy Services Coalition
ESCO	energy service company
ESP	electric service provider
ESPC	energy savings performance contract

F

FCE	fuel conversion efficiency
FCM	forward capacity market
FEMP	Federal Energy Management Program
FERC	Federal Energy Regulatory Commission
FIT	feed-in tariff

G

GEMS	Green Energy Market Securitization program (Hawaii)
GHG	greenhouse gas
GW	gigawatt
GWh	gigawatt-hour

H

HCRC	Hawaii Community Reinvestment Corporation
HECO	Hawaiian Electric Company
HERO	Home Energy Renovation Opportunity (California)
HERS	Home Energy Rating System
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilating, and air conditioning

I

ICC	Interstate Commerce Clause
ICC	International Code Council

ICC	Illinois Commerce Commission
ICE	internal combustion engine
IEA	International Energy Agency
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronic Engineers
IEI	Edison Foundation Institute for Electric Innovation
IEPEC	International Energy Program Evaluation Conference
IGCC	integrated gasification combined cycle
IMPEAQ	Integrated, Multi-pollutant Planning for Energy and Air Quality
IMT	Institute for Market Transformation
IOU	investor-owned utility
IPMVP	International Performance Measurement and Verification Protocol
IREC	Interstate Renewable Energy Council
IRP	integrated resource plan/planning
ISO	independent system operator
ISO-NE	Independent System Operator New England
ITC	investment tax credit

J

JEDI	Jobs and Economic Development Impact

K

kW	kilowatt
kWh	kilowatt-hour

L

LDC	load distribution company
LEED	Leadership in Energy and Environmental Design
LIEF	Long-Term Industrial Energy Forecasting
LIHEAP	Low-Income Home Energy Assistance Program
LoanSTAR	Saving Taxes and Resources
LRAM	lost revenue adjustment mechanism
LTPP	long-term procurement planning

M

M&V	measurement and verification
MACRS	Modified Accelerated Cost Recovery System
MADRI	Mid-Atlantic Distributed Resources Initiative
MEEA	Midwest Energy Efficiency Alliance
MEEIA	Missouri Energy Efficiency Investment Act
MISO	Midcontinent Independent System Operator
MPSC	Missouri Public Service Commission
MSW	municipal solid waste
MW	megawatt
MWh	megawatt-hour

N

NAECA	National Appliance Energy Conservation Act
NAESCO	National Association of Energy Service Companies
NASEO	National Association of State Energy Officials
NBI	New Buildings Institute
NEEA	Northwest Energy Efficiency Alliance
NEEP	Northeast Energy Efficiency Partnerships
NEG	net excess generation
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Council

NFPA	National Fire Protection Association
NGA	National Governors Association
NGO	nongovernmental organization
NJBPU	New Jersey Board of Public Utilities
NJCEP	New Jersey's Clean Energy Program
NO_x	nitrogen oxides
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
NWPCC	Northwest Power and Conservation Council
NYSERDA	New York State Energy Research and Development Authority

O

OBF	on-bill financing
OBR	on-bill repayment
OBR	output-based regulations

P

PACE	property assessed clean energy
PBF	public benefits fund
PBR	performance-based ratemaking
RI GHG	Rhode Island Greenhouse Gas Process
PG&E	Pacific Gas and Electric
PGE	Portland General Electric
PMA	Power Marketing Administration
PPA	power purchase agreement
PSB	Public Service Board
PSC	Public Service Commission
PTC	production tax credit
PUC	public utility commission
PUCN	Public Utilities Commission of Nevada
PURPA	Public Utility Regulatory Policies Act
PV	photovoltaic
PVE	Petroleum Violation Escrow

Q

QECB	Qualified Energy Conservation Bond

R

RAP	Regulatory Assistance Project
REAL	Regional Economics Applications Laboratory
REAP	Rural Energy for America Program
REC	renewable energy certificate
REED	Regional Energy Efficiency Database
REEO	Regional Energy Efficiency Organization
RES	renewable energy standard
RESNET	Residential Energy Services Network
REV	Reforming the Energy Vision
RGGI	Regional Greenhouse Gas Initiative
RIM	Ratepayer Impact Measure
RIMS II	Regional Input-Output Modeling System
RPS	renewable portfolio standard
RTO	regional transmission organization
RTP	real-time pricing

S

SAM	System Advisor Model
SBC	system benefits charge
SCT	Societal Cost Test
SECO	State Energy Conservation Office (Texas)
SEE Action	State and Local Energy Efficiency Action Network
SEP	supplemental environmental project
SFV	straight fixed variable
SGIA	Small Generator Interconnection Agreement
SGIG	Smart Grid Investment Grants
SGIP	Small Generator Interconnection Procedures

SIP	State Implementation Plan
SIR	Standard Interconnection Requirements (New York)
SIT	State Inventory Tool
SOS	Standard Offer Service
SPEER	South-central Partnership for Energy Efficiency as a Resource
SREC	solar renewable energy certificate
SWEEP	Southwest Energy Efficiency Project

T

Tbtu	trillion British thermal units
TEP	Tucson Electric Power Company
TERP	Texas Emissions Reduction Plan
TIF	tax increment financing
TOU	time-of-use
TRC	Total Resource Cost
TRM	technical reference manual
TVA	Tennessee Valley Authority
TWh	terawatt-hour

U

UCSD	University of California, San Diego
UCT	utility cost test
UL	Underwriters Laboratories
UMP	Uniform Methods Project
USDA	U.S. Department of Agriculture
USGBC	U.S. Green Building Council

V

VOST	value-of-solar tariff

W

WGA	Western Governors Association
WHP	waste heat to power

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Executive Summary

Introduction and Background

In 2006, the U.S. Environmental Protection Agency (EPA) issued the *Clean Energy-Environment Guide to Action* to help state policy-makers learn about what other states were doing to bring clean, cost-effective, reliable energy to the marketplace. States have long served as policy pioneers, particularly when it comes to energy efficiency, renewable energy, and combined heat and power (CHP). The original *Clean Energy-Environment Guide to Action's* intent was to gather and share information about proven state best practices, successful strategies, and lessons learned.

Who Should Use the *Guide to Action*?

The *Guide to Action* is written for state air, energy, environmental, and economic policy-makers who want to learn about proven state clean energy policies and implementation best practices so they can:

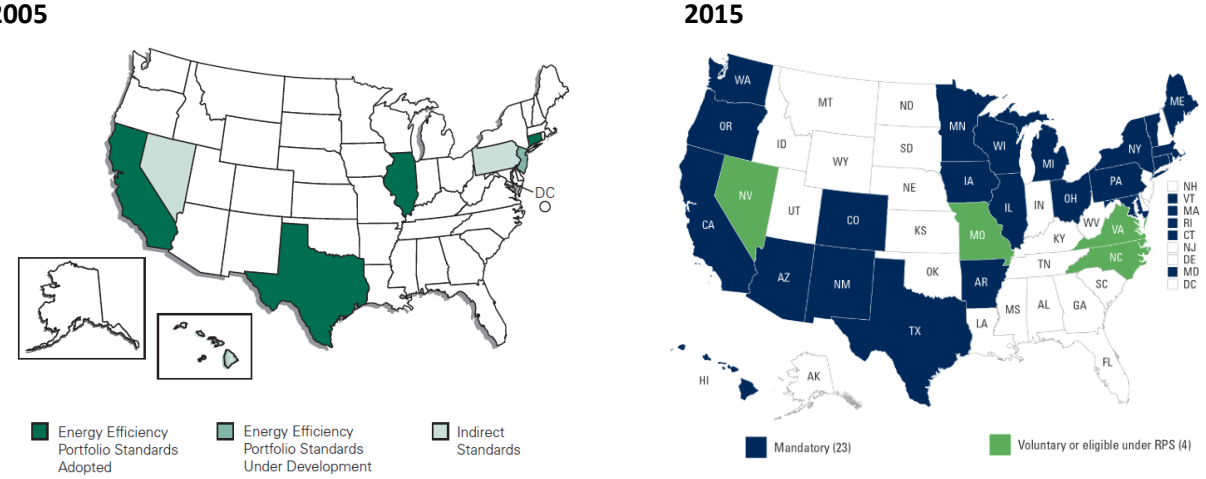
- Develop a clean energy strategy appropriate for their state.
- Boost existing efforts to achieve a cleaner, more efficient energy system.
- Identify the roles and responsibilities of key decision-makers.
- Access technical assistance, resources, and tools available for state-specific analyses and program implementation.

Since the original *Guide to Action* was issued, states have continued to break new ground in these policy areas as they adjust to market needs, take advantage of technology breakthroughs, and achieve their energy and environmental goals. For example, as of March 2015:

- Twenty-seven states have adopted energy efficiency resource standards (EERSs), up from seven in 2005. Mandatory EERSs have increased from two to 23 states. See Figure ES.1.
- Thirty-seven states and Washington, D.C. have adopted renewable portfolio standards (RPSs) that increase the amount of wind, solar, biomass, and other renewable resources in their energy portfolios. Twenty-nine states and Washington, D.C. have mandatory RPSs (DSIRE 2015). This is an increase from 23 states with some form of RPS in 2005 (EPA 2006).

Still, many states can implement new policies and do more to strengthen their existing energy efficiency, renewable energy, and CHP efforts.

Figure ES.1: States with EERSs: 2005 and 2015



Sources: 2005 map from EPA 2006; 2015 map from ACEEE 2014b and DSIRE 2015.

EPA is publishing this update, the *Energy and Environment Guide to Action: State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power* (*Guide to Action*), to gather the latest best practices and opportunities that states are using to invest in energy efficiency, renewable energy, and CHP in service of their environmental, energy, and economic goals. The 2015 *Guide to Action* describes over a dozen state policies, details the best practices and attributes when designing and overseeing effective state policies and programs, identifies key stakeholders to engage during policy development and implementation, and provides resources for more information. Each policy description is based on state experiences in designing and implementing policies, as documented in existing literature and shared through peer-exchange opportunities provided to states by EPA's State Climate and Energy Program.

What's New in the Updated *Guide to Action*?

Over the last 10 years, states have made great progress with their clean energy policies. The new *Guide to Action* includes the following updates:

- All case studies and examples have been updated to reflect new or refined state approaches.
- Best practices have been updated to reflect current thinking.
- Discussions of evaluation approaches have been strengthened to reflect improved state practices.
- New resources have been added to help states design and implement policies.

Why Energy Efficiency, Renewable Energy, and CHP?

States have found that investing in energy efficiency, renewable energy, and CHP is a cost-effective way to meet their energy needs while reducing harmful greenhouse gas (GHG) emissions and other air pollutants, lowering energy costs, and potentially improving the reliability and security of the nation's energy system. Fossil-fueled electricity generation is a major source of air pollutants that form ground-level ozone and fine particulate matter, as well as over 30 percent of GHGs in the United States (EPA 2014a). Using energy efficiency, renewable energy, and CHP helps reduce or avoid environmental and related public health problems.

What Are Energy Efficiency, Renewable Energy, and CHP?

The policies discussed in the *Guide to Action* include demand- and supply-side strategies to meet energy demand and reduce peak electricity system loads in a clean, reliable, and cost-effective manner. These strategies generally fall within the following categories:

Energy efficiency reduces the amount of energy needed to provide the same or improved level of service. Common energy efficiency measures include hundreds of technologies and practices for practically all end-uses across all sectors of the economy.

Renewable energy comes from sources that replenish themselves over time. Renewable energy definitions vary by state, but usually include solar, wind, geothermal, biomass, biogas, and low-impact hydroelectric power.

CHP, also known as cogeneration, is a clean, efficient approach to generating both electric and thermal energy from a single fuel source.

States are finding that investing in energy efficiency, renewable energy, and CHP also creates jobs. The U.S. energy efficiency and renewable energy sectors employed over 566,000 people in 2010, with job growth rates exceeding 2.5 percent annually from 2003 to 2010 (Brookings 2011; EPA 2014b). States and the U.S. energy industry face many challenges in providing affordable, clean, and reliable energy in today's complex energy markets. States have found that reducing electricity demand through energy efficiency and introducing new, cleaner forms of electricity generation can save money for all customer classes, reduce GHG emissions, and help ensure that the grid continues to meet our energy needs.

Opportunities for State Action

Many states have already implemented policies and programs to increase energy efficiency, renewable energy, and CHP. States can learn from each other to adopt new policies and improve their existing policies and programs. This *Guide to Action* discusses ways that states can capitalize on additional, cost-effective clean energy potential and reap multiple benefits in the following areas:

- *Developing a clean energy strategy.* State energy efficiency, renewable energy, and CHP policies are typically developed and implemented across multiple agencies and regulatory jurisdictions. States are finding that developing these policies in conjunction with broad planning processes, such as comprehensive energy and air quality planning or statewide sustainability planning, can help ensure that relevant stakeholders are involved and that the policies are recognized as possible strategies to meet multiple policy goals; they may also provide an opportunity for regional collaboration.
- *Energy efficiency*. States have found that cost-effective energy efficiency can make a significant dent in future energy demand while also benefitting the environment, economy, and energy system. There is still a lot of potential: study estimates vary, but most show that achievable potential on the order of 15 to 20 percent of U.S. electricity demand could be met through energy efficiency over the next 10 to 15 years (ACEEE 2008; ACEEE 2014a; Sreedharan 2013). A little more than half of all states have enacted EERSs, which require that retail electricity distributors meet a specific portion of their electricity demand through energy efficiency; this is an option that could be explored by other states.

  To maximize energy efficiency deployment, states use programs funded by electricity customer fees, federal grants, capacity markets, or emissions allowance auctions. State energy efficiency programs can also coordinate with weatherization assistance programs to leverage an additional funding source while also ensuring complementary energy efficiency program design and implementation for low-income residential customers. They also take advantage of technical assistance and tools available from federal programs such as ENERGY STAR®.
- *Renewable energy*. States have found that the cost of renewable energy technologies has fallen significantly in recent years, creating new policy opportunities. States that do not already have RPSs are considering developing them. An RPS provides a clear and long-term target for renewable energy generation that can increase investors' and developers' confidence in the prospects for renewable energy and therefore encourage investment. States with existing RPS requirements can actively adjust their investments and policy approaches to take advantage of cost-competitive, new, renewable energy technology.
- *CHP*. Most existing CHP capacity (over 80 percent) is located at industrial manufacturing facilities; however, states have found that this trend is changing. States are increasingly focusing on the potential for adding CHP in a variety of ways, including district energy systems at universities and downtown areas, industrial-scale CHP in many industry sectors (e.g., chemicals, paper, and food manufacturing), and in commercial buildings such as hotels and casinos.
- *Leading by example*. For years, many states have been leading by example by establishing policies that reduce emissions and achieve substantial energy cost savings within state facilities, fleets, and operations. In doing so, they have demonstrated environmental leadership and raised public awareness of the benefits of energy efficiency, renewable energy, and CHP. Since leading by example can involve a wide range of policies that potentially cover all state agencies, local governments, schools, and other public sector organizations, there are likely additional ways states can redouble their efforts to lead. The *Guide to Action* describes the full suite of state lead by example options.

The *Guide to Action*: Overview

This *Guide to Action* covers state energy efficiency, renewable energy, and CHP policies and is organized in the following chapters:

Chapter 2: *"Developing a State Strategy*." Describes processes states have used to engage stakeholders; assess their resource potential and policy opportunities; and develop a comprehensive, statewide strategy that provides clean, low-cost, reliable energy while achieving state energy, environmental, and/or economic goals.

Chapter 3: *"Funding and Financial Incentive Policies."* Describes how states are using targeted funding and incentive programs to increase investment in clean energy technologies and services by residents, industries, and businesses.

Chapter 4: *"Energy Efficiency Policies."* Describes how states are encouraging energy efficiency improvements through programs, standards, and codes.

Chapter 5: *"Renewable Portfolio Standards."* Offers a range of strategies and approaches that states are using to promote renewable energy.

Chapter 6: *"Policy Considerations for Combined Heat and Power."* Describes options states have used to capture CHP's environmental, energy, economic, and reliability benefits, either by providing CHP-specific incentives or incentivizing CHP with other similar technologies or fuel types.

Chapter 7: *"Electric Utility Policies."* Offers details on a variety of strategies that states have used to further promote energy efficiency, renewable energy, and CHP. These strategies include electricity resource planning and procurement, policies that sustain utility financial health, interconnection and net metering standards, customer rates and data access, and maximizing grid investments to achieve energy efficiency and improve renewable energy integration.

States Are Developing Strategies for Implementing Energy Efficiency, Renewable Energy, and CHP

States across the nation are setting environmental and energy targets and identifying the best ways to reach those targets.

As of September 2014, 20 states and Washington, D.C., have set targets for GHG reductions. States have found that energy efficiency and renewable energy policies are often key to achieving these goals. For example, Oregon's 10-Year Energy Action Plan sets GHG reduction targets and aims to meet 100 percent of new electric load growth through energy efficiency.

Pennsylvania recently commissioned a study, *Electric Energy Efficiency Potential for Pennsylvania*, which provides detailed information on the energy efficiency measures that are the most cost-effective and have the greatest potential energy savings.

New York commissioned the *Energy Efficiency and Renewable Energy Potential Study of New York State*, which identified energy efficiency policies that would yield about $30 billion in net economic benefits, as well as solar and wind energy technology with the highest potential for in-state renewable energy sources.

Table ES.1 provides an overview of the policies described in the *Guide to Action*, as well as the energy resources targeted by each policy. These policies were selected because of their proven effectiveness; their ability to help overcome the barriers states face as they promote energy efficiency, renewable energy, and CHP; and their successful implementation by a number of states. The information presented about each policy is based on proven models, state experiences, and lessons learned.

Table ES.1: Summary of Policies by Type of Energy Resource

Policy	*Guide to Action* Section	Energy Efficiency	Renewable Energy	CHP
Funding and Financial Incentives Policies	3	•	•	•
Energy Efficiency Policies	4	•	•	•
Energy Efficiency Resource Standards	4.1	•		•
Energy Efficiency Programs	4.2	•		
Building Codes for Energy Efficiency	4.3	•		
State Appliance Efficiency Standards	4.4	•		
Lead by Example	4.5	•	•	•
Renewable Portfolio Standards	5		•	•
Combined Heat and Power	6	•	•	•
Electric Utility Policies	7	•	•	•
Electricity Resource Planning and Procurement	7.1	•	•	•
Policies that Sustain Utility Financial Health	7.2	•	•	•
Interconnection and Net Metering Standards	7.3		•	•
Customer Rates and Data Access	7.4	•	•	•
Maximizing Grid Investments to Achieve Energy Efficiency and Improve Renewable Energy Integration	7.5	•	•	•

Table ES.2 (at the end of this section) presents additional details about each of the policies, including specific approaches states can use to implement each policy, key design issues and resources, and states that serve as examples of each policy. (Note that many other states have also implemented these policies; for more information, see the policy sections in the *Guide to Action*.) A brief description of each of the 14 policies follows, including highlights of state experiences with each policy.

Developing a State Strategy

Rather than evaluating individual policies in isolation, states have found that an overarching strategy for developing energy efficiency, renewable energy, and CHP can help articulate goals and identify the best ways to meet them. Goals include reducing energy consumption by a certain amount; achieving a certain percentage of renewable energy in the energy mix; or lowering GHG emissions to a certain level with energy efficiency, renewable energy, and CHP. States have found that goals can be performance-based, with a focus on reliability, or cost-based, with a focus on reducing energy costs. There are many ways to meet most goals; developing a comprehensive strategy for meeting them ensures that efforts are focused appropriately.

States have found that the main steps in developing a comprehensive energy efficiency, renewable energy, and CHP strategy generally include:

- Engaging with key state agency officials and stakeholders (because decisions related to the electricity system cut across multiple jurisdictions).
- Clarifying state priorities and goals for energy.

- Developing a baseline and forecast to understand current conditions and future trends relevant to the state's energy and/or environmental goals.
- Assessing energy efficiency, renewable energy, and CHP potential.
- Identifying policy and program options, including enhancing existing policies as well as implementing new ones.
- Estimating potential policy and program impacts.
- Prioritizing policies and programs relative to the state's goals.
- Developing an implementation strategy that defines responsibilities, actions, a schedule, and a mechanism for monitoring and reporting.

The order of these steps varies from state to state. For example, some states first develop broad goals for energy efficiency, renewable energy, and CHP, which may be based on regional goals or agreements, other state activities, or political considerations; they then determine the most effective ways to achieve their goals. Alternatively, some states first conduct thorough analyses of their clean energy potential, then evaluate policy options and assess related opportunities before determining a goal. This range of approaches to goal-setting allows each state to proceed in a manner suited to local circumstances.

Funding and Financial Incentives

States that are promoting energy efficiency, renewable energy, and CHP provide different degrees of funding opportunities and financial incentives. Revolving loan funds, property assessed clean energy (PACE) financing, energy savings performance contracting, credit enhancement, and energy efficiency mortgages are all state funding strategies that help lower the upfront costs of investing in new technology, reducing one of the major barriers to wider adoption. Financial incentives that lower this cost barrier include grant programs, rebate programs, performance-based incentives, and tax incentives.

When designing effective funding and financial incentive programs, states typically keep four general principles in mind:

- Focus on specific markets and technologies and select them based on technical and economic analyses of those markets and technologies.
- Use financing and incentives *as part of* a broader package of policies to encourage investments to maximize the success of all of the policies.
- Establish specific technical and financial criteria to define the types of eligible projects.
- Track details of program costs and energy savings/production to ensure that the programs can be evaluated for cost-effectiveness and improved.

States Are Supporting Energy Efficiency, Renewable Energy, and CHP with Funding and Financial Incentives

- The Home Energy Rebate Program, administered by the Alaska Housing Finance Corporation, provides up to $10,000 in rebates to homeowners who make energy efficiency improvements to an existing home, and up to $10,000 for the construction of a qualified energy-efficient new home.
- North Carolina offers a renewable energy tax credit equal to 35 percent of the cost of eligible renewable energy property that is constructed, purchased, or leased by a taxpayer.
- The Connecticut Commercial Property Assessed Clean Energy program allows commercial, industrial, and multifamily property owners to finance energy efficiency and clean energy improvements through a special assessment on their property tax bill, which is repaid over a period of up to 20 years.
- The New Jersey Energy Resilience Bank provides funding to support energy infrastructure projects that will address energy vulnerabilities and maximize energy resilience by supporting projects such as fuel cells, CHP, solar with storage, and dynamic microgrids.

Promoting Energy Efficiency

States have found that saving energy through energy efficiency improvements can cost less than generating, transmitting, and distributing energy from power plants. These improvements also provide many other benefits, including reduced peak loads, lower electricity bills, reliable grid support, reduced air emissions, and improved public health. States have adopted many policies that support cost-effective energy efficiency programs by removing key market, regulatory, and institutional barriers that hinder investment in energy efficiency by consumers, businesses, utilities, and public agencies. The *Guide to Action* describes four energy efficiency policies that states have successfully implemented to support greater investment in, and adoption of, energy efficiency.

Energy Efficiency Resource Standards

EERSs are set by state legislatures and require that energy providers meet a certain portion of their electricity demand through energy efficiency. EERSs usually take the form of multi-year targets that utilities or other retail distributors must meet, such as a requirement to meet 10 percent of annual energy demand or a certain percentage of retail sales through energy efficiency.

While EERSs set a specific target for energy savings, state policy-makers and utilities usually have some flexibility to explore the best strategies for meeting those targets. Utilities and other program administrators often meet these targets through customer energy efficiency programs, such as offering rebates for energy-efficient appliances or light bulbs. Some states also achieve EERS targets using other approaches, such as peak demand reductions, building codes, and CHP. EERSs have been a major force behind the adoption of energy efficiency programs, such as those described below.

States have found that effectively designed and explicit EERSs, based on sound analyses of technical, economic, and achievable potential, can help ensure that energy efficiency opportunities are pursued to meet electricity demand at least cost.

States Are Establishing EERSs

As of March 2015, at least **27 states** have set some sort of energy efficiency requirement or goal. Most of these EERSs have been highly successful: states generally exceeded their savings targets in 2012, with overall savings of 20 million megawatt-hours (MWh)—surpassing combined targets of 18 million MWh (ACEEE 2015).

- In Arizona, the state's largest utility reported a net benefit to consumers of more than $200 million in 2012 alone as a result of the state's EERS. In total, Arizona's electric utilities saved 693 gigawatt-hours in 2012, equivalent to 1.66 percent of retail sales.
- Following the passage of Assembly Bill 2021 in 2006, the California Energy Commission (CEC), CPUC, and other stakeholders were required to develop a statewide estimate of all cost-effective electricity and gas savings and to develop annual energy savings and demand reduction goals for the state's four largest IOUs. This study must be updated every 3 years. From 2006 to 2014, accounting for program and customer costs, California's EERS program has resulted in overall savings of $1.8 billion.
- The Illinois Power Agency Act of 2007 sets incremental electric and gas savings, ramping up from 0.2 percent electricity savings in 2008 to 2 percent in 2015 and thereafter. Illinois electric utilities ComEd and Ameren both exceeded their electricity savings goals for each of the first 5 years of the EERS.
- In Pennsylvania, all utilities met or exceeded the EERS goal of achieving 10 percent energy savings from government buildings, nonprofits, and schools by 2013.

Energy Efficiency Programs

States develop energy efficiency programs to lower customers' energy costs, reduce the need for new power system capacity, meet energy savings goals, stimulate local economic development and new jobs, and reduce the environmental and health impacts of meeting electricity service needs. Energy efficiency programs help educate consumers about the benefits of energy-efficient purchases or actions, and help overcome costs and other barriers that prevent households and businesses from investing in energy efficiency improvements. State agencies that deliver Low-Income Home Energy Assistance Program assistance also help implement energy efficiency programs to improve energy affordability.

States rely on a combination of authorities and funding sources to administer and oversee successful energy efficiency programs. In most states, energy efficiency programs are funded through modest electricity surcharges on customer bills. This funding is used to cover the costs of designing and implementing the programs, as well as incentives paid to customers.

States are finding that energy efficiency programs significantly reduce electricity demand at a relatively low cost. In 2012, energy efficiency programs in 48 states reported energy savings. Well-designed and administered energy efficiency programs have reduced demand at a lower cost than generating electricity, and have also helped create local jobs by lowering energy costs and stimulating new public and private sector investments.

States Are Establishing Energy Efficiency Programs

As of 2013, **48 states and Washington, D.C.,** have energy efficiency programs. State funding for electricity energy efficiency programs increased from $1.6 billion in 2006 to $6.3 billion in 2013 (ACEEE 2014c).

- Massachusetts first required electric utilities to provide energy efficiency programs through public benefits funds during its restructuring of the industry in 1997. In January 2013, the Department of Public Utilities approved the second 3-year (2013–2015) electric and gas energy efficiency plans under the Green Communities Act, calling for savings to increase to 2.6 percent in 2015.
- In 2009, Missouri enacted Senate Bill 376, the Missouri Energy Efficiency Investment Act (MEEIA). MEEIA requires Missouri's investor-owned electric utilities to capture all cost-effective energy efficiency opportunities. The Missouri Public Service Commission's rule to implement the MEEIA sets out voluntary goals for electric utilities to achieve 0.3 percent annual savings in 2012, ramping up annually to 1.7 percent in 2019, for cumulative annual savings of 9.9 percent by 2020. In 2011, Missouri's energy efficiency programs resulted in savings of 369,000 MWh.
- In 1999, Vermont authorized the Vermont Public Service Board to collect a volumetric (per kilowatt-hour [kWh]) charge on all electric utility customers' bills to support energy efficiency programs. In 2012, Vermont's budget for electricity efficiency programs was almost $40 million, making up 5.2 percent of statewide utility revenues; its budget for natural gas efficiency programs was $2 million.

Building Energy Codes

Building energy codes require new building construction, as well as major renovations to existing buildings, to meet minimum energy efficiency requirements. These codes are intended to reduce the building's energy needs throughout its lifetime. With these codes, states require certain construction practices that can achieve significant energy and cost savings for building owners and occupants with little to no increase in total construction costs.

The U.S. Department of Energy (DOE) estimates that building codes will result in more than 14 quadrillion British thermal units of energy savings from 2009 to 2030. These energy savings will translate to significant economic benefits for consumers and businesses. DOE estimates that building energy codes will result in a financial benefit of nearly $2 billion annually by 2015 and more than $15 billion annually by 2030. The projected savings from energy codes also translates to an estimated cumulative savings of 800 million metric tons of carbon dioxide by 2030–equivalent to removing 145 million vehicles from our nation's roadways (DOE 2014).

State and local governments have already made progress with codes. However, states have found opportunities to realize further energy savings by adopting new and more efficient codes and by improving code compliance. DOE estimates that upgrading from the 2006 to the 2012 International Energy Conservation Code (IECC) would reduce energy costs to homeowners by an average of 32.1 percent (DOE 2012).

States Save Energy with Building Codes

As of March 1 2015, **41 states** (including Washington, D.C.) have a state-level *residential* building energy code equal-or-better than the 2006 IECC; **42 states** (including Washington, D.C.) have a state-level *commercial* building energy code equal-or-better than ASHRAE Standard 90.1-2004 (BCAP 2015).

- California's Title 24 standard for residential and commercial buildings is a mandatory, statewide building energy code that is more efficient than the 2012 IECC and ASHRAE 90.1-2010. California's building energy code differs from other state codes in that it affects the process of building design and construction verification more thoroughly.
- Massachusetts was the first state to adopt an above-code appendix to its state building energy code in 2009. One hundred twenty-two communities in Massachusetts adopted this voluntary code. The state government adopted new codes in 2014, which are expected to save $144 million annually by 2030.
- Illinois adopted the 2012 IECC on January 1, 2013, and has set up an aggressive system for implementing future updates to energy building codes. DOE expects Illinois' energy cost savings to reach $270 million annually by 2030.

State Appliance Standards

State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products. These standards typically prohibit the sale of less efficient models within a state. Many states are implementing appliance and equipment efficiency standards for products that are not already covered by the federal government, and are finding that they offer a cost-effective strategy for improving energy efficiency and lowering energy costs for businesses and consumers.

Appliance standards help overcome barriers such as "split incentives," whereby the individual purchasing the appliance (such as a builder or landlord) is not the individual who benefits from the energy savings. The purchaser therefore has little incentive to spend the time identifying or incurring the additional cost of the most efficient model. Standards also help overcome the barrier of "panic purchases," whereby homeowners purchase appliances on an emergency basis (when the previous model breaks down) and do not have time to research the most efficient options.

Efficiency standards can play a significant role in helping states meet energy savings goals. In California, for example, draft regulations for 15 new appliance standards are expected to save 50 billion gallons of water, 1,400 megawatts (MW) of peak electricity, 9,800 gigawatt-hours (GWh) of electricity, and 162 million therms of natural gas per year, all while providing $2 billion in energy cost savings annually (CEC 2014).

States Are Setting Efficiency Standards for Appliances

As of February 2014, **12 states** and Washington, D.C., have passed legislation to adopt appliance efficiency standards for 16 types of appliances not covered by federal standards.

- California's energy efficiency standards cover more than 50 products. Since California's appliance standards program was first established, it has saved consumers over $75 billion on electricity bills alone.
- Connecticut has adopted or plans to adopt nine appliance standards that are not currently covered by federal standards. These appliances include bottle-type water dispensers, commercial hot food holding cabinets, hot tubs, swimming pool pumps, compact audio equipment, DVD players and recorders, and televisions.
- Oregon's standards cover bottle-type water dispensers, hot food holding cabinets, compact audio devices, DVD players and recorders, and portable electric spas. In 2013, Oregon passed Senate Bill 692, which added standards for televisions and battery chargers effective in 2014, as well as double-ended quartz halogen lamps effective in 2016. These new standards are expected to save 244 GWh and $22 million annually in energy costs by 2020.

Lead by Example

Lead by example initiatives include a range of programs and policies that states and municipalities can pursue to increase energy efficiency, renewable energy, and CHP in their facilities, fleets, and operations. For example, many local governments require their agencies to purchase a certain amount of renewable energy, install solar panels, adopt certain energy efficiency measures, or achieve specific levels of energy savings.

States have found that lead by example initiatives are important because they are uniquely positioned to use their purchasing power, significant scope of operations, and visibility to demonstrate the value and benefits of energy efficiency, renewable energy, and CHP. State and local governments are also positioned to support similar actions among other local governments, schools, colleges and universities, parks and recreation facilities, and other public sector organizations. Public agencies collectively oversee a large amount of building space, vehicle fleets, and energy use, meaning that changes implemented for public agencies can have significant impacts.

In this way, state lead by example initiatives help demonstrate to home and business owners that energy efficiency, renewable energy, and CHP measures are feasible and can result in real savings. They also offer opportunities to achieve substantial energy cost savings, demonstrate environmental leadership, and raise public awareness of the benefits of clean energy technologies.

States Are Leading by Example

Many states and local governments have lead by example initiatives. For example:

- New Hampshire's Executive Order 2011-1 establishes a target to reduce statewide fossil fuel use by 25 percent from 2005 levels by 2025, with interim goals for 2015 and 2020. Staff must also purchase ENERGY STAR rated equipment and implement a "clean fleets" program to reduce transportation fuel use.
- Montgomery County, Maryland, led a regional partnership to purchase wind energy. Participating entities include six Montgomery County agencies and 12 other local government entities. As of 2012, green power was supplying about 25 percent of the aggregate demand in county facilities.
- The Texas legislature passed Senate Bill 700 in June 2014, which requires state agencies and institutions of higher education to set percentage goals for reducing their use of water, electricity, gasoline, and natural gas, and to include those goals in their comprehensive energy plans.

Promoting Renewable Energy: RPSs

An RPS requires electric utilities and other retail electric providers to meet a certain amount of customer demand with eligible sources of renewable electricity. States have found that an RPS is a useful tool to increase the amount of renewable energy using a cost-effective, market-based approach. RPSs can be used in both regulated and restructured electricity markets.

States create RPS programs because renewable energy provides significant energy, environmental, and economic benefits. These include reduced emissions of GHGs and other air pollutants, reduced waste, increased energy supply diversity and security, reduced power price volatility, and local economic development. Many states have also adopted RPS programs to stimulate market and technology development, with the ultimate goal of making renewable energy competitive with conventional forms of electric power.

States have found that RPS policies are a key driver for developing new renewable electric generation facilities, such as wind and solar, in the United States. They have also helped increase how much electricity is directly generated by homes and businesses. RPSs are attractive to many states because they are an administratively efficient, cost-effective, market-based approach to achieving renewable electricity policy objectives.

States Are Setting RPSs

As of July 2014, **29 states** and Washington, D.C., as well as the Northern Mariana Islands and Puerto Rico, have established RPS requirements. An additional nine states, as well as Guam and the U.S. Virgin Islands, have adopted non-binding renewable portfolio goals. In 2012, state RPS policies applied to 55 percent of all U.S retail electricity sales.

- California's RPS requirements are among the most aggressive in the country, requiring retail sellers of electricity to purchase 33 percent renewable electricity by 2020.
- Massachusetts has set a state RPS target of 22.1% by 2020. By assigning separate tiers for new and existing resources, Massachusetts' RPS encourages development of new renewables while also acknowledging and providing support to existing renewables.
- Wisconsin's RPS lists a few non-electrical technologies as eligible resources, specifically solar water heaters; solar light pipes; ground source heat pumps; and installations that generate output from biomass, biogas, synthetic gas, densified fuel pellets, or fuel produced by pyrolysis. The state also has regulations that direct how eligible RECs can be issued from these resources that do not produce electricity.

Promoting Combined Heat and Power

CHP is a system that simultaneously generates heat and electricity from a single fuel source. States have found that CHP is a highly efficient way to produce energy because it uses heat that is produced as a byproduct of electricity generation or industrial sources and would normally be wasted. Thus, CHP systems are substantially more efficient than traditional electricity generation purchased from the grid. CHP is used in every state, and is found primarily in areas with high industrial and commercial activity concentrations, high electricity prices, and policies favorable to CHP.

CHP offers a low-cost approach to adding new electricity generation capacity. Onsite electric generation reduces grid congestion and improves the electricity distribution system's reliability. CHP defers the need for investments in new central generating plants and transmission and distribution infrastructure, helping to minimize electricity cost increases. It also provides all of the environmental benefits of improved energy efficiency (e.g., lower emissions of GHGs and other conventional air pollutants).

States use a variety of policies to promote CHP, including encouraging private sector investment, coordinating at the federal level, partnering with and supporting other states, and identifying investment models beneficial to the multiple stakeholders involved. In several states, CHP can count toward a renewable energy or clean energy portfolio standard goal.

States Are Promoting CHP

Many states promote CHP through a variety of strategies and measures. For example, as of 2011, **19 state climate action plans** and **22 state energy plans** include CHP provisions, and **26 state portfolio standards** include CHP requirements.

- Kentucky is using a multi-pronged policy approach to advance CHP. It has factored in CHP as part of its efforts to meet the state energy plan's GHG emissions reduction target. It has established financial incentives under its Incentives for Energy Independence Act as well as energy efficiency loans for state government agencies. It also has interconnection standards in place that take CHP into consideration.
- In California, utilities must prepare an onsite generation forecast as part of their long-term procurement plans. Onsite generation, of which CHP is a subset, must also be considered as an alternative to distribution system upgrades by California's IOUs.
- In the 2008 *Iowa Climate Change Advisory Council Final Report*, policy recommendation CRE-12, "Combined Heat and Power," suggests promoting CHP across Iowa by providing incentives for CHP development. Suggested incentives include tax credits, grants, zoning provisions, and offset credits for avoided emissions.

Promoting Energy Efficiency, Renewable Energy, and CHP through Electric Utilities

Electricity Resource Planning and Procurement

Planning and procurement play key roles in increasing clean resources in the electric sector. Since most utility decisions are long-term in nature, decisions made during the planning and procurement process can have environmental and economic implications for decades.

Utility planning is an opportunity to examine non-traditional electricity resources such as energy efficiency, renewable energy, and CHP with the same rigor as traditional generation resources. States are also now considering anticipated environmental regulations in electricity planning, including promulgated, proposed, planned, and emerging environmental regulations.

State environmental and utility regulators are increasingly coordinating and consulting with one another as they set new policies. This helps ensure that environmental goals are reflected in electricity planning decisions and vice versa.

States Are Including Energy Efficiency, Renewable Energy, and CHP in Electricity Planning and Procurement

Most states require utilities to engage in some form of electricity resource planning. As of January 2015, **integrated resource plan (IRP) processes are required or present in more than 30 states**; they provide an opportunity for states to examine how energy efficiency, renewable energy, and CHP affect utility operations, customer costs, system reliability, and risks. **At least 26 states have at least some form of discrete resource approvals through a Certificate of Public Convenience and Necessity process.** Examples of state policies for electricity planning include the following:

- Nevada IRP rules require that electric utilities submit a plan every 3 years to increase the state's electricity supply or the demands made on its system. The state public utility commission (PUC) prescribes the contents of these plans. Recent changes to the authorizing statutes require that utilities also file plans to reduce emissions from coal-fired electricity generation plants and replace that capacity with capacity from renewable facilities.
- In Oregon, investor-owned gas and electric utilities file individual 20-year least-cost plans or IRPs with the PUC every 2 years.
- Many states have benefitted from fostering interagency collaboration during the planning process. In 2007, Massachusetts consolidated its environmental and energy offices. However, even without combining agencies, utility and environmental regulators can find many opportunities to coordinate. For example, PUC staff can alert environmental managers about ongoing planning processes and engage them to vet long-term environmental outcomes; environmental regulators can similarly alert PUC staff and ratepayer advocates about air and water permit applications.

Policies That Sustain Utility Financial Health

States have found that well-designed financial incentive structures for utilities encourage them to actively support demand-side resources such as energy efficiency, distributed renewable energy, and CHP.

Under traditional regulatory approaches, utilities recoup their costs through the amount of energy they sell. This approach discourages investment in energy efficiency, distributed renewable energy, and CHP, all of which reduce sales volume—which in turn reduces utility revenue.[1] To overcome this disincentive, many states have decoupled utility revenue from sales volumes, whereby utilities are allowed to recover their costs regardless of projected sales volume. States have found that utility payment structures that ensure program cost recovery, along with performance-based shareholder incentives, can encourage a lower cost, cleaner, and more reliable energy system. For example, utilities can be incentivized to encourage energy efficiency, even though it may reduce the volume of electricity they sell.

Most states have either implemented, or are currently considering, at least one of these forms of decoupling and incentive regulations.

[1] The effect of this linkage is increased in the case of distribution-only utilities, as the revenue impact of electricity sales reduction is disproportionately larger for utilities without generation resources.

States are Adopting Policies to Sustain Utility Financial Health

Nearly all states have adopted incentives for demand-side resources. For example:

- Arizona has recently undertaken regulatory efforts to address incentive regulation, approving both performance incentives and revenue decoupling mechanisms on a case-by-case basis for utilities. The state's two largest investor-owned utilities both have partial revenue decoupling mechanisms and performance incentives in place,
- In New York, all six major electric and all 10 major gas companies have revenue decoupling mechanisms in place. In 2008, the Public Service Commission established incentives for electric utility energy efficiency programs in which utilities earn incentives or incur negative adjustments based on the extent to which they achieve energy savings targets.
- In Nevada, 2009 Senate Bill 358 directed the Public Utilities Commission of Nevada (PUCN) to remove financial disincentives for energy efficiency faced by utilities. In 2010, the PUCN approved a lost revenue adjustment mechanism for utilities, which allows them to recover lost revenues during annual demand-side management (DSM) filings. As of March 2015, a docket (12-12030) was open to investigate another method besides lost revenue recovery to compensate utilities for providing DSM programs. The PUCN has also adopted rules permitting gas utilities to propose decoupling profits from sales through a revenue-per-customer system.

Interconnection and Net Metering Standards

States have found that using standard interconnection and net metering rules for onsite generation systems (i.e., systems where customers generate their own electricity), such as renewable energy and CHP, accelerates the development of clean energy. The requirements for connecting onsite generation systems to the grid are important, since they affect electrical system safety and reliability. States have found that poorly designed requirements can create unintentional barriers to onsite generation systems.

Standard interconnection rules stem from state legislation that directs state public utility commissions (PUCs) to establish uniform processes and technical requirements for grid-connected electric generators. States also use legislation to direct their PUCs to develop standard net metering rules. Net metering rules often serve as a form of interconnection policy as well as a cost recovery mechanism for smaller onsite generation systems. Net metering policies allow onsite generation system owners to receive credit for electricity generated by their systems that is exported to the utility grid. In effect, customers can bank exported generation to offset future electricity use they would otherwise have to purchase at the utility's full retail rate.

Nearly all states have some sort of interconnection or net metering policy; however, many states' standards do not currently meet established best practices or model rules. To further the deployment of energy efficiency, distributed renewable energy, and CHP, states can consider updating and improving their existing interconnection and net metering policies. Specifically, interconnection and net metering standards must be sensitive to variations in process, cost, system size, and technology. Also, technical standards, procedures, and agreements should be transparent and uniform to reduce uncertainty and prevent delays that clean onsite generation systems can encounter when seeking approval for electric grid connection.

State Interconnection and Net Metering Standards

Nearly all states have some sort of interconnection or net metering policy.

- Oregon has three separate interconnection standards: one for net metered systems (including its primary IOUs) and its municipally and cooperatively owned utilities, one for small generator facilities (non-net metered systems), and one for large generator facilities (non-net metered systems). Both fossil-fueled and renewably fueled net metered systems, including CHP systems, are eligible for standardized interconnection. Oregon is one of the few states to receive an "A" grade for both its interconnection and net metering policies in a FreeingTheGrid.org survey of state policies.
- Utah requires the state's IOU and cooperatively owned utilities serving more than 10,000 customers to offer net metering to customers who generate electricity. In 2013, FreeingTheGrid.org gave Utah's interconnection and net metering policies an "A" ranking based on a scoring system that compares state rules against a standard best practice model policy. In Utah, renewable fuels, including waste gas and waste heat capture and recovery, are eligible under the state's interconnection standards. Only renewably fueled CHP systems are eligible under the state's net metering and interconnection standards.

Customer Rates and Data Access

State PUCs have many options for how utilities will charge customers for service. The design of these charges is often referred to as the customer's rate structure and includes charges for consuming electricity, interconnecting with the electricity grid, and generating electricity at the customer's premises. States have found that rate structures can either encourage or discourage energy efficiency, renewable energy, and CHP. For example, increasing customer rates with higher usage under inclining block rates encourages investment in energy efficiency. States have also found that some rates charged by electric utilities (e.g., standby rates) may provide a disincentive for customers to invest in distributed renewable energy and CHP, such as solar panels. This is particularly true when rates are designed to reflect customers relying on grid electricity during high-cost times only.

Providing customers, utilities, and others access to energy use information is another important way to incentivize energy efficiency, renewable energy, and CHP. For example, access to energy use data from tenants in commercial and multifamily residential buildings is critical for building owners and managers to benchmark energy use, identify the best opportunities for improvement, and measure efficiency effort impacts. Utilities may also analyze customer data to improve the design and implementation of energy efficiency and renewable energy programs.

A well-designed and supportive rate structure, complemented by access to energy data, can be critical to helping customers justify investments and evaluate their impacts.

States Are Using Customer Rates and Data Access to Encourage Energy Efficiency, Renewable Energy, and CHP

- In New York, the utility Consolidated Edison's default residential rate is a blend of flat and inclining block rates. The inclining block rate charges customers approximately 1.3 cents per-kWh more for electricity use exceeding 250 kWh in the summer months.
- In 2010, Hawaii instituted a feed-in tariff for a variety of renewable energy technologies. Owners of eligible onsite generation installations can sign 20-year contracts with one of the three IOUs in Hawaii. Under these contracts, the utility agrees to purchase the onsite generation system's output at a fixed per-kWh price. Eligible technologies include solar photovoltaic, concentrating solar thermal, in-line hydroelectric, on-shore wind, and all other renewable technologies that qualify for Hawaii's RPS.
- Access to energy use data is critical for benchmarking energy use in commercial and multifamily buildings; however, building owners may not have access to whole-building data if tenants pay their bills directly to the utility. Some states have mandated that utilities provide energy use data to building owners, especially where building benchmarking is mandated at the state or local level.

Maximizing Grid Investments to Achieve Energy Efficiency and Improve Renewable Energy Integration

States have traditionally made electricity grid investments with goals of providing reliable service, alleviating congestion, recovering from outages, and expanding to meet new or growing customer demand. While these remain primary goals, leading states are also working to ensure that current and future grid investments are planned and managed to increase system energy efficiency, support end-use energy efficiency, and accommodate the anticipated growth in renewable resources.

For example, utilities can reduce energy losses along the distribution system itself, as well as at end-use, by managing voltage along distribution systems. Throughout the United States, electricity must be delivered to most customers within a range of voltages. Delivering electricity closer to the lower end of this voltage range can save customers energy because some equipment operates more efficiently at lower voltage. Some of the same technologies and strategies used to adjust system voltage can be used to better handle the reactive power needed to manage current and voltage in alternating current electricity systems—used almost universally in the United States to deliver electricity to customers. Better reactive power management can reduce the fuel needed to operate the grid while improving the quality of power delivered to customers.

Many states have found that appropriate management of grid assets is essential to realizing the full extent of grid investments. Leading states are investing in new technologies and management practices to achieve energy efficiency and enhance renewable energy integration.

States Planning for Energy Efficiency and Renewable Energy Benefit from Grid Investments

- In Indiana, the legislature created a new tracker, which is overseen by the Indiana Utility Regulatory Commission, to encourage utility investment in transmission, distribution, and storage system improvements. Before costs can be passed through to consumers, the utility is required to submit a 7-year plan that is subject to public comment and approval by the Indiana Utility Regulatory Commission.
- As part of its transition into the next 3-year phase of the EmPOWER Maryland Energy Efficiency Act of 2008, the Maryland Public Service Commission approved a proposed utility conservation voltage reduction (CVR) program and directed all other regulated companies to develop or accelerate CVR programs.
- The Massachusetts Department of Public Utilities issued an order in June 2014 requiring all of the state's utilities to develop and submit 10-year grid modernization plans designed to achieve the following goals: minimize outages, reduce system and customer costs by optimizing demand, facilitate integration and higher penetration of distributed resources, and improve asset and personnel management.

For More Information

To Obtain a Copy of the *Guide to Action*

Please visit EPA's State and Local Climate and Energy Program:
http://www.epa.gov/statelocalclimate/resources/action-guide.html

For More Information about the *Guide to Action*

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Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Chapter 3: Funding and Financial Incentive Policies				
Funding and financing programs, as well as direct financial incentives that enable residents and businesses to increase energy efficiency, renewable energy, and CHP.	o Direct cash incentives (grants, rebates, performance-based incentives). o Tax incentives. o Loans and financing programs. o Green banking.	o Select specific target markets and technologies based on technical and economic analyses of clean energy markets and technologies. o Create conditions for long-term market stability and growth—i.e., be predictable and stable. o Eligibility clearly defined. o Used in conjunction with complementary policies, in support of broader goals. o Track outcomes and costs to allow for program evaluation.	AK, CA, CO, CT, HI, MI, NC, NJ, NY, TX, WA	o Description and key considerations of various options for providing funding and financial incentives. o Discussion of barriers addressed by each type of program. o Examples of how other states have implemented policies.
Chapter 4. Energy Efficiency Policies				
Section 4.1: Energy Efficiency Resource Standards				
EERSs encourage or require that energy suppliers in their state meet a certain percentage of their demand forecast through energy efficiency measures.	o EERSs can be mandatory or voluntary. o Utilities often have flexibility in how they meet their EERS targets.	o Determine which entities would be subject to the EERS. o EERS target can either be a percentage of load (or load growth) or a fixed number of energy units. When setting the target, conduct analysis to determine realistic potential for energy efficiency, as well as the benefits of different energy efficiency levels. o Consider timing and duration of the EERS. States have found that energy efficiency benefits are usually realized over the course of many years. o Need to consider the interaction with federal and state policies. Complementary policies can help achieve the EERS targets.	AR, AZ, CA, IL, VT	o Information about state experiences. o Information about measurement and verification. Examples of legislation and PUC rulemakings.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Section 4.2: Energy Efficiency Programs				
Energy efficiency programs can contribute to EERSs, help reduce demand, or achieve other state goals.	o Program specifics can vary widely, but funding might be used to provide rebates for energy-efficient appliances, encourage building retrofits, or provide upstream incentives to increase availability of energy efficiency technologies in the market.	o Determine who will administer energy efficiency programs. o States have found that it is usually beneficial to establish a portfolio of programs, and any single program may not be sufficient to meet goals.	MA, MO, MS, VT	o Discussion about identifying key players and establishing funding sources. o Information about evaluating the cost-effectiveness of programs. o Overview of program evaluation, measurement, and verification.
Section 4.3: Building Codes for Energy Efficiency				
Building energy codes establish minimum energy efficiency requirements for residential and commercial buildings, thereby setting a minimum level of energy efficiency.	o Minimum energy efficiency requirements for residential and commercial buildings. o Periodic review and updates to existing codes. o Code implementation, compliance, and evaluation assistance.	o Develop effective program implementation, compliance, and evaluation approaches. o Work collaboratively with builders, developers, and building owners to ensure compliance. o Establish requirements and process for periodically reviewing and updating codes to reflect changes in building technology and design. o Promote “beyond code” building programs to achieve additional cost-effective energy efficiency.	AZ, CA, IL, MA, TX	o Information about individual state codes. o Best practices for energy code implementation.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Section 4.4: State Appliance Efficiency Standards				
State appliance efficiency standards set minimum energy efficiency standards for equipment and appliances not covered by federal efficiency standards.	o Minimum energy efficiency levels for consumer products and commercial equipment. o Periodic evaluation and review of standards, markets, and product applications.	o Identify products not covered by federal law that have potential for notable efficiency improvements. o Use established test methods to set efficiency levels for the state appliance standards. o Consider implementation issues, including product certification, labeling requirements, and enforcement.	CA, CT, OR	o General and state-specific information about standards. o Information on products covered under some state standards. o Examples of enabling legislation and state rulemakings.
Section 4.5: Lead by Example				
Lead by example programs support a range of activities designed to lower energy costs within state operations, buildings, and fleets, and to demonstrate the feasibility and benefits of energy efficiency, renewable energy, and CHP to the larger market.	o Energy savings targets for public buildings. o Energy efficiency and renewable energy purchase commitments for state facilities.	o Collaborate across public agencies, local governments, schools, and private sector and nonprofit organizations. o Measure, verify, and communicate energy savings.	CA, NH, TX	o Information on program evaluation. o Description of how state lead by example efforts interact with federal programs.
Chapter 5: Renewable Portfolio Standards				
RPSs establish requirements for electric utilities and other retail electric providers to serve a specified percentage or amount of customer load with eligible renewable sources.	o Promoting specified technologies through technology tiers and credit multipliers. o Allowing alternative compliance payments. o Allowing trading of renewable energy certificates.	o Develop broad support for an RPS, including top-level offices of the state government, by performing studies that analyze job creation, economic development, and customer bill impacts. o Specify which renewable energy technologies will be eligible. o Allow utility cost recovery, establish cost caps, and consider flexible compliance mechanisms.	CA, MA, NJ, RI, WI	o Example state RPS requirements and eligible technologies. o Information on program design, including compliance mechanisms.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Chapter 6: Policy Considerations for Combined Heat and Power				
CHP, also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source with commercially proven technology.	o Bond o Commercial PACE o Feed-in tariff o Grant o Interconnection standard o Loan o Net metering o Portfolio standard o Production incentive o Public benefits fund o Rebate o State climate change plan o State energy plan o State utility rate policy o Tax o Utility rate	o Assess local CHP potential. o Review and select approaches for project development. o Enter maintenance contracts. o Involve local planning departments. o Sell excess energy.	IA, KY, NY, RI	o Discussion of various policy options for encouraging CHP.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Chapter 7: Electric Utility Policies				
Section 7.1: Electricity Resource Planning and Procurement				
Longer term planning and procurement decisions related to electricity provide opportunities to incorporate energy efficiency, renewable energy, and CHP.	o Integrated resource planning. o Certificate of Public Convenience and Necessity. o Planning for electricity supply in states with restructured electricity markets.	o Develop a load forecast, including both peak demand and energy. o Address existing and anticipated environmental regulations. o Consider both supply options and demand-side resources. o Electricity system plans require some form of electricity system modeling.	CT, GA, NJ, NV, OR	o Description and key considerations of the main types of state electricity resource planning. o Policy options for fully integrating energy efficiency, renewable energy, and CHP in planning. o Descriptions of how states incorporate energy efficiency, renewable energy, and CHP in planning.
Section 7.2: Policies That Sustain Utility Financial Health				
Financial incentive structures help align utility profit goals with the delivery of cost-effective demand-side resources such as energy efficiency, distributed renewable energy, and CHP.	o Decoupling o Lost revenue adjustment mechanisms o Alternate rate structure	o How to compensate utilities for energy efficiency programs so they are incentivized to maximize energy saved and, in turn, sell less electricity. o Designing shareholder incentives to include features related to performance, energy efficiency, and renewable energy.	AZ, CA, NV, NY	o Explanation of how rates can be structured to incentivize energy efficiency, distributed renewable energy, and CHP. o Discussion of how to align shareholder incentives with state energy and environmental goals.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Section 7.3: Interconnection and Net Metering Standards				
Standard interconnection rules establish processes and technical requirements that reduce uncertainty and delays when projects seek grid connection.	o Standard interconnection rules for onsite generation systems through defined application processes and technical requirements. o Net metering, which defines application processes and technical requirements, typically for smaller projects.	o Develop standards that cover the scope of the desired onsite generation technologies, generator types, sizes, and distribution system types. o Address all components of the interconnection process, including issues related to the application process and technical requirements. o Create a streamlined process for generators that are certified compliant with technical standards. o Consider adopting portions of national models and successful programs in other states.	MA, OR, UT	o State-by-state assessment and references. o Information on federal and other resources. o National standards organizations. o Examples of standard interconnection rules.
Section 7.4: Customer Rates and Data Access				
The design of customer rates can incentivize adoption of energy efficiency, renewable energy, and CHP. Providing customers, utilities, and others access to energy data can also incentivize adoption.	o Energy consumption rates o Flat rates o Inclining block rates o Time-varying rates o Demand charges o Data access o Technology-targeted rates o Standby rates o Exit fees o Net metering o Buyback rates o Electric vehicle rates	o Determine whether it is voluntary or mandatory for customers to move to the new rate structure, which provides greater incentives for energy efficiency. o Determine how and with whom customer data may be shared. o Determine how to fairly compensate customers for investments in distributed renewable energy. o Monitor utility implementation.	CA, CT, GA, HI, IL, NY	o Overview of the different rate structures. o Information on different users for energy data.

Table ES.2: Summary of Policies Covered in This Document

Policy Description	Specific Approaches	State Policy Considerations	State Examples in the *Guide to Action*	Key Resources in the *Guide to Action*
Section 7.5: Maximizing Grid Investments to Achieve Energy Efficiency and Improve Renewable Energy Integration				
Electricity grid technologies can be deployed to achieve energy efficiency and improve renewable energy integration.	o Improved voltage and reactive power management. o Strategic use of customer data. o Renewable energy integration opportunities. o Complementary role of demand response and storage.	o Environmental considerations are an important factor in grid modernization efforts. o Gaining operational experience through pilot initiatives helps inform the business case. o Broad deployment may require stakeholder input and state review to ensure utility actions maximize energy efficiency and renewable energy.	CA, IN, MA, MD, Pacific Northwest	o Detailed discussion on how to reduce line losses from electricity distribution systems. o Policy options for grid modernization investments support end-use energy efficiency. o Technology and policy options to support the integration of renewable energy, including storage.

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