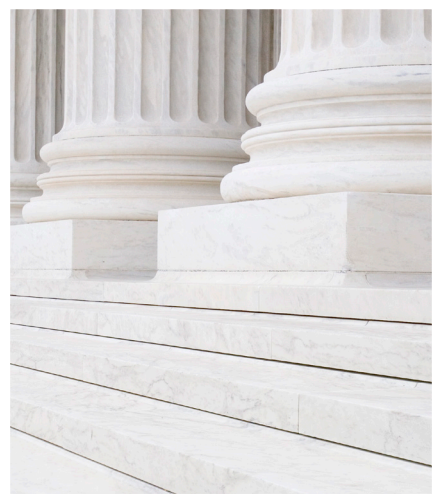
State Strategies to Address Climate Change:

How policy choices impact the potential for success

DECEMBER 2020



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December, 2020

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About VHB/Scott Johnstone
For more than 40 years VHB has provided comprehensive, integrated sustainable solutions supporting energy projects along the east coast. As VHB's New England Energy Market Leader, Scott Johnstone, PE, leads a team of engineers, scientists, and planners that provides public and private sector clients with these future focused energy solutions that address our clean energy needs while minimizing impacts to the environment. For more than 30 years, Scott has focused on energy efficiency and renewable programs, building partnerships with government agencies, utilities, NGOs, and private developers. VHB's clients benefit from professionals, like Scott, whose deep knowledge of the latest policies, and ability to navigate regulatory requirements, increases efficiency and reduces environmental impacts to get energy projects up and running.

E4TheFuture is a non-profit organization dedicated to helping federal and state policies as well as plans, programs, legislation, and technological advancement contributing to improving four "E's": *Energy, Economy, Equity* and *Environment*.

E4TheFuture asked Scott Johnstone to draft this report due to a confluence of the positive state-level movement to promote climate and clean energy strategies and our increasing awareness of the need to examine similarities and differences among states' approaches which can lead to widespread uncertainty about how to best proceed. Offering a comprehensive review and comparison of strategies and approaches can help both states and future federal initiatives learn from efforts that are under way.

E4TheFuture Overview on State Strategies to Address Climate Change

People are very aware of the urgent need to address climate change. Many consider it the most important issue of our time.

E4TheFuture has been participating in state-level actions to help solve the climate emergency. We are excited about the variety of efforts under way in many states. We have also observed that state-level initiatives involve a wide range of targets, goals, pledges, definitions, and resource mix solutions. Due to the complexity of such diverse efforts, states often struggle with how to begin effectively tackling climate change. E4TheFuture engaged consulting firm VHB via their climate and energy policy expert Scott Johnstone to conduct this broad review. His report discusses policy approaches, gaps and barriers, and provides observations for future progress.

States have been—and can continue to be—leaders in developing innovative climate policies. This report documents some of those strategies. It is designed as a starting point to assist states in reviewing a variety of climate strategies and to accelerate important policy initiatives. The set of options and approaches available to each state is diverse, and there is no one-size-fits-all solution. Efforts are hampered by a lack of consistent terminology and methodologies, especially in tracking and reporting impacts.

Of paramount importance for any climate planning are two key considerations: environmental justice and a just transition. Along with the need to prioritize and ensure equity in crafting and implementing climate solutions, we hope all states will intentionally link improving economic health with improving the health of all. A just transition will provide jobs for those impacted by the energy transition.

We look forward to feedback, thoughts, and dialogue among states, consultants, advocates and other stakeholders. We hope that this initial step will lead to future collaboration on state-level climate action, ideally in coordination with Federal leadership.

Sincerely,

Steve Cowell

President, E4TheFuture

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Executive Summary

States are leading efforts in the United States to address climate change, emphasizing the adoption of clean energy policy. The approaches states use vary considerably; each must assess its political environment, economy, and important issues. Lacking clear federal direction, states have developed an array of policy topics, goals, targets, methods, and actions. Understanding and measuring collective progress can be difficult when diverse approaches to policy, measurement, and reporting are prevalent among states.

This report looks at the approaches used by fifteen states, covering an array of policy and implementation. While not all states included are “leaders” in climate policy, each has adopted substantive policies thus warranting their inclusion. All have adopted some policy to begin a transition to clean energy, while most have also adopted clear goals to address climate change. The contributing parts of each state’s economy included in climate change laws also vary. States included are California, Colorado, Hawaii, Maryland, Massachusetts, Minnesota, New Jersey, New Mexico, Nevada, New York, Oregon, Pennsylvania, Vermont, Virginia, and Washington.

Including diverse levels of policy coverage and effort is designed to increase the utility of this report. It enables the reader to understand how progress may be made in any state by seeing what is possible today.

A wide suite of tools has been developed by states to support clean energy and climate goals. While dozens of tools and methods exist, this report focuses on the following categories:

- Adoption of Law
- Codes and Standards
- Carbon Pricing
- Financial Tools
- Economics/Incentives
- Sequestration
- Environmental Justice

States consistently adopt and implement short term, no-regrets strategies. They also are adept in considering interim clean energy and climate goals and then adopting strategies to meet them. While the scale of the interim goals is variable, careful analysis to assure they can be met within the constraints of each state is consistent.

Consideration of longer-term goals brings greater uncertainty regarding the likelihood of attaining success. Variability in the analysis and understanding of which strategies and actions can best meet goals, and unintended consequences that may emerge from those actions, each contribute to this uncertainty. State policymakers often leave these matters for the development of “Roadmaps” or “State Implementation Plans” by the administrative branch or to future legislative consideration.

Among the issues frequently misunderstood or neglected are the future role of—and/or transition from—natural gas, as well as the consequences of strategic electrification on the scale and operation of the future electric grid. The role of sequestration and, where included, the

need to address the permeance questions related to it is another area where actions vary considerably.

States have experimented with policy, strategy, and tools to an extent that there is now a wide body of data and results for anyone desiring to take action on climate change via clean energy policy. Observations are included in this report to assist states in moving forward.

The importance of a strong governance model and the alignment of policy at the highest possible level is explored. The need for common definitions, measurement, and reporting is detailed to address the challenges faced when combining data across states. The value of goals and targets—and the use of roadmaps to develop detailed strategy and actions to meet them—is detailed, as are the variety of solutions.

Lastly, areas requiring further research, analysis, and/or development are highlighted to guide future investment considerations in areas such as:

- Best Practice Development
- Roadmap Practice
- Regional and National Data Sets and Analysis
- Sequestration Evaluation and Tools
- Strategic Electrification Assessment
- Electric Grid Evaluation for Future Needs
- Natural Gas Role and Transition

As states lead, important progress in climate change mitigation and clean energy implementation is occurring. Each state faces hard work within its borders, as part of a region, and as a part of the country. Notable early successes show that policy outcomes are attainable with focus and commitment. States making progress highlight the need for all states, and the nation, to accelerate a beneficial energy transition on our climate and clean energy journey.

Introduction

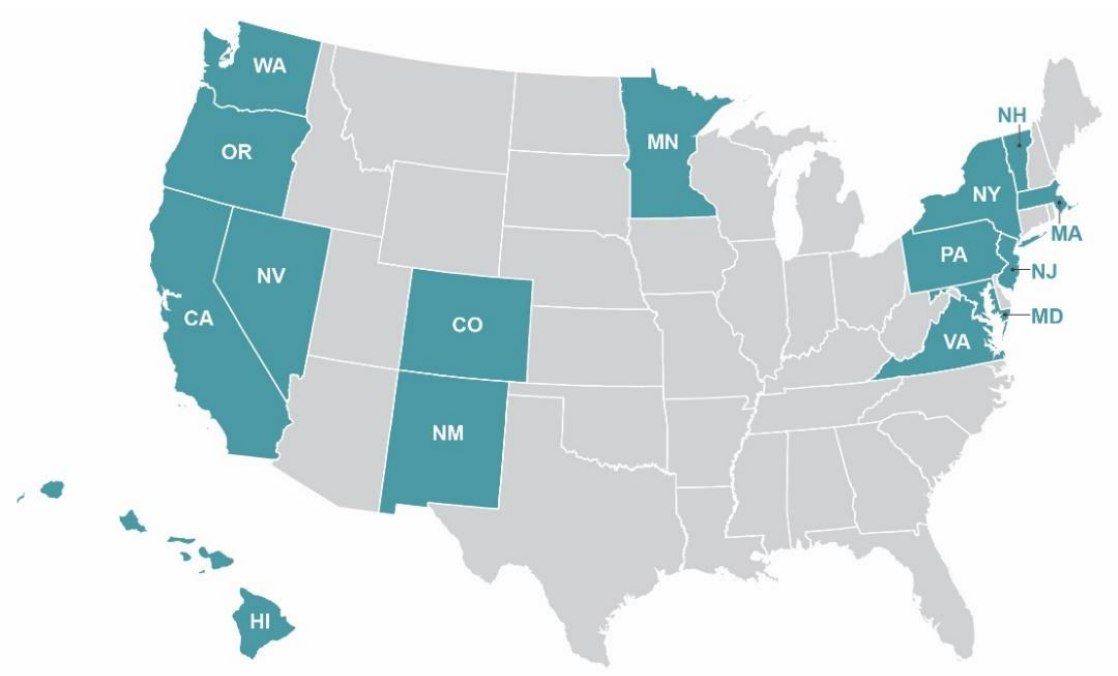
Without cogent national policy on climate change or clean energy, states and cities have emerged as leaders. Not surprisingly, states have chosen to pursue a wide array of strategies and actions for each policy topic. This paper seeks to understand the current status of policy creation and implementation, find useful paths forward, identify gaps in understanding, and clarify how goal setting and legislative direction influence success—both long term and interim. States can build upon this work, detailing how they act to meet critical climate and clean energy policy goals.

That climate change and clean energy policy are deeply interwoven is widely accepted. This paper reviews how legislatures and Governors consider the impact of policy choices on energy infrastructure and electric grid loads that result from new policy pathways. As well, it explores how lower-carbon fuels, like natural gas, are eliminated from consideration or evaluated as a method to meet goals and possibly utilized in a thoughtful transition.

Methodologically, the report studies the laws of 15 states that have committed to progress on clean energy and/or climate change. This group of states does not represent a typical “top 15” list, though many are represented on such lists. For example, the selected states include 12 in the top half for energy efficiency (ACEEE 2019 scorecard), and seven of the top 10. The American Council for an Energy-Efficient Economy looks across all energy sector uses for its annual scorecard. In assessing states that are considering how best to meet goals through energy efficiency, the ranking is a useful resource.

This report examines both leading states as well as others with strong commitments to clean energy and/or climate mitigation in order to include geographic and political spectrums. By studying diverse efforts, exemplar practices and methods emerge. Important gaps are identified for states taking next policy steps and for all states as they determine how to best attain goals.

Figure 1: States Included.



State of the States

As the driving force in the U.S. policy arenas of clean energy and climate change mitigation, states have adopted policy to fit local circumstance, regional energy system context and planning model, and/or political potential for adoption. A good deal of alignment exists across states, as well as wide diversity in policy type and volume of tools considered and adopted. Terminology and timelines for attainment of goals and benchmarks for measuring success against vary significantly. This highlights the challenge of operating a reliable and resilient energy system, as well as wider progress against climate change without a vibrant, deeply engaged and committed national partner.

Terms and Definitions

Differences exist in definitions and terms in law and regulation across the states. However, two represent a useful way to aggregate an assessment: greenhouse gas emissions (GHG) and renewable portfolio standards (RPS). While most GHG assessment is focused on carbon emissions, impacts from methane released by animal waste and food waste disposal are often neglected or overlooked.

States often utilize *goal* and *target* interchangeably in statute and rule. Classically, a goal describes what you want to accomplish while a target assigns a numerical value to the goal. For example, a goal is to reduce greenhouse gas emissions while a target is to attain an 80% reduction by 2045.

Greenhouse gas targets, legislatively mandated, are predominantly defined as measurable reductions to GHG emissions, and set by states to attain goals by 2030–2050. The baseline comparative year for attaining targets is also variable, 1990–2006. Most states set interim targets as an accountability measure to assure progress. This enables a clear understanding of goals at the state level, yet hampers understanding of regional or national progress.

Three states have yet to adopt emission reduction targets, opting instead to use electric renewable generation as a surrogate for this policy outcome. While focusing on electric generation is a useful place to begin climate policy, it is not sufficient in and of itself to meet the long-term goals set by the states.

Table 1: Climate Emission Law Targets[1]

State	Basis	Goal Date	Goal Target	Baseline	Interim Target	Interim Year
California	GHG	2050	80%	1990	40%	2030
Colorado	GHG	2050	90%	2005	26%/50%	2025/2030
Hawaii	Carbon Neutral	2045	100%	N/A	None	None
Maryland	GHG	2030	40%	2006	25%	2020
Massachusetts	GHG	2050	80%	1990	25%	2020
Minnesota	GHG	2050	80%	2005	15%/30%	2015/2030

[1] Center for Climate and Energy Solutions; Greenhouse Gas Emissions Targets. https://www.c2es.org/content/state-climate-policy/

State	Basis	Goal Date	Goal Target	Baseline	Interim Target	Interim Year
New Jersey	GHG	2050	80%	2006	100% of 1990	2020
New Mexico	Executive Only	2030	45%	2005	N/A	N/A
Nevada	GHG	2030	45%	2005	28%	2025
New York	GHG	2050	85%	1990	40%	2030
Oregon	GHG	2050	80%	2050	45%	2035
Pennsylvania	GHG	2050	80%	2005	26%	2025
Vermont	GHG	2050	80%	1990	40%	2030
Virginia	NA	NA	NA	NA	NA	NA
Washington	GHG	2050	95%	1990	45%/70%	2030/2040

Renewable Portfolio Standard (RPS) mandates define "clean energy" as *carbon free, carbon neutral, renewable, clean,* or *alternative*. Eligibility to meet RPS targets varies by state, as do the rules about who may claim renewable energy credits (RECs), the timeframe the targets are set for (long term and interim), and/or how the cost basis to attain goals is bounded or unbounded within enabling statutes. Targets range from 18–100% of electric supply reaching a state's definition of "clean energy" and timelines of 2021–2050. Interim targets and timelines are similarly variable.

Table 2: Renewable Portfolio Standard Targets[2]

State	Basis	Goal Date	Goal Target	Interim Target	Interim Year
California	Carbon Free	2045	100%	60%	2030
Colorado	Renewable	2040	100%	30%	2030
Hawaii	Renewable	2045	100%	30%/70%	2020/2040
Maryland	Renewable	2030	50%	NA	NA
Massachusetts	Renewable	2030	35%	1.50%	per year
	Clean Energy Standard	2050	80%	2.00%	per year
Minnesota	Renewable	2050	100%	NA	NA
New Jersey	Clean Sources	2050	100%		
	Renewable	2030	50%	By source	variable
New Mexico	Carbon Free Electricity	2045	100%	50%/80%	2030/2040
Nevada	Clean Energy	2050	100%	50%	2030
New York	Carbon Neutral	2040	100%	70%	2030
Oregon	Renewable	2040	50%	25%	2025

[2] National Conference of State Legislatures; State Renewable Portfolio Standards and Goals, 4/17/20. https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx#mn

State	Basis	Goal Date	Goal Target	Interim Target	Interim Year
Pennsylvania	Alternative Energy	2021	18%	NA	NA
Vermont	Renewable	2032	75%	NA	NA
Virginia	Renewable Electricity	2050	100%	Many	Many
Washington	Carbon Free/ Neutral	2045	100% CF	100% CN	2030

Policy Coverage

States use differing approaches to climate change and renewable energy policy, beginning with which sectors of the economy are covered by policies enacted. Most states include GHG policy defined as “economy-wide.” However, within policy details the sectors actually covered vary.

A typical definition of “economy-wide” includes electric, transportation, industry, agriculture, and buildings (both commercial and residential). Across all states evaluated, policies govern the transition of the electric system toward clean or renewable energy; two states utilize this mechanism as a surrogate for GHG policy.

Table 3: Policy Coverage

State	GHG Economy Wide	Electricity Only
California	●	
Colorado	●	
Hawaii	●	
Maryland	●	
Massachusetts	●	
Minnesota	●	
New Jersey	●	
New Mexico		●
Nevada	●	
New York	●	
Oregon	●	
Pennsylvania	●	
Vermont	●	
Virginia		●
Washington	●	

As noted, GHG policy typically includes all sectors. A typical representation of these sectors, with 2017 U.S. GHG emission percentages:

Table 4: U.S. Greenhouse Gas Emission Sources & Percentages[3]

Electric Power Generation	28%
Transportation	29%
Industry	22%
Agriculture	9%
Buildings (Commercial and Residential)	12%

The type of energy supply (renewable or fossil) used by the electric system is universally of interest and a focus for policy makers. Buildings are also a typical focus, as for example the adoption of energy efficiency standards and load management provisions. Industry and agriculture are less frequently *directly* included in economy-wide policy, though they are frequently included in action plans. Transportation has historically been the least considered GHG policy area; however, this is rapidly changing with the advance of electric vehicles and the significance of transportation as an emissions source.

Today the primary focus of states' policy is on the transition to clean, renewable electricity. However, meeting interim and particularly longer-term targets will require all economic sectors to transition away from fossil fuels. Each sector will be scrutinized by policy makers.

Policy Tools

States have experimented with methods to implement the policies mandated legislatively and/or through Executive Orders. A wide array of tools, implemented over recent decades, provides good documentation of the results. In this report, groupings of tools are assessed to understand which are being used by states and to what purpose. Not all tools being used are considered, as many dozens exist.

Adoption of Law

Laws set policy at a macro level that drive regulation, rules, and market creation strategies and tactics. States have adopted such laws governing expectations and goals including GHG reduction, renewable or clean energy goals, and/or energy efficiency targets. In some cases, these laws are crafted and created holistically, designed in a coordinated fashion to reach the most macro goal, typically GHG reduction. In other cases, policy thinking may be less connected as states focus on separate issues.

[3] Center for Climate & Energy Solutions; US Emissions 2017. https://www.c2es.org/content/u-s-emissions/#:~:text=Greenhouse%20gases%20are%20emitted%20by,%2C%20and%20agriculture%20(9%25).

Table 5: Climate & Clean Energy Law Adoption[4]

State	GHG Limits	State Action Climate Plans	Clean Energy	Energy Efficiency
California	Statutory & Executive	In Place	CES	Decoupling[5] both
Colorado	Statutory Target	In Place	RPS	Decoupling elec
Hawaii	Statutory Target	In Place	RPS	Decoupling elec
Maryland	Statutory & Executive	Updating	RPS	Decoupling both
Massachusetts	Statutory Target	In Place	RPS, CES, APS, HEAT Loan	Decoupling both
Minnesota	Statutory Target	In Place	RPS	Decoupling both
New Jersey	Statutory Target	Updating	RPS	Decoupling gas
New Mexico	Executive Target	In Place	CES	None
Nevada	Statutory Target	Developing	CES	Decoupling both
New York	Statutory Target	Updating	CES	Decoupling both
Oregon	Statutory & Executive	In Place	CES	Decoupling both
Pennsylvania	Executive Target	In Place	APS	Decoupling both
Vermont	Statutory Target	In Place	RPS	Decoupling elec
Virginia	None	In Place	APS	Decoupling gas
Washington	Statutory Target	In Place	CES	Decoupling both

CES = Clean Energy Standard
RPS = Renewable Energy Standard
APS = Alternative Portfolio Standard

Codes and Standards

Codes and standards provide mechanisms by which market participants are required to take actions that align with mandates. These may come in the form of statewide policy standards, such as Renewable Portfolio Standards, Low Carbon or Alternative Fuel Standards, or Energy Efficiency Resource Standards; or they may apply specifically to sites such as building codes for energy efficiency (for both new construction and retrofits), appliance standards and technology standards. Some states are adopting a suite of these tools.

[4] Center for Climate & Energy Solutions; State Climate Policy Maps. https://www.c2es.org/content/state-climate-policy/
[5] Decoupling refers to the disassociation of a utility's profits from its sale of an energy commodity. This makes the utility indifferent to selling less product and improves the ability of energy efficiency to operate within the utility environment.

Table 6: Codes & Standards Adoption

State	RPS[6,7]	LCFS/ AFS[8]	Energy Building Code[9]	Appliance & Technology Code[10]	Energy Efficiency Resource[11]
California	X	L	R & C	A & T	Mandatory
Colorado	X		R & C	A & T	Mandatory
Hawaii	X		R & C	T	Mandatory
Maryland	X		R & C		Mandatory
Massachusetts	X		R & C		Mandatory
Minnesota	X	A	R & C		Mandatory
New Jersey	X		R & C		Mandatory
New Mexico	X		R & C		Mandatory
Nevada	X		R & C		None (repealed)
New York	X		R & C		Mandatory
Oregon	X	Both	R & C	T	Voluntary
Pennsylvania	X	A	R & C		Mandatory
Vermont	X		R & C	A & T	Mandatory
Virginia	X		R & C		Voluntary
Washington	X	A	R & C	A & T	Mandatory

LCFS = Low Carbon Fuel Standard
AFS = Alternative Fuel Standard
R = Residential
C = Commercial
A = State Appliance Standards
T = State Technology Standards

Renewable portfolio standards (RPS) typically set a target, in the form of a percentage of electric energy generated by renewable or "clean" energy sources. Utilities are required to develop plans that must be enacted to meet the standards. In some states a maximum consumer rate impact is set within the RPS to assure the cost to consumers is controlled. In other cases, differing types of renewable sources are required within the overall RPS, e.g., a "solar carveout." These standards often include interim targets to be met by certain dates. Occasionally, targets and timelines vary across different types of utilities (Municipal, Cooperative or Investor Owned Utility). Overall, RPS has been an effective tool for the transition to renewable or clean energy in the electric sector.

Low carbon fuel standard (LCFS) is a mechanism to reduce carbon intensity of fuels used in the transportation sector. This promotes the increased use of low carbon and renewable fuels.

[6] Center for Energy & Climate Solutions; US State Electricity Portfolio Standards. https://www.c2es.org/content/state-climate-policy/
[7] National Conference of State Legislatures; State Renewable Portfolio Standards and Goals, 4/17/20. https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx#mn
[8] Center for Energy & Climate Solutions; Low Carbon and Alternative Fuel Standard. https://www.c2es.org/content/state-climate-policy/
[9] State Policy Opportunity Tracker; Spot for Clean Energy; 50 State Gap Analysis. https://spotforcleanenergy.org/
[10] Appliance Standards Awareness Project; State Adoption of Energy Efficiency Standards. https://appliance-standards.org/states
[11] Center for Energy & Climate Solutions; Energy Efficiency Standards & Targets, March 2019. https://www.c2es.org/document/energy-efficiency-standards-and-targets/#:~:text=An%20Energy%20Efficiency%20Resource%20Standard,in%20some%20cases%20natural%20gas.&text=Efficiency%20reduction%20requirements%20or%20targets,by%20state%20public%20utility%20commissions

To reach the carbon intensity decrease by a specified date, the market must find ways to move away from higher carbon petroleum fuels. California pioneered the LCFS; other states have adopted this or similar tools to address the transportation sector.

Energy efficiency standards have long been a means to lower costs for consumers and reduce GHG emissions. These standards come in many forms.

Technology efficiency standards: The ENERGY STAR® brand assures consumers of the highest standards of efficiency. Another example is the Design Lights Consortium (while not technically a standard or code) which performs a similar function for commercial lighting by enabling efficiency certification via a qualified products list.

Building codes for energy efficiency are adopted for residential and commercial sectors. States typically select a version of a code promulgated by an organization that specializes in developing forward-thinking, practical codes. For example, the International Energy Conservation Code, IECC, is frequently adopted by states and cities as a requirement for construction, particularly for homes. State commercial building codes are commonly based on a standard developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Various years (versions) of these codes have been adopted by 49 states and many U.S. cities.

Cities and states increasingly require GHG solutions for new construction such as solar ready, electric vehicle (EV) charging ready and/or zero carbon or zero energy codes. These codes seek to assure either that buildings built today are ready to add new electric sources and uses, or that buildings built after a certain date are not a new emission burden on society.

Energy efficiency resource standards (EERS) is similar to an RPS. However, targets are met by reducing electric and/or natural gas energy sales. Of the 22 states that have adopted EERS a range of expectations exist, including: mandatory vs. voluntary requirements, and/or standalone vs. EERS counted toward meeting RPS targets.

State appliance and technology standards are frequently adopted for an appliance or technology where no national standard exists. States provide this leadership, most typically California, to advance efficiency progress in needed devices. Adopting a new standard usually involves negotiation with manufacturers. State standards, once adopted and proven, may become the starting basis for consideration of a national standard for the product.

Carbon Pricing

Placing a value on GHG is a mechanism enacted worldwide; it uses economic means to attain emission reductions. In the U.S., two central tools have been utilized to value carbon in economic testing.

The first is to consider the impacts of societal emissions, those occurring beyond the costs captured for compliance with environmental regulations and requirements. In states that include societal costs in cost testing, these costs have been included in the evaluation of energy efficiency economics as an externality or non-energy benefit (NEB).[12] Understanding the cost

[12] National Energy Screening Project, E4TheFuture; Woolf, Lane, Whited, Neme, Alter, Fine, Rabago, Schiller, Strickland & Chew; National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources, August 2020. https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf

test used by a state, as shown in Table 7, is helpful but insufficient to enable the reader to see whether (and how) a state is evaluating carbon and/or other societal costs. Those utilizing the societal cost test are more likely to include this assessment; however, others may include carbon costs even if the societal cost test is not their primary tool. A thorough examination of a state's tests and the rules for each test is necessary to fully assess whether, and how, carbon is being evaluated.

The second tool is the creation of carbon markets. These efforts (e.g., Regional Greenhouse Gas Initiative, Western Climate Initiative, Transportation Climate Initiative) set a target for GHG emissions and then create market mechanisms whereby carbon is valued, bought and sold to enable participants to meet their threshold emission limits. Revenues generated by these markets then flow back to states, typically to be used for initiatives that further reduce GHG emissions. This method is considered a utility system impact and is categorized as an environmental compliance cost.[13]

Table 7: Carbon Price Methods Adoption

State	Cost Test[14]	Cap & Trade[15,16]	Carbon Tax[17]
California	Total Resource Cost	X	Challenging
Colorado	Total Resource Cost Modified		Challenging
Hawaii	Total Resource Cost		Potential
Maryland	Total Resource Cost, Societal Cost Test	X	Potential
Massachusetts	Total Resource Cost	X	Potential
Minnesota	Societal Cost Test		Very Challenging
New Jersey	Total Resource Cost	X	Challenging
New Mexico	Utility Cost Test		Some Potential
Nevada	Total Resource Cost		Challenging
New York	Societal Cost Test	X	Potential
Oregon	Total Resource Cost	Considering	Challenging
Pennsylvania	Total Resource Cost		Very Challenging
Vermont	Societal Cost Test	X	Some Potential
Virginia	Total Resource Cost	X	Some Potential
Washington	Total Resource Cost	X	Potential

Most discussion of carbon pricing in the media focuses on the idea of a carbon tax. In the U.S., no state has yet adopted a carbon tax. Washington held unsuccessful votes, in 2016 and 2018, on such a measure. In 2017 the Carbon Tax Center deemed seven states promising in their ability to adopt a carbon tax, including five reviewed in this report (HI, MA, MD, NY, WA). The

[13] Ibid.
[14] "Total Resource Cost" nomenclature can be misleading; many states have modified the definition. American Council for an Energy Efficient Economy, State and Local Policy Database; Evaluation, Measurement, & Verification. https://database.aceee.org/state/evaluation-measurement-verification
[15] Regional Greenhouse Gas Initiative; 2020. https://www.rggi.org/
[16] Center for Energy & Climate Solutions; State Carbon Pricing Policies. https://www.c2es.org/content/state-climate-policy/
[17] Carbon Tax Center; Bauman, Y. & Komanoff, C., 2017; Opportunities for Carbon Taxes at the State Level. https://www.carbontax.org/u-s-states/state-carbon-taxes-overview/

City of Boulder, Colorado and the Canadian provinces of British Columbia and Alberta represent the current jurisdictions with formal carbon taxes in place.[18]

Financial Tools

States create and offer financial tools to encourage adoption of climate and clean energy measures. Examples include tax credits, renewable energy credits, RECs, solar RECs, incentives, low interest loans, and subsidies. While not a comprehensive list of financial tools, Table 8 provides an overview of tools states are currently utilizing.

Table 8: Financial Tool Adoption[19]

State	Incentives	RECs, SRECs, RINs, SC	Loan Programs	Subsidy
California	EE, PV, nonPVDG, AV, VC	REC + RSO, ANM	R & C Pace, ESPC, On bill F & P, GB	Low Income
Colorado	PV, nonPVDG, AV	REC SC + ANM	R & C Pace, ESPC, GB	Low Income
Hawaii	EE, PV, nonPVDG	REC, RSO	R & C Pace, ESPC, GB	Non substantive
Maryland	EE, PV, nonPVDG, AV, VC	REC, SC, SREC + ANM	R & C Pace, ESPC, GB	Low Income
Massachusetts	EE, PV, nonPVDG, AV	REC, SC + ANM	R & C Pace, ESPC, HEAT	Low Income
Minnesota	EE, PV, nonPVDG, AVCR	REC, SC + ANM + RSO	R & C Pace, ESPC, GB	Low Income
New Jersey	EE, PV, nonPVDG, AV	REC, SC SREC	R & C Pace, ESPC	Low Income
New Mexico	EE, PV, nonPVDG	REC, SC	R Pace, ESPC	Low Income
Nevada	EE, PV, nonPVDG	REC, SC	R & C Pace, ESPC, GB	Low Income
New York	EE, PV, nonPVDG, AV, VC	REC+ RSO, ANM	R & C Pace, ESPC, GB	Low Income
Oregon	EE, PV, nonPVDG, AV, VC	REC, SREC + ANM	R & C Pace, ESPC	Low Income
Pennsylvania	PV, nonPVDG, AV	REC, SC SREC + ANM	ESPC	Low Income
Vermont	EE, PV, nonPVDG	REC, RSO SC + ANM	R Pace, ESPC, GB	Low Income

[18] American Council for an Energy-Efficient Economy, ACEEE; Nadel, S., Kubes, C.; State and Provincial Efforts to Put a Price on Greenhouse Gas Emissions with Implications for Energy Efficiency. Available at: https://www.aceee.org/sites/default/files/carbon-pricing-010719.pdf

[19] State Policy Opportunity Tracker; Spot for Clean Energy; 50 State Gap Analysis. https://spotforcleanenergy.org/

State	Incentives	RECs, SRECs, RINs, SC	Loan Programs	Subsidy
Virginia	PV, nonPVDG, AV, AVCR	REC, RSO + ANM	R & C Pace, ESPC	Non substantive
Washington	EE, PV, nonPVDG, AV, VC	REC, RSO + ANM	ESPC	Low Income
	EE = Energy Eff PV = Solar /PhotoVoltaics nonPVDG = non solar distributed generation AV = advance vehicles VC = vehicle charging AVCR = adv. vehicle charge rates	RSO = Renewable Standard Offer ANM = Aggregate Net Metering SC = Solar Carveout	ESPC = Energy Saving Perf Contract On bill F&P = On bill Finance & Payment GB = Green Bank HEAT loan = traditional bank loan at reduced interest R Pace = residential C Pace = Commercial Pace	

Incentives are designed to help consumers adopt new technologies and solutions, some in early market development. An appropriately set incentive can remove the early high cost of solutions as a barrier to entry. States provide incentives through utility and third-party programs almost universally for energy efficiency, and in some cases for renewable energy and storage solutions. DSIRE,[20] a national database of incentives and other financial mechanisms, is a useful resource for consumers and developers. All states included in this analysis provide incentives supporting certain policy priorities and provide additional financial instruments to assist in creating markets for clean energy and energy efficiency solutions.

A ***renewable energy certificate*** (REC) is a market-based mechanism that represents the property rights to 1 MWh of the environmental, social, and other non-power attributes of renewable energy generation. RECs are issued to track the renewable energy rights an entity can claim in meeting related targets and goals. These certificates are typically available to be bought and sold, and thus create economic value for new renewable projects when the RECs are intended to be sold as part of project economics. States utilize RECs in different ways, e.g., in an open (voluntary) market or for compliance. RECs may remain available for future acquisition or they may be retired (made unavailable). Across the states considered here, all have REC initiatives to offer economic value and thus encourage development of renewable energy.

Solar RECs are simply a subset of RECs specific to encouraging market adoption of photovoltaic (PV) generation. Seven states included solar carve-outs in their RPS as of 2019, including Maryland, Massachusetts, New Jersey and Pennsylvania from our study states. Massachusetts, however, stopped accepting new systems into their program in 2018.

Renewable identification Numbers (RINs) are closely related to RECs except they are created for renewable fuels under the Renewable Fuel Standard Program. Biofuels and total renewable fuels are eligible to gain RINs, which then may be bought and sold for compliance purposes similar to RECs. States also embrace an array of policies to promote electric vehicles and use of alternative fuels. RINs represent an opportunity for states to advance the use of renewable fuels.

[20] Database of State Incentives for Renewables & Efficiency. https://www.dsireusa.org/

Loan programs: States help to create and de-risk loan programs to encourage consumers and businesses to engage their own credit capability to advance state policy targets. States help to buy down interest costs (a form of financial incentive), assist existing financial institutions to lower risk by offering loan loss reserves and other safety nets (Green Banks), and/or develop new structures to remove barriers (Property Assessed Clean Energy, or PACE and/or on-bill financing). All states in this study are engaged in these and/or other such loan initiatives.

Subsidy is an important tool in meeting state goals, as the scope of these goals typically require all buildings and energy uses to transition to clean energy to assure policy success. For low- and moderate-income populations to participate in climate and clean energy transitions requires subsidy. Resources needed to invest in their home, purchase renewable energy, and/or simply pay their energy bills can be barriers to participation. Federal weatherization assistance is helpful to many low-income consumers but is insufficient to meet state goals and targets. California utilizes portions of market-based revenues (derived from the Western Climate Initiative) as funding to improve outcomes for these demographic groups. In Vermont, a portion of the "sales and use tax" is dedicated to this purpose and a specific non-energy benefit adder for low-income efficiency measures was adopted to enable more market traction.

Tax credits encourage investment in larger-scale renewable development. The individual or entity providing capital has the opportunity to offer funding to a project and in return reduce their tax liability. Homeowners and businesses may also utilize tax credits, though they may not have sufficient income to fully utilize the benefit. This tool successfully promotes solar and wind development; the federal government has been a strong market actor in this area. Some states add tax credits atop the federal ones. For many projects, tax credits are coupled with the opportunity to book advanced depreciation of the asset. This may improve investors' results while lowering the cost of capital for the project developer.

Economics

Many of the previous items discussed contribute to the overall economic picture that drives adoption of the measures necessary to meet the climate and clean energy targets adopted by states. Requirements found in many state laws also frame economic parameters for regulations that enable energy efficiency and clean energy solutions or create economic tests (i.e., cost-effectiveness tests) that screen whether initiatives provide a net benefit. These benefit-cost analyses (BCAs) are often critical in catalyzing or impeding adoption, and can depend upon whether and how non-energy benefits are included and valued as will be discussed below.

Non-energy benefits (NEBs) are value streams associated with energy solutions or alternatives that accrue to program participants and society as a whole that are non-energy related. Historically, accounting for NEBs has been associated with energy efficiency evaluation. They are wide ranging and may include benefits that flow to occupants (asset value, economic well-being, health & safety, satisfaction, comfort and productivity) and society (low income, water resources, environmental, economic development and jobs, energy security and or public health). Benefits that flow to utilities (improving economics for all ratepayers by lowering peak load and avoiding energy costs) are not considered NEBs. They are captured as a utility system benefit directly.

States represent a wide range of opinions on the purpose and framing of NEBs and how to evaluate them.[21] Of the five traditional cost effectiveness tests used to evaluate energy efficiency programs, eleven states of this study group rely on the Total Resource Cost test (TRC test), three the Societal Cost Test (SCT) and one the Utility Cost Test (UCT). In most cases, in particular with regard to the TRC test and SCT, states use some modified version of the test, and typically there is asymmetry in the accounting for certain costs and benefits. More recently, the publication of the *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources* (NSPM for DERs)[22] provides guidance to jurisdictions using a consistent BCA framework for assessing DERs. The framework includes a set of foundational principles – including ensuring that impacts align with a jurisdiction's applicable policy goals, and that costs and benefits are accounted for symmetrically – and guidance on developing a jurisdiction's primary test, which includes a range of utility system impacts and relevant non-utility system impacts (including NEBs) identified based on a jurisdiction's applicable policy goals. The NSPM for DERs also addresses cross-cutting issues to consider in the BCA for multiple DER use cases (e.g., grid-interactive efficiency buildings and non-wires solution projects) where, for example, interactive effects between the DERs needs to be accounted for. The choices made—either by selection of a traditional cost test that specifies which NEBs to include or exclude, or by the design of a jurisdiction specific test as guided by the NSPM—will affect the rate of market momentum to encourage energy efficiency or wider DER adoption.

As noted, accounting for NEBs is common in energy efficiency evaluation and decision making. While less frequently catalogued and used in economic analysis of renewable technologies, electric vehicles and EV charging infrastructure, NEBs are important to consider if such benefits are articulated in a jurisdiction's policy goals—such as to provide benefits to host customers and/or program participants, and to contribute to societal goals from health and justice to environmental benefits. States need to identify the purpose of resource investment to meet policy objectives, such as in statute or other decisions, and for the BCA to account for associated impacts, including utility and non-utility system impacts (NEBs and other fuel impacts) in order to fully recognize the resource value streams and help states catalyze these solutions. The National Energy Screening Project created a Database of Screening Practices[23] that will be valuable to any state seeking to better understand what states account for various NEBs.

Rate making strategy is a focus of attention in many states. In some, the maximum impacts on rates transitioning to renewable energy are prescribed in law as a means to assure that progress is not to be made at any cost, but rather, within locally acceptable parameters defined within the legislation. In other states, this matter is neglected, resulting in each regulatory body determining the appropriate rate constraint on their own.

In many states, energy efficiency is to be advanced using "all cost effective" guidance, then dictated by which cost effectiveness screening tool is used in that state (as discussed above).

[21] American Council for an Energy Efficient Economy; ACEEE Topic Brief; Cost Effectiveness Tests: Overview of State Approaches for Health and Environmental Benefits of Energy Efficiency, December 2018. https://www.aceee.org/sites/default/files/he-ce-tests-121318.pdf

[22] National Energy Screening Project, E4TheFuture; Woolf, Lane, Whited, Neme, Alter, Fine, Rabago, Schiller, Strickland & Chew; National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources, August 2020. https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf

[23] Database of Screening Practices (DSP). https://www.nationalenergyscreeningproject.org/state-database-dsesp/

Even with such economic limitations frequently in place, states continue to move toward goal and target attainment in the electric and efficiency sectors.

Job creation and local economy matter both in evaluating economic outcomes and for associated positive "public optics." While economic value is included as a NEB, strong public support in favor of local jobs and economic growth is also a meaningful political benefit.

Both the Union of Concerned Scientists[24] and E4TheFuture[25] rank jobs in the clean energy or energy efficiency sectors as a percentage of overall employment in states. These economic indicators are among the most often cited by state leaders when announcing support for clean energy or climate initiatives, as are the numbers indicating how these sectors keep dollars in the local economy and support communities and families. Leading states in clean energy and energy efficiency perform very well in these jobs reports.

The Union of Concerned Scientists uses a comprehensive view of clean energy momentum. Renewable energy policy, clean energy jobs, energy efficiency, electric vehicle adoption and more are considered. In its most recent 2017 ranking, the group of states considered here fare well, with seven of the top ten ranked states.

Sequestration of Forest and Soil

Though sequestration rarely is included in the legislative process, states frequently turn to this tool in road maps or implementation plans. Estimates[26] suggest that an additional 1 gigaton of carbon can potentially be added in U.S. soils and forests through sequestration. As discussed below, understanding baselines against which to count (or not count) sequestered carbon will be important for policy makers to confidently rely on sequestration as part of a solution set.

Table 9: Basis of Sequestration Inclusion[27]

State	Sequestration of Forest & Soil
California	State Implementation Plan
Colorado	State Program
Hawaii	Basis of Climate Law
Maryland	State Program
Massachusetts	State Program
Minnesota	State Program
New Jersey	State Program
New Mexico	State Program

[24] Union of Concerned Scientists; Clean Energy Momentum, Ranking State Progress, 2017. https://www.ucsusa.org/sites/default/files/attach/2017/04/Clean-Energy-Momentum-report.pdf
[25] E4TheFuture; Energy Efficiency Jobs in America, September 2019. https://e4thefuture.org/wp-content/uploads/2019/09/Energy-Efficiency-Jobs-in-America-2019.pdf
[26] Center for American Progress; The Plan for a 100% Clean Future Must Include Saving Nature; Richards, R. August 2020. https://www.americanprogress.org/issues/green/reports/2020/08/11/489154/plan-100-percent-clean-future-must-include-saving-nature/.
[27] United States Climate Alliance; 2019 State Factsheets; Climate Leadership Across the Alliance, 2019. https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/5db99b0347f95045e051d262/1572444936157/USCA_2019+State+Factsheets_20191011_compressed.pdf

State	Sequestration of Forest & Soil
Nevada	State Implementation Plan
New York	State Program
Oregon	State Program
Pennsylvania	State Program
Vermont	Law
Virginia	State Program
Washington	Law

Sequestration is a focus area for the U.S. Climate Alliance, which includes 24 states and Puerto Rico as well as all states in this report's analysis.

Examples:

- Hawaii created a Greenhouse Gas Sequestration Task Force. Their climate law, Act 15, is based upon the principle "to sequester more atmospheric carbon and GHGs than emitted." HB 1986 creates a carbon offset program through global carbon sequestration protocols, addressing sequestration through forest restoration.
- Maryland programs increase sequestration in soils and provide incentives to participating farmers. They are providing technical assistance to owners of 30,000+ acres of private lands with forest sequestration practices and have identified 100% of state-owned resource and forest lands to meet sequestration targets.
- Nevada's climate framework, in statute, includes land use and forestry specifically as a sector for meeting climate targets.
- Oregon's Department of Forestry developed a statewide inventory of forest carbon stocks and flows in their forested landscapes.
- Washington's Legislature directed the Department of Natural Resources to launch a carbon sequestration advisory group for natural and working lands and to conduct a state carbon inventory.

In some states, like Hawaii, Maryland, and Vermont, sequestration is intended to help meet policy and legal goals. Intention in others is less clear; it may appear as a path to consider or evaluate. California allows for forest sequestration to be included as an offset but with requirements that it be "real additional, quantifiable, permanent, verifiable, and enforceable."[28] Strong requirements such as these help to address concerns with sequestration around impermanence and saturation.[29] With the recent major wildfires in the western U.S., questions surrounding the impact of these types of fires on sequestration practices will require attention and perhaps further research.

[28] Wise, L., Marland, E., Marland, G. *et al.* Optimizing sequestered carbon in forest offset programs: balancing accounting stringency and participation. *Carbon Balance Manage* (2019). https://doi.org/10.1186/s13021-019-0131-y.
[29] McCarl, Bruce *et al*. "The Comparative Value of Biological Carbon Sequestration." (2001). https://agecon2.tamu.edu/people/faculty/mccarl-bruce/papers/0915.pdf

Environmental Justice and Just Transition

Matters of justice are found in some state climate and clean energy law and implementation plans. These sort into two broad categories: 1) *Environmental justice* considers whether people are treated fairly in environmental decision making and can help to address issues caused by structural racism.[30] As applied to the climate and energy system this may include the impacts of current proposals as well as past injustices of power plants and mining on neighboring communities as well as how siting decisions are influenced by racial inequality, local poverty conditions, and low-income community locations. Addressing energy poverty speaks to the effect of 37 million Americans not being enabled to meet their energy needs.[31] One measure of energy poverty is one's energy burden, defined as the percentage of a household's income spent on energy bills. High energy burden households spend over 6% of income on energy bills while severe burden is over 10%.[32] 2) *Just transition* considers the importance of providing assistance to workers who were displaced from fossil fuel jobs due to the energy transition.

Both are vital equity policy issues to address. Over 250 environmental justice and environmental organizations signed onto a 2020 platform[33] calling for climate and clean energy policy planning consideration of these issues. While listed here as a separate policy and implementation topic, a focus on assuring environmental justice and a just transition is a necessary aspect of every policy decision.

Table 10: Inclusion of Justice Initiatives

State	Environmental Justice & Just Transition[34]
California	Both
Colorado	Both
Hawaii	
Maryland	
Massachusetts	
Minnesota	
New Jersey	
New Mexico	JT
Nevada	
New York	Both
Oregon	
Pennsylvania	EJ

[30] U.S. Environmental Protection Agency (EPA), 2017. Learn About Environmental Justice. https://www.epa.gov/environmentaljustice/learn-about-environmental-justice.
[31] Reames, T. (2013), "Targeting Energy Justice", Energy Policy, 97:549-558. http://css.umich.edu/factsheets/environmental-justice-factsheet.
[32] Drehobl, A. Ross, L Ayala, R. ACEEE, How High Are Household Energy Burdens, September 10, 2020. https://www.aceee.org/research-report/u2006
[33] Center for American Progress; States are Laying A Roadmap for Climate Leadership; Ricketts, Cliffton, Oduyeru, & Holland, April 2020. https://www.americanprogress.org/issues/green/reports/2020/04/30/484163/states-laying-road-map-climate-leadership/

State	Environmental Justice & Just Transition
Vermont	Both
Virginia	Both
Washington	Both

Examples addressing environmental justice include:

- New York requiring 35% of all NYS investments in climate solutions to accrue to the benefit of disadvantaged communities in its Climate Leadership and Community Protection Act of 2019 (CLCPA);
- California creating and requiring statewide assessment of pollution and environmental impacts, including climate change, through its program CalEnviroScreen;
- Washington utilizing an Environmental Health Disparities Map, which tracks statewide environmental and health disparities; data used to assure its 100% clean energy law rollout requires utilities to provide adequate funding for weatherization, bill assistance and other such supportive programs; and
- Virginia's Clean Economy Act requiring that half of all RGGI proceeds be used for weatherization assistance for low-income Virginians.

States also are focused on creating and supporting a just transition for workers. Examples include:

- California invests a sizable budget, supported by its cap and trade mechanism, to support programs to help ensure clean energy jobs are high paying jobs; this includes a construction program for apprenticeships and multi-craft construction careers;
- New York's CLCPA creates a climate justice working group and a just transition working group, with the latter advising on workforce training and job impacts;
- Washington adopted a tiered sales and use tax exemption to encourage projects to meet objectives designed to assist with a just transition; and,
- Colorado created an Office of Just Transition to align with and deliver programming and funding to communities and workers impacted by the transition away from coal-fired electricity.

Policy Source

Most laws are deliberated and passed through traditional legislative process. State administrations, in accordance with the law, then mobilize to implement laws. However, Executive Orders (EOs), or even less formal directives, are also used by Governors fairly often. New York—prior to CLCPA adoption—advanced progress without an EO, guided by an executive branch decision and implemented by the Public Service Commission. In some cases, e.g., in New Mexico for GHG emissions, an EO is the only adopted policy driving climate or clean energy progress. In other cases, an EO is signed to successfully prompt legislative action, as in Minnesota. Governors frequently sign EOs after laws are passed for clarity of organization, implementation, or occasionally to build upon the law.

Executive orders, decisions, or preferences may easily be changed as administrations turn over, while legislation tends to be more lasting and is typically considered something to build upon. EOs can be helpful to prompt legislation and/or to align an administration's response to implementing a newly passed or updated law.

Policy Target Setting

All evaluated states have set GHG and/or renewable/clean energy targets. (See Tables 1 and 2.) GHG targets tend to be adopted as measured in reductions against a baseline year, for example "80% reduction in emissions below 1990 levels." Renewable targets are represented as a percentage of energy use (electricity) derived from renewable or clean energy sources, for example "electricity use will include 90% renewable energy by 2045." These targets are typically set either aspirationally or by adopting numbers as determined by agreements such as the Paris Climate Agreement. Long-term goals most frequently appear to be based on what is deemed necessary for a stable, livable climate. Goals may include a set of shorter-term actions, working groups, or a requirement to create a road map.

Many states then further adopt one or more interim targets to be met using similar metrics, often for 2025–2030. Policy makers understand the importance of setting interim targets that are attainable, to create real progress and to instill public confidence that climate goals can be met.

Policy Implementation

For all states in this study certain agencies, working groups, task forces, and/or other entities are assigned responsibilities to fulfill requirements of the legislation or executive order. No single entity—within or outside government—can accomplish climate policy implementation entirely on its own. Focus across state administration and a legion of stakeholders is necessary. That said, the regulatory agency that addresses energy is always an important implementation partner. At times a state regulatory agency becomes the lead agency to guide policy implementation; in other states, the regulator's role is limited to setting rules to implement the law, Executive Order or road map requirements.

Executive Orders are often helpful to assign expectations, to require plan development and progress, tracking and reporting. Legislative assignments for certain outcomes and evaluation and reporting are helpful and warranted.

Gaps/Barriers

Despite states' significant progress in the adoption of policies and actions undertaken to address climate change and renewable energy outcomes, barriers may impede the path forward. Looking closely at gaps and barriers is essential, not to criticize but to illuminate issues that require collective attention if existing targets and goals are to be met. Doing so will assist other states to address such matters as they move forward with policy and action.

Policy Model

The most common method for policy and implementation by states is best described as an aggregated model. Such a model comprises three time horizons:

- *Short term*—Adopt low cost, no-regrets policies and/or actions to gain traction, show early results, and build public support. Use low-cost solutions that will be useful regardless of what future choices may appear.
- *Interim Term*—States frequently adopt interim targets and actions, designed to set expectations for 8–12 years, with careful consideration to achieving targets at a reasonable cost to consumers.
- *Long term*—Targeting 2040, 2045 or 2050, planning is seeded with aspiration and largely derived from what science shows to be necessary to address climate change rather than an assessment of economic impacts. It emphasizes study, and research and development.

This aggregated policy approach has led to a swarm of activity in energy efficiency, solar and storage deployment and many other no-regrets policies. It has resulted in the attainment of many interim RPS and GHG targets. Simply put, states are proving that no-regrets and interim targets work. However, a potential gap exists where states need deep analysis, research and development activity to enable the longer-term aspirations and targets to be met. For all but the largest states, funds for such purposes are impractical to expect. The U.S. Department of Energy and its national laboratories are historically strong partners with states, and will be ever more necessary.

Longer-term issues to consider include:

- *Future technology needs.* For example, how will we decarbonize the high-heat needs of laboratories, industry and district heating systems?[35]
- *Space conditioning.* Questions exist about the technology capability of a full transition to air source heat pumps, particularly in colder climates, as well as economics. Planning a shift to electrifying all space conditioning raises questions about the ability to reliably serve new loads. Additional energy efficiency and renewable generation and electric grid improvements as well as storage, demand response and limited use of fuels may be necessary to assure reliable service.
- *Multi-sector initiatives*: The private sector may invest in needed research and development—such as for air source heat pumps—where it is in their economic interest. Otherwise, multi-sector initiatives will be necessary. Aviation and long-haul trucking fuels and high heat needs are areas requiring solutions. For example, can states solve high-heat needs by prioritizing the use of renewable natural gas (RNG) and/or renewable hydrogen? Might the RNG or hydrogen be utilized with combined heat and power systems with resultant renewable electricity fed into a localized micro-grid? Such solutions will require cooperation, investment, and partnership to plan and optimize.
- *Data centers*: Information is foundational to our economy and social life in 2020. Data centers are very high electricity users. Assuring that their overall efficiency is optimal, and that load management is considered is important for reliability.

[35] Climateworks Foundation; 2050 Priorities for Climate Action: “Electrify Everything is Too Simple”, Effert, Mazurek, & Monteith; June 2018. https://www.climateworks.org/blog/2050-priorities-for-climate-action-electrify-everything-is-too-simple/

Natural Gas Transition

The transition away from piped gas requires additional exploration and research. Gas is relatively low cost and is considered a low carbon fuel because it burns more cleanly than coal or oil. To meet most GHG long term targets set by states, gas does not "fit" in a climate constrained portfolio or carbon budget. Renewable natural gas (biogas and waste methane) and hydrogen may fill part of this need; however, each requires research and development, analysis to prioritize the best uses of available supply, and support to meet cost basis economics before adoption.

Scant analysis is available, even prior to the economic fallout caused by COVID-19, to consider the implications of transitioning away from gas economically. Issues around stranded assets and potential reuse of infrastructure need attention.

Research may also be necessary to fully understand the degree to which gas is superior economically as a solution. Advocates suggest it is only cheaper than electricity for space heating because gas infrastructure is amortized over a much longer time[36] thus stretching out costs. Normalizing electric and gas capital payback cycles to better understand and correct economic imbalances may be important to determine the role of gas moving forward. Moving gas to the shorter-term payback cycles of the electric system will raise its cost, which is unlikely to find support. Conversely, extending paybacks for electric infrastructure can lower electric rates and may provide a pathway. However, this ignores the need (and thus costs) for the potentially significant increase in transmission and distribution infrastructure to enable the transition to a strategically electrified, renewable energy future—which could ameliorate the cost savings.

Upon understanding the economic considerations, policy makers may assess methods to bridge any economic gaps to transition away from fossil fuels, such as natural gas. Applying a carbon tax or utilizing cap and trade revenues to provide necessary incentives for transition—and/or to address stranded gas infrastructure costs—may warrant research and consideration.

This scenario is an example of the complexity of the systems and the analysis, planning, and research needed to provide clarity to policy makers and implementers of longer-term climate directives.

Strategic Electrification Transition

Another gap is insufficient analysis of the impacts of strategically electrifying the current uses of natural gas, oil, propane, diesel and gasoline. How much additional variable renewable energy, storage, demand management, microgrid, and electric grid will be necessary to assure low costs and reliability? Is it possible, in the 2020s and 2030s, to convince the public to support the permitting and development of needed infrastructure to meet climate and renewable energy goals?

The support and understanding of consumers and building owners is essential to enable every building to be considered as a functioning part of electric grid management, to mitigate the electric grid expansion through new types of load control. Early research shows that a

[36] Wyman, B. Dandelion Energy; Testimony to NY State Public Service Commission, May 2019. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={4BF36CD1-BCBF-4101-A697-5C5085600940}

substantial expansion of renewables and the electric grid is needed to meet a fully electrified future.

An E4TheFuture / Synapse Energy Economics study found the New England electric grid capable of providing reliable service in the coming decade, even with significant adoption of heat pump and electric vehicle technology.[37] A Brattle Group analysis for New England looked further into the future; it projects doubling of electricity demand by 2050, even with excellent performance on energy efficiency and load management, requiring a six-fold expansion of renewable generation.[38] E3 has performed such assessments in states across the country and will soon publish a study for New England. Where they have published results, they are typically comparable to the Brattle study. National lab research in 2017 concluded that a doubling of electric demand by mid-century is likely.[39] However, ACEEE suggests that by focusing on energy efficiency and demand management the need to expand may instead be kept as low as 10–20%.[40]

Climate or Clean Energy—Where to Begin?

Some states appear blind to the complex relationship between climate and clean energy policy. They may set goals for the electric system only, whereas other states adopt climate policy to cover the total economy. States may conclude that renewable electricity is as far as policy can move. However, meeting climate goals requires a focus on all economic sectors. As examples, both Virginia and New Mexico focus only on the clean energy sector of the economy; Minnesota, Hawaii, and Nevada have largely omitted the transportation sector; Massachusetts, New York, and California appear to fully engage all sectors of their economy.

Tying the analysis of all legislative bills that relate to climate change back to the primary policy, goals and analysis is important to ensure that individual, single-purpose bills are considered in relation to broader goals. Even where all sectors of the economy are considered, a common analysis methodology can best enable an understanding of potential points of friction arising from varying policy or implementation strategies.

An illustrative example is represented in a study[41] by the Department of Energy that considered the competing utility of heat pump hot water heaters for energy efficiency and load management purposes. Heat pump hot water clearly represents a superior efficiency measure to combat climate change, which is why energy efficiency programs offer strong incentives. Yet also, these devices offer about one-half of the total opportunity to provide load management to assist the electric grid in achieving balance for peak load, frequency regulation, price arbitrage, and spinning reserves compared with a traditional electric resistance hot water tank. These points of friction must be evaluated and assessed. Many such issues need to be considered across the

[37] E4TheFuture; New England Electrification Load Forecast; Synapse by Goldberg, D., Frost, J. Hurley, D. Takahashi, K.; May 2020. https://e4thefuture.org/wp-content/uploads/2020/06/New-England-Electrification-Load-Forecast.pdf
[38] EIA 2019 AEO, Brattle analysis & presentation by Jurgen Weiss, Brattle, to E2Tech webinar June 2020.
[39] PNNL "Reference +80% scenario in GGCAM USA Analysis of U.S. Electric Power Sector Transitions. May 2017. Performed for the United States Mid-Century Strategy for Deep Decarbonization. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-26174.pdf
[40] Synapse Energy Economics, Hopkins, A., Takahashi, K., American Council for an Energy Efficiency Economy, Nadel, S.; Keep warm and carry on. Electrification and efficiency meet the "polar vortex", ACEEE 2020 Summer Study. https://aceee2020.conferencespot.org/event-data/pdf/catalyst_activity_10770/catalyst_activity_paper_20200812132354836_5df26ad1_43be_43cb_b055_fca62087e219
[41] Boudreaux, Philip R, Jackson, Roderick K, Munk, Jeffrey D, Gehl, Anthony C, and Lyne, Christopher T. Utilization of Heat Pump Water Heaters for Load Management. United States: N.P., 2014

landscape of policy and implementation options. This can only be accomplished by evaluating new, well intentioned bills against existing law and policy as well as evaluating competing bills under consideration.

Sequestration

Sequestering carbon in forests and/or soils is frequently raised in action plans and road maps by states, but rarely included in laws as a matter of importance. Each represents considerable climate opportunity and requires careful understanding of the baseline condition, then management and monitoring to assure results.

Sequestration, and the methods and actions necessary to rely upon it as a tool to attain significant GHG reduction results, represents an important gap in state policy considerations. As the work of climate change advances and evolves, sequestration will likely become a more significant component of discussion and policy. This will need careful evaluation of the best way to measure sequestration on a net impact basis, e.g., when adding sequestration in one part of the state but removing a forest elsewhere.

As noted previously in the codes and standards section, zero carbon energy and buildings are among policies gaining prominence. While these solutions impact much more than sequestration these policies also have implications for sequestration of carbon. For example, when considering carbon from cradle to grave in buildings, replacing steel products with laminated wood can reduce a building's carbon emissions by 20%, while sequestering the carbon in the wood beam over a long period of time.[42]

Embodied Carbon

Today, references to embodied carbon are infrequent in policy discussions, and impact analysis still nascent. Even renewable energy is not "zero carbon" when including all aspects of embodied carbon. This topical area in climate and clean energy policy represents an important gap, requiring study and understanding as well as research, development, and assessment on technology details and impacts.

Complexity vs. Progress

States are working hard to address climate change and renewable energy policy. Issues are complex and interwoven across most parts of a state's economy—the impacts and benefits, as well as the costs and economics. For some, fully understanding both the science and how addressing one issue may impact the ability to address another is seen as critical. Assuring progress is made in the most economical fashion is a typical goal of taking on complexity. The lack of evaluative tools and methods to assist policy makers and those implementing policies to more quickly and easily perform such assessment is a barrier to most states cost-effectively implementing solutions.

[42] Zakrzewski, S. Gray, A., Passive House Buildings. https://passivehousebuildings.com/magazine/spring-2019/addressing-embodied-energy-with-mass-timber/

States that “keep it simple” by addressing one policy area at a time create short-term progress with less need for study and analysis, yet they may impede longer-term progress by negatively impacting future choices for both economic and target driven results.

Non-Energy Benefits

Non-energy benefits are fairly well studied and understood in the energy efficiency industry, even if they are not evenly applied in a consistent fashion to provide normalized comparison and results across states. Non-energy benefits are generally understood but less studied for renewable energy, sequestration, electrification, electric vehicle transition, and other climate solutions and are applied less frequently. The recent publication of the NSPM for DERs provides information and guidance on a wide range of non-energy benefits that can be useful for jurisdictions. Building this body of knowledge and assisting policy makers, regulators and implementers in understanding—and valuing—these impacts will assist progress in supporting outcomes consistent with the policy goals of each state.

Justice

Justice issues are being incorporated into state policy considerations; however, these matters are most typically a matter of workforce training and providing incentives. The climate and clean energy industries need a much deeper understanding of justice issues for solutions to become less transactional and more systemic. Issues such as who pays for certain aspects of investment in strategies to address climate change (directly and indirectly) and who is most impacted or harmed by not dealing with climate change require discussion and resolution.

Our nation is embracing justice and equity in 2020 as a matter requiring collective attention. We have an opportunity to make progress in assuring that U.S. energy and climate solutions are for all people, do not disproportionally impact low income people or people of color, and carefully design a just transition to assist fossil fuel workers in finding meaningful jobs that pay well—in or outside of the future clean energy economy.

U.S. Energy Policy

United States energy policy remains a gap in 2020. While some federal agencies are key partners to assist states, we lack a long lasting, consistent energy and climate policy with the full backing of federal research and development. Gaps exist in standards development, technology development, and models and tools to assist states toward accelerating success.

A national policy—which states may be encouraged to exceed—will help to encourage regions to work together to meet their needs, while catalyzing states to do what they do best: implement solutions. Some attention is being applied in Congress[43] to developing federal policy which may become a useful starting point when the nation is prepared for national policy.

States should not exit the policy realm. Rather, with robust national climate and clean energy policy and resources, states could more consistently meet federal, regional and their own policy

[43] Democrats’ Special Committee on the Climate Crisis and House Select Committee on the Climate Crisis.
https://www.schatz.senate.gov/imo/media/doc/SCCC_Climate_Crisis_Report.pdf
https://climatecrisis.house.gov/news/press-releases/climate-plan-press-release

targets. Implementing solutions to benefit their citizenry, whether focused on environmental, economic, or other outcomes, is ultimately where states excel.

Observations to Move Forward

States have been leading on climate and clean energy policy and implementation for decades. Due to this leadership, solutions are available for all to utilize and build upon. Below is a set of proven ideas; this set of successful practices is not comprehensive. For a state or municipality seeking to begin or improve upon their climate and clean energy journey, steps include: identify the desired outcome, evaluate the current conditions, gaps and barriers, then study what is available to borrow or build upon.

Governance Structure

States use a variety of paths to create and sustain progress against goals. Most have accomplished great success by following a simple governance model to create policy:

1. Introduce and pass legislation.
2. Utilize Executive Orders to fill gaps in the implementation of laws, to align a singular administrative focus, and to assure accountability for the effort; assign an implementing agency or department if necessary.
3. Implement policy through the accountable agency, with support of all of government and appropriate stakeholders, necessary actions, policy revisions and updates. Measure and report on progress, challenges, and successes. Where laws are centered on a transition to clean energy, the regulatory body typically sets the rules for utilities and developers of clean energy solutions to follow.

Executive orders, decisions and preferences may also be useful to direct policy action where a legislature has not supported adopting law(s), and/or as a mechanism to create momentum encouraging the passage of legislation. Each has been embraced by states and created positive results.

State-level governance structure is typically designed as topical siloes that do not support implementation of climate and clean energy policy. Executive orders can resolve “turf” or authority conundrums to assure progress is made once policy is adopted.

Topical Depth

Approaches to determining the topical focus of laws vary, and are influenced by politics, advocacy, and public attitudes. Many states have adopted climate legislation intending to consider all economic sectors while others have adopted laws to govern the clean energy content of electric generation, transmission and/or distribution.

The all sector, economy wide model provides for the greatest success opportunity, as climate targets, such as those adopted by cities, states, and global accords may only be attained with this “all in” approach. Climate goals and objectives cannot be entirely met even if our electric supply meets all renewable targets. California, New York and Massachusetts are examples of states taking the comprehensive approach.

Where a focus on the electric supply system is deemed the only legislative or regulatory approach with sufficient support for passage, states should follow that model short-term; greater depth may be added later. Wherever possible, discourse ought to begin at a total economy, climate change basis. This then provides a foundation for future legislation with specific focus on each sector of the economy, fuel type or solution as conditions enable each to move forward. This enables thoughtful economic analysis that includes sectors where costs may rise as well as where costs may be reduced, resulting in a more comprehensive view.

States may begin consideration of a new climate law, or an update to an existing one, by assessing these sectors:

- Electric
- Transportation
- Industry
- Agriculture and land management
- Forest and soils (Sequestration)
- Real estate (Commercial and Residential Buildings)

This approach brings all fuels, emissions, and carbon storage opportunities to the policy discussion. Targets, research needs, and implementation strategies for each topic can be considered against the arc of time available to meet goals.

Definition Alignment

States have defined terminology in laws, executive orders and implementation plans within local context. In the current model—where states are leading with some research support from the federal government—this is to be expected. It will be necessary to create common definitions if we are to make sense of the data at regional and national levels.

Differences between “renewable energy,” “green energy,” and “clean energy” and within those, next tier issues, are important to clarify. An example of a next tier issue is hydroelectric generation: Is it to be counted as renewable and if so, are large- and small-scale facilities further defined? The ability to make compliance payments for a renewable portfolio standard depends on definitions provided; e.g., wood heat, sequestration, and low carbon or renewable fuels. These definitions all include electricity but may or may not include transportation fuels, renewable natural gas (biomass digestion), renewable hydrogen, geothermal and other potential clean or renewable solutions.

In certain regions a convergence of definitions is required, at least for certain fuel types, at a regional reporting level. Energy markets in the electric sector, governed by Independent System Operators or Regional Transmission Operators, require common definitions and/or reporting of results by a common method. Thus, states in major energy markets such as ISO NE, NYISO, PJM, and CAISO must meet these common reporting requirements. Regionally, and then nationally, it will become important to adopt and follow a common set of definitions.

Many organizations, such as the European Union, United Nations, U.S. Environmental Protection Agency, and U.S. Department of Energy offer definitions to draw upon. States should work together, at least regionally, to select appropriate, common definitions.

Consistent Measurement of Progress with Regular Reporting

States measure progress using various methods. While each method attains results, significant variance from state to state can impede the ability to gauge progress in a region or the U.S. and/or the ability to gauge which states are creating superior outcomes.

States can learn from and collaborate with each other by:

- Setting GHG emissions and targets using consistent metrics,
- Using a common baseline year for evaluation,
- Normalizing net GHG progress against the baseline (*net* is defined here as "emission reduction compared with the baseline year"),
- Using common definitions and targets for renewable energy, energy efficiency, sequestration, electric vehicles and other aligned measurements and strategies.

By creating consistency in the tracking and reporting of impacts, states can find alliances and commonality of purpose and outcome. National efforts such as the *National Standard Practice Manual for Benefit Cost Analysis of Distributed Energy Resources*[44] provide useful guidance for cost-effectiveness assessment that may be a model for other key methodological and reporting topics going forward.

Aggregating and normalizing data and progress across regions and the United States could also become a function of the U.S. Department of Energy, perhaps through National Labs or regional Universities, to enable the broader assessment and ability to provide future best practices to states. As the country becomes more active in setting policy, with states as the implementers, aligning the measurement, definitions, and data will become vitally important.

Policy by Research and Depth or by Advocacy

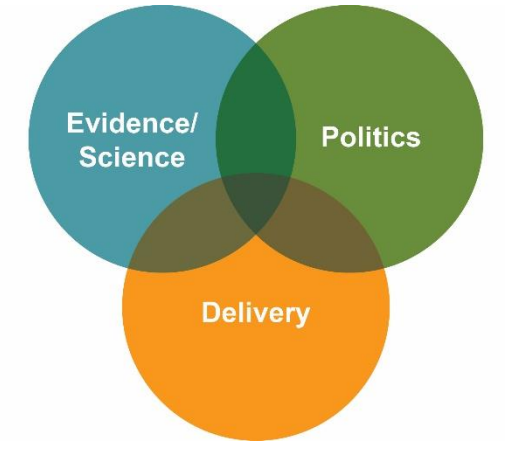
What is considered good policy making can be represented by three key aspects:[45]

- *Evidence/Science*—Developing a sound basis for policy
- *Politics*—Understanding and managing the political context
- *Delivery*—Planning from the outset how the policy will be delivered

Other models of developing policy follow a process pathway such as:

- Identify Problem
- Formulate Policy
- Implement Policy

Figure 2: Aspects of Good Policy



[44] National Energy Screening Project, E4TheFuture; Woolf, Lane, Whited, Neme, Alter, Fine, Rabago, Schiller, Strickland & Chew; National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources, August 2020. https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf

[45] Wormald, Chris; Better Policymaking, January 2016. https://civilservice.blog.gov.uk/2016/01/12/new-masters-degree-to-support-better-policymaking/

- Evaluate Policy

What appears significantly variable in climate and clean energy policy is the balance of "evidence" and "politics" when a problem is identified and policy is formulated across states. In small rural states, legislatures have few staff resources; legislators rely on advocates to offer evidentiary information, along with state agencies and departments. Other states gather more comprehensive information and perform analysis to illuminate and guide their process, while hearing from advocates and other stakeholders to understand "the art of the possible" within prevailing public attitudes.

This process can lead to setting unattainable, aspirational long-term goals. Important topics to meet goals may be neglected, and/or the impact on economics or infrastructure needs may be ignored or only partially considered. Conversely, the art of law making sometimes requires aspiration to meet a challenge or need in society where the path to resolution is simply not understandable in the current knowledge base.

Laws are best designed at the point of convergence of evidence and advocacy, even with data uncertainties, so long as each law considers future needs of learning and investment up front and designs mechanisms to track and assure progress.

Climate and clean energy are significantly complex. A policy development process where all possible considerations are evaluated is theoretically possible with current knowledge. However, such a policy would be so complex and take so long to develop that a vote for adoption would likely never occur.

States should consistently seek and evaluate a balance point of evidence, politics, and the ability to deliver results. Advocacy voices must not overly inform policy such that lawmaking becomes "feel good" press conferences with little chance to meet targets; complexity and depth of consideration must be stopped well short of being used as a tool to confuse and block thoughtful laws. The items that follow intend to offer more depth of key considerations to assist states in finding this important balance point of policy development.

Use and Inclusion of Goals and Targets

As discussed in the gap section above, all states included for this analysis set long term targets for either climate emissions, clean energy or both—through law, executive order or both. The evidence necessary to address climate change (and thus renewable energy policy) is well documented. This evidence has influenced long-term goal and target setting by states to emphasize aspiration.

Some states perform analysis (e.g., wedge or electric supply) but recognize that the actions necessary to attain these goals is not ready to be supported within their state. Public attitudes, fear of economic consequence, current reliance on fossil fuel jobs and other considerations weigh heavily on these policy decisions. As such, most longer-term goals are aspirational in nature. This is acceptable where and when the aspiration is recognized within statute.

The best policies recognize this by:

- Requiring development of future roadmaps to success,

- Calling for research and development of new technologies and solutions within the state's private sector and institutions of higher education,
- Actions that clearly indicate, for future legislative bodies/administrations and the public, that more work is required to meet goals; and
- Sharing results and roadmaps among states.

Without these callouts, aspirational goals and targets can be a barrier to success. The public will eventually notice when progress on targets slows. However, with thoughtful policy callouts, including aspiration in 2040 or 2050 targets is reasonable.

All states considered in this analysis include interim goals and targets within their laws or executive orders, except for Hawaii, New Mexico and Virginia. Interim targets are mostly in the 10 +/- year timeframe. When well-developed, the process involves a deeper level of investigation regarding necessary steps to make targets attainable. Whether enabling a renewable portfolio standard with a 2030 target or a GHG emission target with a similar timeframe, the best policies set clearer expectations for implementing entities.

Where states took this approach 2005–2010, most interim targets set for 2015–2020 were met and typically exceeded. There is still room for aspiration in interim targets; however, the opportunity to actually meet them must be balanced with the level of aspiration.

Lastly, many states include "no regrets" actions directly in clean energy and/or climate laws. These help to assure that implementing entities take appropriate action quickly. Increasing energy efficiency targets and spending levels, adopting net metering laws where conditions assure short-term success, and other state policies are designed to generate immediate action and success. These actions make sense, are well understood, and will not impede future interim or long-term actions by virtue of already being accomplished.

Policy Evaluation and Road Mapping

A central component of good policy making is to receive regular progress reports to hear emergent policy needs and then discern the best time to update a current law or add a new one to complement an existing statute. Laws should include expectations for reporting, and identify the responsible entity to track and report progress and data as well as to whom the information must be delivered for evaluation.

This approach provides states that adopt high-level climate policy the information needed to take informed next steps in policy, whether they began with comprehensive all-sector GHG or adopted specific electric supply laws first and will prepare GHG sectoral policy as a next step.

A key tool being utilized by many states is the requirement to develop a roadmap, long-term plan or State Implementation Plan to evaluate and guide how laws will be implemented, what needs exist for future research and development, investment, job creation or transition, and other key components.

Road maps frequently are required to match the timeline of the long-term goal and then may specify evaluation of interim goals and "no regrets" recommendations. Focus and analysis are typically on how exactly to meet the legislated interim targets. Actions from the road map may then feed into follow-up legislation, regulatory dockets, and/or implementation.

Road maps consider what research and development and/or investments are necessary to resolve market or technological barriers to advancing goals beyond the interim timeframe. For example, if solutions to replace high process heat needs in laboratories and manufacturing processes are not developed within 10–15 years, then it will be impossible to transition those uses away from fossil fuels by the time the long-term goals are due to be met. Thus, even as meeting interim goals in the coming decade is the priority, setting the table for future success must be considered in today's planning and investment process.

Successful road maps have tended to include significant opportunity for stakeholder involvement to assure all voices are heard and considered. This enables deeper learning for the implementers. It highlights the urgency of progress and the current barriers (from technology and fuel type to economics) that stand in the way, and it provides a way to document and resolve issues. It also builds a more diverse cohort of those who, at some level, will be supportive of the implementation directions and can be useful in moving public attitudes on climate and clean energy solutions in a positive direction.

Road maps or long-term plans ought not to become the end product of laws; but, rather, a useful force to drive implementation. With the focus on interim goals and longer-term R&D, these plans should be re-considered on a five to seven-year basis. If progress against the interim goals becomes concerning, then a shorter timeframe should be invoked; beginning again may be necessary. Where there is good alignment between the road map and progress, a "check in" on the road map may be acceptable to assure there are no surprises when interim goal results are due.

Legislatures may, at some point, add a second interim goal. A new road map should be required naming what has been accomplished in R&D resulting from the first road map, lessons learned via other states, stakeholders and practitioners, and how each will influence the new map.

Balancing Economics with Technical Knowledge

In developing policy and implementation plans, a significant tension exists between the economics of meeting goals and the technical knowledge available to meet them. States should set policy guidance for implementers that balances both cost (as appropriate) and level of importance to a state.

States may set an upset limit on the cost of goods (electricity, renewable natural gas etc.), identify key economic and societal goals for investing in clean energy resources (e.g., impact on state domestic product, local job creation, just transition of local jobs, retention of dollars in the local economy, public health benefits, carbon reduction); identify the benefit-cost tests to use to value the clean energy resources (e.g., energy efficiency, solar generation, electric vehicles, and storage), and set programmatic (e.g., energy efficiency programs) and market mechanisms (RPS, cap and trade, or carbon price) to achieve the state's clean energy and economic goals.

Economic determinations will impact the speed of progress. For example, most energy efficiency retrofits now considered economically positive result in energy reductions around 25% of previous use and cost totals. Technically, it is feasible to approach 50%+ reduction.[46] Net

[46] American Council for an Energy Efficiency Economy; Research Report: Residential Deep Energy Retrofits; Cluett, R. and Amann J., March 2014. https://www.aceee.org/research-report/a1401#:~:text=Deep%20energy%20retrofits%20aim%20to,on%20housing%20and%20climate%20characteristics

zero energy homes are being built, typically with significantly higher costs. These costs may become viable for the average consumer when they are financed with the full building mortgage[47] if the applicant can qualify for the higher credit cost ceiling. Still, this solution would benefit from application of market transformation principles where states provide incentives to help new technology and solutions to be cost competitive while in a nascent stage of development. Once technologies and solutions mature, incentives may be lowered.

Some technologies needed to meet climate targets may not exist today. As noted, high heat uses for laboratory and manufacturing require solutions. Similarly, technology advances are required in order to transform buildings into operating bi-directional components of the electric grid and to create affordable solutions to address embodied carbon. Data centers require copious reliable power; supplying them must not compromise reliability for other electric users.

An economic “disconnect” between regulators and implementers exists which requires resolution. Regulators typically focus on short-term rate impacts in dockets while implementers focus more on short-term production outcomes to meet key performance indicators and also long-term business strategies. Conflicts between these parties often impede progress as well as the ability to meet interim and longer-term targets.

In setting goals, targets and plans, states should consider economic and technological approaches that are politically acceptable and enable them to meet targets. States can broaden their thinking beyond short-term direct economic costs to create a prosperous climate and clean energy economy; a limited short-term focus can dampen progress if it is seen as the only acceptable option. Seeking a balance that embraces market transformation, clean energy jobs with a just transition, and the ability to retain local dollars is a good starting point.

A Suite of Solutions vs. a Siloed Approach

It is vital to have all sectors represented in policy evaluation. Thoughtful consideration of solutions can determine their overall impact on both GHG policy and the economy. This approach helps avoid limiting one’s view to any single solution that may increase societal expense or cost of goods and rejecting it, without understanding potential offsetting economic gains.

For example, when considered alone, providing deep retrofits of residential and commercial buildings is costly with current methods. Even with incentives provided, many barriers impede adoption. If one looks only at direct economic consequences, further investments may be deferred or rejected. Meanwhile, consumers who transition to electric vehicles may find that their operational cost is far less in most U.S. jurisdictions than traditional vehicles with the cost of gasoline, diesel and maintenance. If both the retrofit and the electric vehicle are evaluated as a package one may conclude the combination is cost neutral or cost positive for the consumer and then move forward with both—gaining additional progress against goals.

Offering packages of solutions to consumers with too many components can also be taken too far. If these packages must optimize for energy efficiency, net metering of solar, storage solutions, the impacts of strategic electrification, as well as the opportunity for every package of

[47] Zero Energy Buildings in Massachusetts: Saving Money from the Start. 2019. USGBC Massachusetts. https://builtenvironmentplus.org/wp-content/uploads/2019/09/ZeroEnergyBldgMA2019.pdf

solutions to include grid interactive efficient building load management principles; then, progress may actually be impeded due to the complexity, capital cost and difficulty in garnering consumer understanding and adoption.

Tailoring simple, cost-effective packages for consumers to consider is a good path to follow. An example might be to offer a rooftop solar installation sized to provide adequate power after cost-effective energy efficiency upgrades are made—so the customer does not buy more solar panels than they actually need for a more optimized home. Sizing solar panel installations following the electrification of space conditioning or the addition of electric vehicles to a home would be another example of a useful package to consider.

The practice suggested here is to be inclusive in crafting potential solutions and then follow that thinking with policy and implementation strategies that consumers, implementers and system operators can understand, embrace and take action upon to enable progress.

Integrating Solutions

The transition needed to meet climate targets is complicated. Wedge analyses suggest where progress must be made to meet goals. However, in evaluating pathways, the reality of systems and solutions and their transition to the future are consistently less elegant than a wedge analysis. States must evaluate these issues.

Climate goals and implementation plans often largely focus on consumer adoption of strategies, plus investment in big solutions like offshore wind and solar fields, while setting new codes and standards to govern building construction. What is frequently missing is a depth of evaluation and consideration of current energy system constraints and the issues related to transitioning.

In some states, for example, low carbon generation may actually be higher on a percentage basis today than it is projected to be in coming years due to retirement of low-emitting nuclear plants[48] or increases in electricity use due to strategic electrification (requiring increased demand met by fossil fuels). The ability to provide reliable service at current levels of demand may be in question, or constraints in the electric grid or gas service may exist such that even if new renewable electricity or gas came online it could not be delivered.

Rarely, states overtly require those responsible for delivering electricity to the market (utilities, ISOs/RTOs, regulators) to fully evaluate and plan for delivery system upgrades necessary to meet future conditions in roadmaps, regulations, or capital plans. For example, states and advocates may expect that all building and transportation energy will transition to renewable, and most will be variable generation requiring storage and load management for reliability. Yet little evaluation has been performed on how the grid may need to grow, nor do we have a full understanding of the environmental, economic and public support or resistance to this necessary infrastructure. States should evaluate in-state transmission and distribution and work closely with ISOs and RTOs to embrace longer-term evaluations. Studies exist beyond the Synapse study mentioned above, but more will be needed.

What a full transition to clean energy looks like also needs deeper analysis and evaluation. More specifically, states are overtly or covertly signaling that to meet their goals the economy

[48] Abdulla, Ahmed; “The demise of US nuclear power in 4 charts”; The Conversation. https://theconversation.com/the-demise-of-us-nuclear-power-in-4-charts-98817

must abandon use of fossil fuels. A few states have adopted a low carbon or alternative fuel standard to assure moving from high-carbon to low-carbon—and eventually no-carbon—fuels. Issues exist as to whether supply and grid infrastructure can be built to support that transition in a timeframe that will retain reliability. Issues that would benefit from further study relate to the gas system such as stranded costs, how prevalent renewable natural gas may become and to what uses it should be applied, how best (if at all) to create hydrogen from curtailed wind and solar systems and how it might be delivered. Adaptive reuses for current gas infrastructure also must be better understood.

In some states, oil[49] (particularly across the Northeast, from New Jersey and Pennsylvania to Maine and Vermont) and propane[50] (rural parts of California, Minnesota and New York) are used disproportionately for space heating.

Vermont and Oregon are among the most likely to utilize wood for heating, along with rural areas of big states like New York and Pennsylvania. Across the country, some rural states rely heavily on wood for home heating.[51] Often cordwood and pellets (which may or may not be considered "renewable") are used by low income households. Assuring that wood resources are linked to sustainable forestry practices and optimal sequestration practices is important. Such aspects along with particulate matter emissions, typically are considered within the definition of "modern wood heat" and when adopted may allow renewable wood to be included in a GHG-constrained policy future.

Regulators responsible for creating energy transition rules frequently have limited authority over fossil fuel networks—of which oil and propane are on the higher end of the carbon spectrum. For both climate and job transition purposes, higher-emission fuels should transition out of use most quickly.

Transportation fuel use is frequently separate from renewable energy policy discussion. Electric policy is often disconnected from low carbon fuels discourse, and may ignore the economic perspective, i.e., how fuel tax provides state funds for transportation infrastructure and maintenance.

By integrating evaluation, and perhaps evolving regulatory scope, method and oversight can be helpful to build upon the tools available to assure that energy systems meet climate transition goals in the most economic method possible.

Market Mechanisms

States have utilized various market mechanisms to drive progress on both clean energy and climate goals and targets, such as renewable portfolio standards (RPS) and cap and trade programs. Each provides price signals to the broader economic market by setting target expectations, then developing economic tools to move the market. Carbon pricing may be used in the future.

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[49] Smart Energy Touch Blog; The Market for Heating Oil – Past, Present and Future, February 2016. https://blog.smarttouchenergy.com/heating-oil-price-history#:~:text=New%20Hampshire%2C%20Maine%2C%20Rhode%20Island,1.8%20million%20use%20fuel%20oil

[50] LP Gas; US Propane Sales Fall for Second Straight Year, Feb 2018. https://www.lpgasmagazine.com/us-propane-gallon-sales-fall-for-second-straight-year/

[51] Alliance for Green Heat; 2010 Census Shows Wood is Fastest Growing Heating Fuel in U.S., Rural low-income families the new growth leaders in renewable energy production; October 2011. https://www.eesi.org/files/press.pdf

Electric utilities in states with an RPS change their mix of electricity supply to meet a target, working with renewable energy credits, or other mechanisms. RPS have been widely successful at helping the clean energy market grow.

Cap and trade programs set a time-sensitive cap on emissions and require all market actors, as defined, to meet targets by either reducing their emissions or acquiring credits from a diminishing pool over time, to meet their targets.

Carbon pricing instead puts a direct price, fee, or tax on carbon emissions at the time of consumption. This sends a price signal to adopt a different, less costly, solution.

Tools

The State of The States section above provides a sampling of the tools that states are utilizing. Each is helpful; more so when combined wisely. Dozens of clean energy and climate tool solutions bring enormous value.

Readers can more fully understand and maximize the tools your state already has and add other tools proven worthwhile by others. One small example is how underutilized the low carbon fuel standard seems to be. By combining GHG legislation, cap and trade, energy efficiency resource standards, building codes, RPS and perhaps carbon pricing, a state would have a comprehensive solutions package to drive clean energy and GHG policy across its entire economy.

Many tools and finance methods are available to improve economics in the short term to assist in market adoption. Cap and trade, carbon tax, innovative finance methods, as well as the prospect of federal funding (through stimulus, a Green New Deal, or similar approach) are methods readers might consider as financial tools to enable the broader implementation and/or policy tools currently available.

These solutions can be effective and quick when well-designed and understood as tools at states' disposal. Identifying those that are acceptable within a state represents the best starting point when considering adoption.

Many states understand that urgent action is needed to address the effects of climate change and to transition today's energy system to one relying upon renewable resources. All actions by states attempting progress within the political and public attitudinal perspectives of their populace are to be applauded. A suite of best practices and recommendations to help states either widen and deepen their laws and implementation practices, or begin their climate and clean energy journey, provides the opportunity to optimize results.

In the sections above are observations and ways to move forward, focusing on methods states may adopt to align policy and implementation in useful ways and to more fully consider those points of tension and/or synergy as policy is developed. Below are ways to build upon these ideas and further research suggestions to assist states in developing better long-term policy with economical outcomes.

Use Best Practices

First and foremost, states should carefully consider best practices and determine which may be applicable from within their current policy landscape. Planning for next steps must take into account the political realities in their jurisdiction.

States should consider beginning with the most comprehensive policy possible. Policies that address climate change and greenhouse gas emissions broadly represent a state's best opportunity to attain maximal progress at the lowest cost.

A focus on "no-regrets" actions and policies as well as setting strong interim targets represents the most productive path to creating substantive progress. Using energy efficiency as a "first fuel" to lower demand, saving consumers and businesses money while lowering the supply impacts of transitioning away from fossil fuels represents such a policy. It should be at the forefront of every initiative.

States should put all implementation and policy mechanisms on the table for consideration. Codes and standards, market transformation incentives, subsidies and/or incentives to enable participation by people of various income levels, market mechanisms, and economic considerations beyond direct cost all should be evaluated for their potential to enable progress and fuel transitions across sectors. Assistance and research to build out best practices is important to continuing states' progress and success. Many universities and nonprofits are working to advance decarbonization and often provide resources that states may find useful. Examples include the Environmental Law Institute[52] and the Rocky Mountain Institute.

Adopt Road Mapping

A clear focus on long term planning (road mapping) is essential for states to meet interim targets and then longer-term aspirational targets and goals found in law today. Research and development for the second and third decades of necessary progress is important to include now in road maps and to fund through states, regions, or our federal government. Creating partnerships with the private sector and higher education as well as with national labs is also recommended.

State, Regional and National Focus

States should fulfill key roles to assure cogent regional and national policy and/or minimally, the ability to aggregate policy and progress for current and future evaluation. Such roles include the work of:

- adopting common baselines to measure progress against
- developing regional or national definitions to build policy upon

Developing common approaches to rules and to market development will assist a cohesive regional or national adoption strategy, create clarity for those developing solutions, and help prevent a "race to the bottom" for codes, standards and/or market mechanisms.

[52] LPDD; Legal Pathways to Deep Decarbonization in the United States, Michael B. Gerrard and John C. Dernbach, Editors; March 2019. https://lpdd.org/about/

States should continue to aggressively act within the parameters of what is possible. And states should coalesce regionally and nationally to bring their combined practical and experienced policy and implementation voice to press for:

- a national climate and energy policy
- vastly increased funding for research and development, and implementation mechanisms to drive adoption of policies
- providing regions—through Governors Associations, ISOs, RTOs or other such convening entities—the resources to more aggressively evaluate common standards and/or address common infrastructure needs to meet the laws already passed.

Finally, areas for future research that would benefit all states and market participants are offered for consideration below.

Strategic Electrification Impact

Most states with strong climate and clean energy targets are aggressively pursuing the electrification of energy use economywide as a central strategy. A good place to start is to move new construction to all-electric (thereby saving the cost of gas infrastructure) and more generally stop expanding the gas transmission system to new areas (when you are in a carbon hole, the first thing to do is to stop digging). Transitioning all building energy use to electricity, while transitioning to electric vehicles, will require substantially more grid resources by 2050 and could create reliability issues from the small (e.g., a transformer on a residential street) to the larger industry uses. For example, in the next decade, electricity use is expected to rise 2–13% in New England.[53] While not significant enough to cause reliability issues within ten years, additional study is needed to both ascertain the short-term reliability impacts of electrification across the United States and to consider needs and impacts for 2040–50.

Strategic electrification can impact energy efficiency outcomes; for example, investing in efficiency to lower loads both reduces the size and cost of heat pump systems and reduces the amount of additional electric generation needed. Air source heat pumps can accelerate the transition to electric space conditioning with higher efficiency. It can also affect energy efficiency's effectiveness, e.g., when electrifying devices without optimizing them for load management conflicts with technology efficiency gains. Research to assist policy makers, regulators and implementers in better understanding how to leverage strategic electrification will help states continue to develop the best policy and regulatory mechanisms to assure maximal progress.

Policy Making Continuity

Modifications to existing policy, and new policies, are developed and considered with other existing policies in effect. A typical policy making process is less elegant than the ideal, and can result in conflicts as well as leaving gaps. Assisting states on how best to connect an economywide climate law with other new bills, regulatory dockets and rules to enact change can result in better outcomes.

[53] E4TheFuture; New England Electrification Load Forecast; Synapse by Goldberg, D., Frost, J. Hurley, D. Takahashi, K.; May 2020. https://e4thefuture.org/wp-content/uploads/2020/06/New-England-Electrification-Load-Forecast.pdf

Sequestration

Most state policies that cover all sectors of the economy within climate laws do not specifically discuss sequestration when developing and adopting legislation. Agriculture is often included; however, typically without clarity regarding the policy's intention to include sequestration. State implementation plans and road maps sometimes include sequestration.

Sequestration is a complex accounting of carbon "puts and takes" within soil and forests. It is vital to understand the amount of sequestered carbon at a baseline date, for future accounting to assure that progress is accurately incorporated into broader emission reporting. While experts understand the conceptual details, sequestration is not seen as a trusted legitimate climate mitigation solution by everyone. This is due to both uncertainties in the process of setting baselines and the perceived impermanence of results, and often leads to policy makers avoiding the topic altogether.

Research and technical transfer on how sequestration of forests and soils occurs, how it gets accounted for, and what policies and actions are necessary for trusted outcomes represent an opportunity for further research and education that would help states more fully develop climate plans cost effectively.

Natural Gas and the Role of Low Carbon / Alternative Fuels

As discussed above, a role exists for lower-carbon fuels like gas to assist states in the transitional years, particularly to meet interim climate targets while assuring reliability. Tools and language relative to low carbon or alternative fuel standards provide guidance on how best to evaluate this transition.

Important avenues for further research include: identifying the most critical uses for limited low carbon fuel supplies, the pace of the transition, the potential for reuse of gas infrastructure, the role of renewable natural gas and/or hydrogen, how electric microgrids may be coupled with combined heat and power systems and/or district geothermal, and how best to transition the electric grid supply from gas to renewables and to deal with stranded costs. Clarity would assist states in balancing the evidentiary portion of policy making with that of advocacy and politics.

Needs of the Electric Grid

Research is necessary on how best to evaluate and plan for the transitional needs of the electric grid to meet the increase in variable renewable energy, storage, load management, transmission and distribution that will be required if the energy economy is to move from fuel-based to clean electricity within thirty years. States, utilities and regional entities would be well served by additional guidance on how to evaluate needs, use available tools, and assist the public in seeing new renewable infrastructure (generation as well as transmission and distribution) as something worthy of their support.

Summary

Some states included in this assessment of climate and clean energy policy progress are leading the nation in understanding both what is necessary to attain policy objectives as well as why it matters. They are taking steps as aggressive as conditions in their states will allow in 2020.

In the last twenty years, states developed an impressive array of tools and measures that enable progress. Many are now well understood and trusted. Any jurisdiction from a nation, region, state or municipality can begin or enhance their climate and clean energy journey by simply looking to proven initiatives that these states have pioneered.

Much remains to be accomplished. The current focus on short and interim goals is appropriate and warranted in many respects. It derives from a desire to meet interim targets as well as a lack of clarity on what steps and initiatives are necessary to meet longer-term, aspirational goals.

As mentioned, more research and guidance is necessary. States also need assistance, intellectually and fiscally, from a fully engaged federal partner. Understanding how the nation and regions are progressing and what gaps and needs arise from these assessments is important.

States that have stepped up are to be applauded for their leadership in addressing climate change and clean energy transition policy and implementation. States have demonstrated that meeting policy objectives is possible. Smart, focused, collaborative and inclusive law, policy, strategy and implementation will enable states and the United States overall to address climate change in the time available, and in a manner inclusive of all people in the country, if the work of these states continues and is adopted, rapidly, by all others.

Appendix: State-by-State Data

This appendix provides a summary of data collected for each of the 15 states included in this report—a snapshot of a point in time. Every state has adopted a more robust array of laws, tools and implementation methods than are depicted here. States continually modify these laws, tools, and methods.

Note: For all states, the "Additional" category lists two fields under National Rankings. The first, "UCS" refers to the Union of Concerned Scientists; Clean Energy Momentum, Ranking State Progress (2017); the second, "ACEEE" refers to The State Energy Efficiency Scorecard (2019).

California

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50	40 by 30	100 by 45	60 by 30

Baseline 1990

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Clean Energy Standard**	**Decoupling**
Bill SB 32, 2016 CA Air Resources Board	Bill SB 100, 2018 PUC & Energy Comm	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	Western Climate Initiative	Challenging

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	Name
If Considered Where					
State Implement Plan	X	X	2	1	TRC

Colorado

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
90 by 50	50 by 30	100 by 40	30 by 30

Baseline 2005

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Renewable Energy Standard**	**Decoupling**
Bill HB 19-1261, 2019 Air Quality Control Comm	2004 PUC	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	None	Challenging

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	
If Considered Where					**Name**
State Program	X	X	14	13	TRC

Hawaii

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
100 by 45	N/A	100 by 45	70 by 40

Baseline N/A

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
Carbon Neutrality	**Renewable Portfolio Standard**	**Decoupling**
Bill HB 2182, 2018 GHGS Task Force	Bill HB 623, 2015 PUC	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	None	Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
Basis in Law	X	X	16	5	TRC

Maryland

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
40 by 30	25 by 20	50 by 30	N/A

Baseline 2006

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Renewable Portfolio Standard**	**Decoupling**
SB323, 2016 Dept of Environment	Bill SB 516, 2019 PUC	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	RGGI	Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
State Program	X	X	7	11	TRC

Massachusetts

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50	25 by 20	80 by 50	+2%/yr

Baseline 1990

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Clean Energy Standard**	**Decoupling**
Chapter 298, 2008	Chapter 227, 2018	Yes
EOEEA	EOEEA	

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency	RGGI	Potential
Other		

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
State Program	X	X	1	3	TRC

Minnesota

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50	30 by 30	100 by 50 EO	N/A

Baseline 2005

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Renewable Energy Standard**	**Decoupling**
Bill HF 375, 2007 Climate Change Advisory Grp	Chapter 216B, 2007 PUC	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	None	Very Challenging

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	
If Considered Where					**Name**
State Implement Plan	X	X	2	1	SCT

New Jersey

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50	100 by 1990	100 by 50	N/A

Baseline 2006

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**RPS**	**Decoupling**
Chapter 112, 2007	A3723, 2018	Yes
DEP	BPU	

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency	RGGI	Challenging
Other		

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	Name
If Considered Where					
State Program	X	X	17	20	TRC

New Mexico

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
N/A	N/A	100 by 45	80 by 40

Baseline N/A

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
N/A	**Carbon Free Electricity** Bill SB 489, 2019 PRC	**Decoupling** No

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	WCA	Some Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
State Program	X	X	33	23	UCT

Nevada

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
45 by 30	28 by 25	100 by 50	50 by 30

Baseline 2005

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Clean Energy Standard**	**Decoupling**
Bill SB 254, 2019	Bill SB 358, 2019	Yes
DCNR	PUC	

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency	None	Some Potential
Other		

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	Name
If Considered Where					
State Implement Plan	X	X	26	15	TRC

New York

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
85 by 50	40 by 30	100 by 40	70 by 30

Baseline 1990

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**Clean Energy**	**Decoupling**
CLCPA 2019	CLCPA, 2019	Yes
DEC	PSC and DEC	

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency (in BCA)	RGGI	Potential
Other		

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	Name
If Considered Where					
State Program	X	X	5	9	SCT

Oregon

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50 EO	40 by 30	50 by 40	25 by 25

Baseline 1990

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
N/A	**Clean Energy Standard** Bill SB 1547, 2016 PUC	**Decoupling** Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	Western Climate Initiative	Challenging

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
State Program	X	X	9	6	TRC

Pennsylvania

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50 EO	26 by 25	18 by 21	N/A

Baseline 2005

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**RPS**	**Decoupling**
Act 70, 2008	Act 40, 2018	Yes
DEP	PUC	

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency	None	Very Challenging
Other		

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
	Environ. Justice	Just Transition	ACEEE	UCS	Name
If Considered Where					
State Implement Plan	X	X	2	1	TRC

Vermont

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
80 by 50	40 by 30	75 by 32	N/A

Baseline 1990

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
GHG Emissions	**RPS**	**Decoupling**
H688, 2020 Climate Council	Bill H40, PUC	Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	RGGI	Some Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
Law	X	X	3	2	SCT

Virginia

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
N/A	N/A	100 by 50	Many

Baseline N/A

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
N/A	**RPS** Bill SB 851, 2020 PUC	**Decoupling** Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	RGGI	Some Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
State Program	X	X	29	41	TRC

Washington

State Goals

Climate/Greenhouse Gas		Clean Energy	
Goal	**Interim**	**Goal**	**Interim**
N/A	N/A	100 by 45	0 Coal

Baseline N/A

Law

Climate/Greenhouse Gas	Clean Energy	Energy Efficiency
N/A	**RPS** 2018 PUC	**Decoupling** Yes

Codes & Standards

Renewable Portfolio Std	Low Carbon Fuel Std	Alternative Fuel Std
Energy Efficiency Resource Std	Residential Energy Build Code	Commercial Energy Build Code

Carbon Pricing

Non-Energy Benefit	Cap & Trade	Carbon Tax Potential
Energy Efficiency Other	Western Climate Initiative	Potential

Financial

Incentives	Credits	Loans	Measure Subsidy
Energy Efficiency	REC	Res PACE	Low Income
Solar	Solar REC	Comm PACE	
NonSolar Dist Gen	Solar Carve Out	ESPC	
Advanced Vehicles	Adv Net Metering	On-Bill Fin & Pay	
Vehicle Charging	Renew Std Offer	Green Bank	
AV Charge Rates			

Additional

Sequestration	Justice		National Rankings		Cost Test for EE
If Considered Where	**Environ. Justice**	**Just Transition**	**ACEEE**	**UCS**	**Name**
Legal Basis	X	X	10	8	TRC