Memo

To: The Next Governor of Maine

From: Acadia Center

Date: December 2018

Re: Strengthening Maine's economy, competitiveness, and overall quality of life.

Message:

The next governor can revitalize Maine by modernizing transportation and energy through five reforms that will unlock significant new economic, consumer, and public health benefits for our state.

Acadia Center

Building a Stronger Maine

Memorandum to the Next Governor - December 2018

Acadia Center
Advancing the Clean Energy Future

Overview: The Next Governor Can Revitalize Maine By Modernizing Transportation and Energy

The next governor of Maine faces the need to revitalize Maine's economy, competitiveness, and overall quality of life while safeguarding its iconic natural resources. By pursuing five reforms to modernize Maine's energy and transportation systems, **the next governor can meet these challenges and benefit all Mainers.**

1. Modernize Maine's transportation infrastructure to improve safety, access, and convenience;
2. Transition power generation to cheaper, cleaner, and more resilient local sources;
3. Improve energy performance in buildings to reduce costly energy use and emissions;
4. Reform energy grid rules to reduce high energy costs and speed energy innovation;
5. Give communities and consumers more control over their energy choices.

These reforms will unlock significant new economic, consumer, environmental, and public health benefits for Maine. For example, modernizing transportation alone could produce over $3.8 billion in new economic benefits, add 8,700 new jobs, and create $2.3 billion in public-health and other benefits. These indicators of the state's well-being are key to retaining and attracting young people. By improving them, each of the five energy reforms can revitalize Maine.

Remaking the energy system must be a core part of Maine's new economic and climate action strategy. Economic progress, improvements in our quality of life, and more equitable benefits for all residents now go hand in hand with innovations in energy and transportation. More detail on the five energy reforms follows.

1. Modernize Maine's Outdated Transportation Infrastructure to Improve Safety, Access, and Convenience

The Transportation System and Current Challenges

Maine's transportation system—its network of highways, trains, public transit, airports, ports, and walking and biking corridors—is vital to the state's economy. It facilitates the movement of goods and connects people to jobs, education, recreation, and other services. However, the system needs critical improvements to address three major challenges and better serve the state's communities and businesses.

Update Transportation Infrastructure: The state's transportation infrastructure and transit options need substantial investment to create a safe, modern, and resilient system. Maine's deteriorating roadways cost the average Maine driver an extra $460 per year for repairs, and vehicle operation, congestion delays, and crashes cost us $1 billion annually.[1]

More than half of all Maine bridges are older than 50 years, and one out of every seven has been rated structurally deficient.[2] Despite the clear need for infrastructure investment, Maine has the lowest funding per mile of the six New England states and a projected $68 million annual funding gap.[3] Proposals to reform transportation funding at the state level have failed every year since 2009.

Improve Transportation Access and Equity: Transportation options must be expanded and improved in communities that remain underserved and overburdened by the current system. This is essential to delivering more affordable, accessible options throughout the state and to reducing the inequitable impacts of local air pollution.

Reduce Transportation Emissions: Transportation is responsible for the biggest share of carbon emissions in New England[4] and a staggering 52% of greenhouse gas

emissions ("GHGs") in Maine.[5] Inefficient and outdated transportation infrastructure greatly contributes to poor air quality and associated public health problems. In 2015, passenger vehicle emissions were responsible for $500 million in health costs in Maine,[6] making emissions reductions an economic, public health, and climate imperative.

Modernizing Maine's Transportation System Benefits Consumers

A safe, modern, and clean transportation system would offer transformative benefits to Maine's economy. By capping transportation GHG emissions and auctioning allowances—much as Maine already does for GHG emissions in the electric generation sector[7]—the state could generate about $1.38 billion in new revenue between 2019-2030.[8] That revenue could then be reinvested in the transportation system to target certain modern improvements, as demonstrated by the sample portfolio shown in Table 1.

Acadia Center has examined the benefits of transportation reforms in other states[9] in order to estimate some of the new economic activity and other monetary benefits that would be generated if Maine invested in cost-effective transportation improvements focused on expanding consumer access and reducing emissions. These economy-wide benefits include:

- Creation of about 8,700 long-term jobs (i.e. not project-related construction jobs);[10]
- Over $1 billion in new wages,[11] primarily as a result of newly-created jobs;
- $3.8 billion of new business sales, resulting from project-related spending, spending of new wages in the local economy, and spending of cost-savings generated by lowered transportation expenses;[12]
- Nearly $2.3 billion in other benefits, including fewer hours spent in traffic and improved health outcomes, as well as $63 million in savings from avoided costs of GHG emissions.[13]

These benefit estimates flow from a sample portfolio of transportation improvements that focus on clean electric vehicles ("EV" or "EVs") and diversification of transit and mobility options, as detailed in Table 1.

This portfolio has many benefits for Maine. For example, electrifying passenger vehicles, buses, and port equipment will improve air quality and reduce operating costs for vehicle owners and taxpayers. Expanding rail, bus transit, and walking and biking will reduce travel in single-occupancy vehicles, improve mobility, and expand consumer options. By 2030, investment guided by this sample portfolio could result in:

Table 1: Simple Reinvestment Portfolio for Maine's Proceeds from New Emissions Policy [14]

Maine	Possible Investment Portfolio	2019-2030 Total Revenue (millions)	Average Annual Revenue (millions)
EV & Charging Infrastructure Rebates	34%	$469	$39
Bus & Rapid Transit	32%	$441	$37
Intercity Rail (Trains & Commuter Rails)	12%	$165	$14
Walking & Biking Infrastructure	8%	$110	$9
Port Electrification	14%	$193	$16
Total	**100%**	**$1,378**	**$115**

- About 155,000 electric vehicles—17% of the passenger vehicle fleet—as well as associated charging infrastructure, aligned with Acadia Center's EnergyVision 2030 recommendation for reducing GHG emissions 45% by 2030;[15]
- Over 500 electric buses and their charging infrastructure to expand Maine's inter- and intracity bus service and replace aging and polluting diesel vehicles;[16]
- Nearly 400 miles of new walking and biking trails throughout the state.[17]
- Electrification of ports throughout the state, including electric shore power investments and electrification of drayage equipment.[18]
- Commuter and inter-city rail enhancements throughout the state.

Improving Maine's transportation system will require a suite of complementary policies. Valuing carbon emissions from transportation, potentially through a regional cap-and-invest program with other Transportation & Climate Initiative states,[19] would complement other policies by generating revenue for reinvestment in significant transportation improvements. These improvements would allow the system to better serve the public while creating new jobs and attracting and retaining businesses.

Maine's next governor should act quickly to join Transportation & Climate states to put a price on transportation emissions to reap these many benefits and accelerate progress to a more modern, equitable, low-carbon transportation system.

2. Transition Electric Generation to Cheaper, Cleaner, and More Resilient Local Sources

The Electric Generation Sector and Current Challenges

Our modern world depends on electricity to power its essential needs—lighting, cooling and heating, motors and electronics. Maine is no different. Electric power is at the core of its economic well-being and overall quality of life. Pressing challenges demand several improvements to Maine's power sector.

Strengthen Energy Independence: Electric generation in Maine and the New England region continues to rely heavily on an imported fossil fuel, natural gas, for power production—roughly 49% of electric energy production in 2016.[20] This makes Maine's economy vulnerable to market conditions largely outside of its control, such as electricity price spikes caused by natural gas supply constraints in the winter.[21]

Grow In-State Clean Energy Industries: Maine needs to protect and grow its emerging in-state renewable energy generation and storage to maximize long-term economic growth, advance energy independence, and better compete with neighboring states. Rooftop solar is the most promising clean energy resource for maximizing economic impact in Maine, and residential solar-plus-storage is accelerating that impact, with some products developed in Maine.[22] Patented, made-in-Maine technology for deep-water floating wind farms[23] suggests that the state could establish a successful offshore wind industry if the regulatory environment were improved.

Reduce Electric Generation Emissions: The electric generation sector remains a significant source of GHG emissions, despite recent strong progress.[24] To meet climate and clean energy commitments, Maine will need to deploy more renewables at a faster pace.[25]

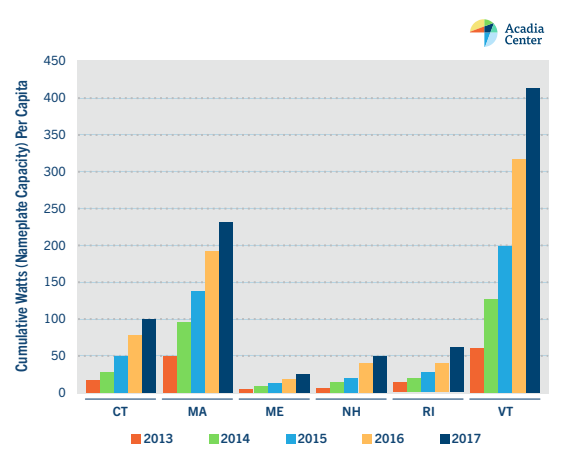
Accelerating the Electric Generation Transition Boosts Maine's Economy

With clean energy and its zero-emissions performance now competing with fossil fuels on cost,[26] the time is right for Maine to move faster on local power supply options that are cheaper, cleaner, and more resilient than imported fossil fuels. The economic rewards would be immense. Investing in local clean power—primarily distributed solar—means prioritizing economic growth and job creation in Maine.

Offshore wind and rooftop solar both represent immediate opportunities for strong and sustained positive economic impact in Maine. As carbon-free power, offshore wind has incredible potential in Maine and the region. Political and regulatory uncertainty has slowed the industry's development in Maine, however, and plans to test a prototype floating offshore wind farm off Monhegan have stalled.[27]

Distributed solar, which includes rooftop and other small-scale installations, is a key part of Maine's important and growing clean energy economy. The industry employs more than 700 people in Maine—25% more than in 2016.[28] Distributed solar also gives Maine residents and businesses another way to control their energy use and reduce high energy costs. Yet Maine can do much more to take advantage of distributed solar's economic benefits. Maine lags other New England states in its pace of deployment (see Chart 1).[29]

Chart 1: Solar Deployment Per Capita in New England

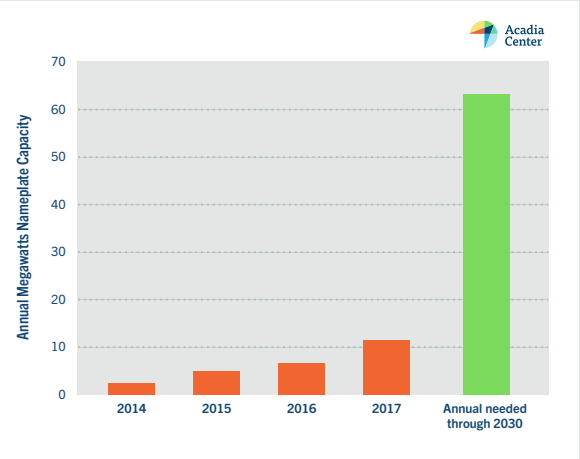


Source: ISO New England DG forecast data & US Census

New Hampshire currently has twice as much solar installed per person as Maine, and Massachusetts nearly 6 times more per person.[30] These higher deployment rates in the rest of the region suggest that Maine's in-state solar industry could easily expand if supported by effective solar policies.

Maine's current deployment rate will not be sufficient for meeting its climate goals, as Acadia Center has modeled through its EnergyVision 2030 project.[31] Maine will need to increase its distributed solar installations more than five-fold—to about 63.8 MW annually—to stay on track through 2030 (see Chart 1).

Chart 2: Maine's Annual Distributed Solar Installations Versus 2030 Climate Target



Source: ISO New England and Acadia Center's EnergyVision 2030

Major Benefits from New Policy Approach to Solar Power

This ambitious, achievable increase in distributed solar installations would help Maine's economy. Acadia Center estimates that increasing installation work for the existing in-state solar industry, including rooftop solar, would result in:

- Approximately 1,285 new jobs in Maine, with that employment level sustained through 2030;[32]
- Increased personal income of at least $142 million, which means greater spending power and more in-state economic activity;[33]
- About $9 million annually in new state tax revenue (personal income and sales taxes) generated by new jobs and economic activity.[34]

To capture the full economic potential of rooftop solar for Maine, existing policies will need to be changed to maximize cost-effective deployment at all scales. Arbitrary limits on community solar must be removed, and net metering reform must be revisited. A modernized renewable portfolio standard should include energy storage, long-term contracts for new renewables, and appropriate standards for existing biomass and hydropower. The next governor of Maine should move quickly to give in-state clean energy industries—especially rooftop solar and potentially offshore wind—a central role in economic development strategy.

3. Improve Energy Performance in Buildings to Reduce Costly Energy Use and Emissions

The Building Sector and Current Challenges

To advance Maine's economic well-being and quality of life, improving energy usage in buildings must also play a key role. The poor energy performance of the many aging buildings in Maine burdens low-income households, business competitiveness, and public health. Unnecessary energy consumption in our buildings makes our energy system more expensive and increases pollution emissions. Two major challenges exist for the building sector, and solutions to each are available that will help boost Maine's economy.

Increase Commitment to Energy Efficiency: Maine needs to give more residents and businesses access to energy efficiency programs by increasing energy efficiency savings targets to match those in leading states, among other policy reforms. Efficiency is not only the lowest cost and cleanest energy choice, it provides enormous economic gains and supports more than 8,000 skilled Maine jobs.[35]

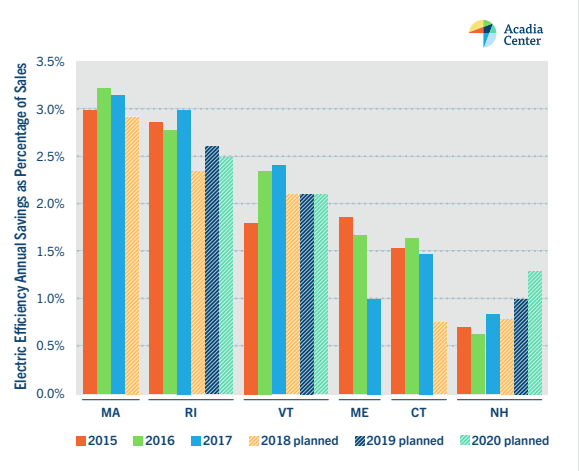
Move to Clean Heating Technologies: Maine leads the region in conversion to modern electric heat pumps that offer highly efficient performance and zero on-site emissions,[36] yet the state's building sector still relies heavily on fossil fuels for its heating needs. Nearly two-thirds of households use home heating oil as their primary energy source.[37] Converting the sector to clean heating technologies is now possible with recent advances in performance and cost reductions. With continued emphasis and investment, Maine can maintain its leadership role in claiming the economic and emissions benefits of electric heat pumps.

Improving Building Energy Performance Unlocks Significant Benefits

Energy efficiency is at a critical moment in Maine. Since 2010, the state has been committed to capturing all cost-effective energy efficiency and to weatherizing all homes by 2030. High-quality energy efficiency programs, administered by Efficiency Maine Trust, demonstrate the state's capacity to reach these goals, yet significant opportunities remain to reduce energy use and create a stronger, healthier state. Maine invests in cost-effective electric efficiency at roughly one-third the levels pursued in Massachusetts and Rhode Island (see Chart 3).[38]

Lagging energy efficiency savings are costly for Maine residents and businesses. Maine is one of the most petroleum-dependent states in the nation, consuming more oil per person than anywhere else in New England[39] and sending nearly $4,000 per person out of state for the purchase of fossil fuels.[40] Insulation, air sealing, and other

Chart 3: Electric Efficiency Savings Levels in New England



Source: Acadia CLEAN Center Analysis using data from: Electric Efficiency Program Administrator Annual Reports, Plans and State Efficiency Database. 2017 actual results and CT planned savings are preliminary. 2017 Burlington Electric savings (~5% of VT) are planned.

efficiency measures lead to dramatically lower energy costs and improved building comfort—and support skilled, local jobs.

Combined with setting higher efficiency savings targets, continued investment in energy efficiency would unlock immediate economic, consumer, and public health benefits for our state.

Major Benefits from New Policy Approach to Energy Efficiency

- $306 million in economic growth from increased efficiency services, upgrades, renovations, or retrofits provided to thousands of residents and businesses;[41]
- $259 million in important consumer and energy system benefits, such as customer bill savings, water savings, less strain on the energy grid, and reduced pollution compliance costs;[42]
- Approximately 3,626 jobs, primarily in Maine's building performance industry, but also jobs created by new household and business spending.[43]

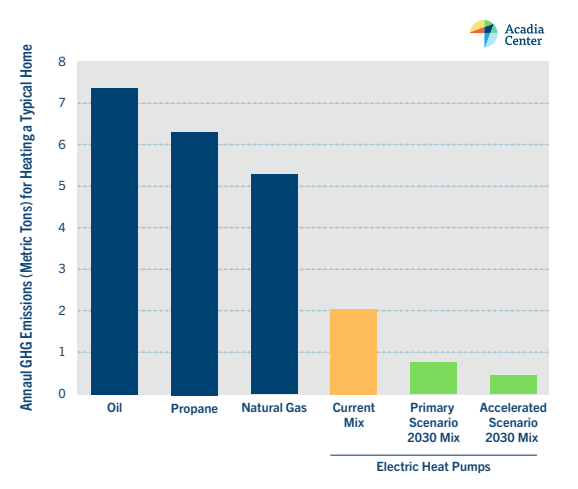
To seize these valuable benefits, the next governor of Maine must prioritize continued, consistent investment in market development, workforce training, and consumer incentives and education for all sectors, including renters. Other states in the region have moved to improve their economies and competitiveness. Maine needs to do the same.

Adopting Clean Electric Heat Pumps Reduces Emissions and Costs

Thanks to advances in technology and significant cost reductions, electric heat pumps have become a new tool for heating and cooling buildings more efficiently while reducing emissions.[44] Heat pumps extract heat from either outside air or the ground and move it into a building to heat it. An air conditioner is a type of heat pump that moves heat from inside a building to the outside to cool it; heat pumps simply reverse this process during the heating season and can now efficiently function even in cold Northeastern winters. During the summer months, heat pumps provide efficient cooling that reduces air conditioning's impact on peak demand, stabilizing the electric grid.[45]

Heat pumps are far more efficient than traditional electric resistance heating and, with today's electric generation mix, provide immediate GHG emissions reductions (see Chart 4). Currently, heat pumps reduce emissions about 70% more compared to oil heat and about 60% compared to natural gas.[46]

Chart 4: Comparison of Emissions from Heating Technologies



Source: Acadia Center

As electric sources grow cleaner, emissions from heat pumps will continue to decline. Installing heat pumps today creates a "renewable-ready" infrastructure that will take advantage of a cleaner energy grid as renewables continue to come on line at a faster rate.

Maine's next governor can maintain and build on the state's leading adoption of clean heating technologies. Several policy reforms will help expand the heat pump market in Maine: increased consumer awareness and education; improved market and customer strategies for manufacturers, distributors, and installers; advancements in heat pump controls and other related innovations; and specialized incentives and

financing to increase consumer uptake. Switching from dirty fossil fuels to electric heat pumps is an economic and environmental win-win, offering strong cost-savings and deep pollution reductions. Helping residents and businesses make this transition could also be a central focus of Maine's energy efficiency programs, if minor changes are made to the rules governing those programs.

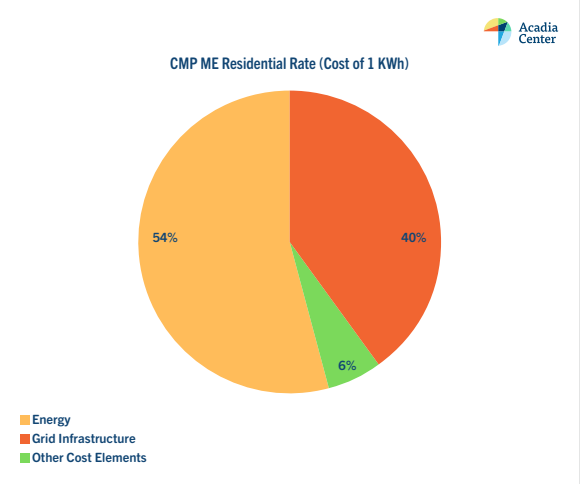
4. Reform Maine's Energy Grid Rules to Reduce High Energy Costs and Speed Energy Innovation

The Energy Grid and Current Challenges

The rules and regulations that drive decision-making about Maine's energy grid are out of sync with technological advances and consumer expectations for a clean, reliable energy system. Local energy resources like energy efficiency, rooftop solar, and energy storage are tools that can solve grid problems—instead of relying only on building expensive, traditional infrastructure projects. Maine's penetration of sophisticated metering technology—among the highest in the nation[47]—can support innovations in how consumers pay and are paid for electricity, rewarding them for optimizing their energy generation and consumption. However, traditional utility business models and power sector planning favors over-investment in electric power grid infrastructure. Updated rules and planning processes, as well as customer education and outreach, are critical to ensuring that these technologies are effectively utilized to meet 2030 and longer-term emissions reduction targets.

System planning and utility business model changes will also help control grid costs in Maine. Residents, businesses, and municipalities pay not only for the electricity they consume, but also for the energy grid infrastructure that delivers it—the poles and wires of the electric system. For Central Maine Power customers, 40% of the retail price of one kilowatt hour of electricity goes to paying for the energy grid infrastructure that delivers that electricity to the customer (see Chart 5).[48]

Chart 5: Major Components of Electricity Costs for Central Maine Power Customers



Source and Notes: CMP Residential Rate 1. Monthly customer service charge not included.

Significant variation in electric distribution system costs across the region indicate the impact of state policies, regulations, and processes on the overall grid and specific customer costs. Maine has already realized dramatic cost-savings through non-transmission alternatives (NTAs) to traditional infrastructure solutions. The Boothbay pilot leveraged five categories of NTAs—energy efficiency, solar photovoltaics, back-up generation, demand response and peak load shifting, and energy storage—to reduce stress on the grid and ensure reliability at less than one-third of the $18 million estimated cost of the transmission line originally proposed by Central Maine Power.[49] Despite this clear success, Maine policymakers and regulators have struggled to define an effective process to consistently advance cost-effective NTAs.

Reforming Grid Rules Results in Real Benefits to Consumers

Creating a more affordable, customer-centric electricity grid of the future for Maine will require wide-ranging grid and utility reforms.[50] Consumers need to be protected and given more opportunities to participate in clean energy. Energy grid planning and stakeholder processes need dramatic improvement. The utility business model and incentives must change to be better aligned with policy goals. Electric rates must provide more granular price signals to ratepayers for both consumption and generation. Energy storage must be leveraged to accelerate the transition to clean energy.

States such as Rhode Island and New York are already engaged in power sector reforms aimed at alleviating a significant financial burden on residents, businesses, and communities. Acadia Center's recent grid reform efforts in the region include:

Major Examples of New Policy Approach to Grid Rules

- Decreasing unfair fixed monthly charges for millions of residential electric customers in Connecticut and New York, with the largest savings for low-use customers, which tend to be lower-income households.

- Reversing an anti-solar fee, or demand charge, in Massachusetts that would have unfairly penalized households that chose to install rooftop solar.

- Creating a new framework to develop a more efficient grid, cleaner and cheaper energy system, and a utility business model that helps advance the public interest through the Rhode Island Power Sector Transformation and rate case settlement.

Maine's next governor should act now to give consumers more opportunities to participate in clean energy and advance cost-effective, consumer-friendly alternatives to traditional utility infrastructure. These efforts will require—and foster—innovation. For example, more granular price signals will help ratepayers manage their energy consumption and generation, and pilot projects, including the successful Boothbay pilot, will inform necessary statutory and regulatory changes.

5. Give Communities and Consumers More Control Over Their Energy Choices

The Current Challenges for Maine Communities

Any effort to revitalize Maine must focus on its communities—where we live, work, and play. Energy system reforms have an important role here too. Communities want more control over their energy options because they are on the front lines of creating a sustainable, low-carbon economic future. Unfortunately, state policies and outdated rules often prevent community action on energy. Current barriers in Maine include:

Community Control Over Building Codes Not Allowed: Maine statute requires a uniform building and energy code.[51] Though the current energy code is nearly a decade behind national best practices, an express limitation on municipal home rule authority[52] prohibits Maine communities from adopting more stringent "stretch" codes that significantly impact energy savings, consumer cost savings, and carbon emission reductions.

Authority for Municipal Microgrids Unclear: Despite strong interest, including from rural and island communities, there is no clear path for municipalities to create microgrids that enable local energy generation, storage, and consumption; add capacity and stability to the larger grid; and operate independently at times. Lawmakers, regulators, and stakeholders began examining the challenges associated with these self-contained energy systems in 2018[53] but have not reached consensus on specific guidance for developers and communities.

Community Choice Aggregation Not Available: Community Choice Aggregation (CCA) allows communities to pool residential, business, and municipal electricity load and then purchase and/or develop clean electricity on behalf of customers participating in the CCA program. State law does not currently authorize CCA in Maine.[54]

Empowering Communities Helps Revitalize Maine

The next governor needs to empower Maine's communities to lead the way on energy innovation. Rooted in their immediate surroundings and championed by respected neighbors, local energy initiatives have great capacity to change behavior, establish new norms, and advance local clean energy options. The fixed scope of local projects often translates into lower hurdles for implementation and a more straightforward evaluation process. Community-based action that successfully demonstrates innovations in energy efficiency, generation, and management can be scaled up to the state level and provide a crucial backstop to federal rollbacks.

In the spirit of our state motto—*Dirigo!*—Maine communities are already leading the way with ambitious climate commitments. Mount Desert Island is working to achieve energy independence by 2030. Portland and South Portland are developing a climate action and adaption plan to reduce emissions 80% by 2050. Rockland is in the early stages of developing a municipal energy policy. Across the state, town offices, covered landfills, and residential roofs are sprouting solar panels. There is an urgent need for Maine's next governor to reform outdated rules and laws that threaten the success of this community action.

Conclusion: Transportation and Energy Reforms Build a Stronger Maine

The five transportation and energy reforms outlined in this memorandum can open a new, bold future for Maine—one that is prosperous and innovative, economically vibrant, and healthier for Maine's people and communities. Over and over, the facts show that the opportunity to transform Maine is real: billions of dollars in economic growth and thousands of new jobs are within reach. By putting key transportation and energy policies in place, the next governor can help our state revitalize its economy, compete for businesses and talent, attract and retain the next generation to its towns and cities, and attain a higher quality of life for its residents. Acadia Center is eager to begin this crucial work with the next governor.

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References

1 See American Society of Civil Engineers Infrastructure Report Card (www.infrastructurereportcard.org/state-item/maine/)

2 See id.

3 See id.

4 For carbon emissions data by sector, see U.S. EIA data available online: https://www.eia.gov/environment/emissions/state/

5 See Regional Greenhouse Gas Initiative (RGGI) 2016 Annual Report (https://drive.google.com/file/d/1OV6InXU9EEQlICyO3Qfs7v87bAIDJg5z/view?usp%3Dsharing), at p. 8.

6 See American Lung Association, Clean Air Future Health and Climate Benefits of Zero Emission Vehicles (http://www.lung.org/local-content/california/documents/2016zeroemissions.pdf)

7 See Acadia Center, Outpacing the Nation: RGGI's Environmental and Economic Success (September 2017) (https://acadiacenter.org/wp-content/uploads/2017/09/Acadia-Center_RGGI-Report_Outpacing-the-Nation.pdf). Since its launch in 2009, the Regional Greenhouse Gas Initiative, also known as RGGI, has reduced electric generation emissions by 40%. During that same timeframe, RGGI member states have experienced 4.3% more economic growth than non-RGGI states.

8 Acadia Center analysis using data from economic analyses of transportation reforms in other states, including CT, MA, NH, and RI. Further detail available upon request.

9 See economic analysis reports for: the New Haven Rail Line Expansion in CT; the MA South Station High Speed Intercity Rail Expansion; the NH Capital Corridor Rail Expansion; the RI South County Commuter Rail Expansion; the Cincinnati Modern Streetcar; the Downtown Los Angeles Streetcar; Bus Rapid Transit in Madison, WI; Rural and Small Urban Transit Systems in ND; Bus Expansion for Greenville Transit Authority in SC; Biking and Pedestrian Trails in NC; and NREL's National Economic Value Assessment of Plug-In Electric Vehicles. Further detail available upon request.

10 See id.

11 Note that new wages are a subset of new business sales and these two categories are not able to be added.

12 Acadia Center analysis using data from economic analyses of transportation reforms in other states, including CT, MA, NH, and RI. Further detail available upon request.

13 See: EPA's Social Cost of Carbon methodology

14 Maine's final reinvestment portfolio should be developed with significant stakeholder input; this analysis provides an example of how revenue generated by a cap-and-invest program could be expended and is intended to show the scale of opportunity for Maine.

15 See http://2030.acadiacenter.org. Maine does not currently offer EV rebates. This analysis is based on adoption of regional best practices, including Connecticut's rebate levels of $3000 for long-range battery EVs and $2500 for shorter range battery electric vehicles and plug-in hybrid EVs: https://ct.gov/deep/cwp/view.asp?a=2684&q=561424&deepNav_GID=2183. It also considers a $2000 incentive for L2 EV chargers and $20,000 for DC fast chargers. The National Renewable Energy Lab estimates that 338,200 workplace and public L2 and L1 chargers will be needed per million EVs; this analysis considers 80% of these charges will be L2. NREL also estimates the need for 470 DCFCs per million EVs See: https://www.nrel.gov/docs/fy17osti/66980.pdf.

16 Assuming a cost of $750,000 per bus, $350,000 per 6-port fast-charger, and $250,000 per charger installation. See http://fortune.com/2017/09/19/electric-cars-buses-proterra/ and https://cafcp.org/sites/default/files/5_CARB-ACT-Cost-Model-Discussions_CaFCP-Bus-Team-Meeting-Aug2016.pdf.

17 Considering a cost of $280,000 per mile based on: https://www.ncdot.gov/bikeped/walkbikenc/pictures/EconomyImpact-Analysis.pdf.

18 See http://www.cleanairactionplan.org/documents/preliminary-cost-estimates-select-caap-strategies.pdf/ and http://www.dem.ri.gov/mobile/pdf/story6.pdf) for cost estimates for electric port technologies.

19 Seven Northeast and Mid-Atlantic states are already exploring regional approaches to reducing transportation emissions, and stakeholder meetings suggest strong support for a cap-and-invest program. For more information on the Transportation & Climate Initiative, see: https://www.transportationandclimate.org/.

20 See ISO-New England, 2017 Regional System Plan (November 2017) (https://www.iso-ne.com/system-planning/system-plans-studies/rsp/), at p. 97. Maine has no native oil and gas reserves.

21 See id., at pp. 102-103.

22 See Westbrook, Maine-based Pika Energy: https://www.pika-energy.com/white-papers/smarter-solar-plus-storage-say-goodbye-to-ac-coupling/

23 See Maine AquaVentus: http://maineaquaventus.com/

24 See Acadia Center, Greenhouse Gas Emissions and Fuel Consumption in New England: Fact Sheet on Key Regional Statistics and Trends (May 2018) (https://acadiacenter.org/wp-content/uploads/2018/05/Acadia-Center-Regional-Emissions-and-Fuel-Consumption-in-New-England-May-2018-.pdf).

25 See Acadia Center, Maine: Pathway to 2030 (http://2030.acadiacenter.org/full-reports/).

26 For example, the 800MW offshore wind bid recently selected by Massachusetts will have a levelized price below wholesale market prices for energy and renewable energy credits, saving Massachusetts ratepayers approximately $1.4 billion over the twenty years of the long-term contract. See Letter to MA Department of Public Utilities from MA Department of Energy Resources dated August 1, 2018 (https://eeaonline.eea.state.ma.us/EEA/FileService/FileService.Api/file/FileRoom/9676906), at pp. 3-4.

27 See Maine Public Utilities Commission Docket 2010-00235

28 http://www.thesolarfoundation.org/wp-content/uploads/2018/02/Solar-Jobs-By-State-1.pdf

29 See Acadia Center, Maine: Pathway to 2030 (http://2030.acadiacenter.org/full-reports/).

30 See id. Acadia Center analysis based on ISO-New England distributed generation forecast data and U.S. Census data.

31 See id.

32 Acadia Center analysis using 2015 economic impact study by the Connecticut Center for Economic Analysis that evaluated Connecticut's existing rooftop solar deployment program.

33 Acadia Center analysis using same study.

34 Same.

35 See U.S. DOE, U.S. Energy and Employment Report (January 2017), ME State Chart.

36 See Acadia Center, Maine: Pathway to 2030 (http://2030.acadiacenter.org/full-reports/).

37 See EIA fuel data for 2016.

38 See also Acadia Center, Maine: Pathway to 2030 (http://2030.acadiacenter.org/full-reports/).

39 See EIA fuel data for 2016.

40 See EIA Rankings: Total Energy Expenditures per Capita, 2016

41 Acadia Center analysis using data from MA, RI, and ME Electric Efficiency Program Administrator annual reports. All cost-effective efficiency levels are assumed to equivalent to MA and RI levels.

42 Same analysis.

43 Same.

44 See Acadia Center, EnergyVision 2030: Buildings Companion Brief (2017), at pp. 3-4.

45 See Efficiency Maine Trust, Ductless Heat Pumps: Myths, Modeling, and Mesmerizing Material (2018), at slides 21-22.

46 See Acadia Center, EnergyVision 2030: Buildings Companion Brief (2017), at pp. 3-4.

47 See EIA Residential Smart Meter Adoption Rates by State (2016)

48 "Grid Infrastructure" noted here includes both the transmission and distribution infrastructure costs for the delivery of electricity. "Other Cost Elements" includes costs for different public benefits programs detailed here, including funding for energy efficiency programs (Efficiency Maine Trust), the Maine Public Utilities Commission, and the Office of the Public Advocate. "Energy" covers the cost of generating and supplying electricity and is determined by competitive markets.

49 https://acadiacenter.org/community-energy-proving-successful-in-boothbay/

50 See Acadia Center, Grid Modernization and Utility Reform Policy Options: A Menu for the Northeast (July 2018) (https://acadiacenter.org/wp-content/uploads/2018/07/Acadia-Center-Grid-Modernization-and-Utility-Reform-Policy-Menu-July-2018.pdf)

51 See Acadia Center, Community|EnergyVision Action Guide for Maine (2017), at p. 8 (http://acadiacenter.org/wp-content/uploads/2017/11/Acadia-Center_Community-EnergyVision_Action-Guide_ME.pdf)

52 10 Maine Revised Statues §9724-1

53 In 2018, Maine's 128th Legislature failed to override Governor Paul LePage's veto of LD 257: An Act to Enable Municipalities Working with Utilities to Establish Microgrids.

54 See Acadia Center, Community|EnergyVision Action Guide for Maine (2017), at p. 10 (http://acadiacenter.org/wp-content/uploads/2017/11/Acadia-Center_Community-EnergyVision_Action-Guide_ME.pdf)