Maine Department of Agriculture, Conservation and Forestry

LD 820 Report to the Legislature

January 2022

Amanda E. Beal
Commissioner

Randy Charette
Deputy Commissioner

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STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
OFFICE OF THE COMMISSIONER
22 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

Dear Members of the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources,

In response to LD 820, *Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays*, passed by the 130th Legislature, the Department of Agriculture, Conservation and Forestry is pleased to submit its report and recommendations related agricultural lands and solar array siting. This is the result of several months of work to engage with various Department stakeholders to ensure that we address the scope of considerations articulated in LD 820, and we present a summary of recommendations gleaned from those discussions in this report.

We appreciate the opportunity to provide this information as you consider related legislation now and in the future. If you have any questions about the considerations, recommendations, and analysis presented on the following pages, please do be in touch.

Thank you,

Amanda E. Beal

Amanda E. Beal
Commissioner

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Summary

L.D. 820, *Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays*, was passed by the 130th Legislature (PL 2021, c.26). The Resolve required the Department of Agriculture, Conservation and Forestry (DACF) to convene a working group of stakeholders to develop plans and consider ways to "discourage the use of land of higher agricultural value and encourage the use of more marginal agricultural lands when siting a solar array." The Resolve required that DACF submit "its report and recommendations, including any suggested legislation, to the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources." (See Appendix A for full Resolve language.)

DACF supports renewable energy development in Maine and understands that solar is a key component of reducing our reliance on fossil fuels. In fact, many of the resources that DACF as an agency, and our stakeholders, steward are put at risk by the impacts of climate change. We also support opportunities for farmers to address their own energy needs with renewable sources, and to enhance the economic viability of their operations with thoughtful siting of renewable energy infrastructure.

At the same time, as a general statement of policy, DACF strongly recommends prioritizing siting of solar projects on non-agricultural lands and within areas that do not: contain rare plant populations; provide habitat for rare or exemplary natural communities; or diminish the ability for our natural and working lands - including currently forested lands - to effectively sequester carbon. Productive agricultural soils *are finite resources* that can take decades to restore, and in some cases, restoration may not even be possible. Hence, careful consideration regarding appropriate siting of solar projects is necessary to avoid permanent loss of agricultural lands.

This report aims to provide the Legislature with a suit of potential strategies and considerations that meet the full scope of its request, as articulated in LD 820. To that end, this report provides an overview of DACF's engagement with an Agricultural Solar Siting Stakeholder Group (Stakeholder Group) that was convened during 2021, a summary of that Stakeholder Group process, and its resulting recommendations, and DACF's evaluation of those recommendations. Furthermore, DACF presents in this report additional strategies or mechanisms that were not fully addressed by the Stakeholder Group in the timeframe they were convened that we think warrant consideration and/or additional evaluation going forward.

DACF's Agricultural, Forestry, and Natural Habitat Goals and Priorities

DACF is the state's largest natural resource agency. It provides oversight, management, and enforcement across broad segments of Maine's diverse working and natural lands by way of its four bureaus: the Bureau of Agriculture, Food and Rural Resources, the Bureau of Forestry, the Bureau of Public Lands, and the Bureau of Resource Information and Land Use Planning. DACF is intricately involved in the stewardship, monitoring, and maintenance of accessible public lands, healthy forests, and productive agricultural soils. These lands support healthy and diverse ecosystems in the state, and provide sustenance, critical natural habitat, and economic opportunities that support the foundation of our heritage industries. As a result, DACF is mindful of its role to thoughtfully protect and enhance these

resources as the state embraces renewable energy goals in its effort to proactively mitigate and adapt to a changing climate.

Maine Won't Wait (Appendix B), the state's four-year climate action plan published in December 2020, sets forth a number of important goals that highlight both the need to invest in clean energy siting and production while simultaneously conserving and enhancing our working forests, natural lands, and agricultural lands, given their ability to assist in carbon capture and other important resiliency goals. *Maine Won't Wait* offers a suite of strategies aimed at meeting Maine's greenhouse gas emission targets which, as required by law, will be reduced by 45% below 1990 levels by 2030 and 80% by 2050.

A number of these strategies directly identify the intersection of renewable energy, working lands, and food production. Strategy C from *Maine Won't Wait* is to "reduce carbon emissions in Maine's energy and industrial sectors through clean-energy innovation," by "achiev[ing] by 2030 an electricity grid where 80% of Maine's usage comes from renewable generation." Strategy D is to "grow Maine's clean-energy economy and protect our natural-resource industries," such as by "increas[ing] the amount of food consumed in Maine from state food producers from 10% to 20% by 2025 and 30% by 2030 through local food system development." Strategy E is to "protect Maine's environment and working lands and waters" and further notes that "by current estimates, Maine loses approximately 10,000 acres of natural and working lands to development each year — a figure which is projected to grow in coming years." Avoidance of this potential impact could possibly be achieved by "develop[ing] policies by 2022 to ensure renewable energy project siting is streamlined and transparent while seeking to minimize impacts on natural and working lands and engaging key stakeholders." Last, another goal set under Strategy E is to "[i]ncrease by 2030 the total acreage of conserved lands in the state to 30% through voluntary, focused purchases of land and working forest or farm conservation easements."

At the outset, it is important to acknowledge the inherent challenge of trying to achieve renewable energy goals while simultaneously maintaining or increasing agricultural, conserved, and natural and working lands. Prime soils and soils of statewide importance are finite and critical natural resources. They are key to Maine's current and future agricultural productivity, biodiversity, climate resiliency, and food security. We are cognizant that there are land-use changes happening in Maine and across the country that impact farmland and woodlands. For instance, the Maine Natural Areas Program (MNAP) within DACF plays a role in assessing development projects generally in the pre-application phase (not all proposals move on to be implemented). In 2020, MNAP tracked information relating to potential construction projects, including those designated as solar and non-solar projects. The graphic below illustrates the sizeable jump between 2019 (**56**) and 2020 (**335**) of solar projects MNAP reviewed.

2020 Summary Solar and Other Development Review			
	Solar	**Unknown**	**Non-Solar**
Number of Requests (811)	335	32	444
Project Request Acreage	43,462	2,414	57,603
Acreage Farmland Soils	14,950	1,154	5,606
Acreage Prime FL Soils	4,133	245	1,746
Acreage FL Soils Statewide Importance	10,816	909	3,860
% with Farmland Soils	87%	84%	59%
% with MNAP Features (Rare Plants/Exemplary Habitats)	5.9%	3.1%	10.7%
Lowest Acreage Request	1	2	0
Highest Acreage Request	5,627	460	10,821

2019	**Solar**	**Unknown**	**Non-Solar**
Number of Requests (562)	56	29	467

Acreage Farmland Soil in Maine	2,895,805
Acreage Prime Farmland Soil in Maine	793,434
Acreage Farmland Soils of Statewide Importance	2,102,372

Maine Natural Areas Program, 2021

Importantly, these numbers represent the total acreage reviews, not those approved for development. However, they do demonstrate a robust interest in solar-specific development relative to non-solar development and that there is significant interest in lands containing prime farmland soils and soils of statewide importance.

At the same time, renewable energy development, including solar development, is key to reducing greenhouse gas emissions and creates economic benefits in communities throughout the state, and as mentioned previously, potentially creates an additional revenue stream for farm and forestland owners. Finding the right policies, incentives, and parameters to help balance these interests is critical. The need for balance is clear, as there is no question that solar development in the state is accelerating. Examples of solar development impacting Maine farmland can be seen in various locations across the state, including Farmington, where a 490-acre, 300,000-panel solar array – New England's largest – is now located on land that was once part of an agricultural operation and partially covered in forest. Throughout Maine, farmers have reported fielding intense pressure from solar developers, receiving multiple mailings and phone calls to encourage them to develop their farmland with solar arrays. Given this intense pressure, some municipalities in Maine are passing moratoria on solar development in their communities and are looking for guidance on how best to thoroughly and responsibly consider solar siting. Last, because farmers often lease land, solar development pressure could lead to the loss of important (and affordable) acreage that these farms rely on for critical inputs, such as hay. The Department encourages thoughtful and planful policy development around siting of solar development projects on agricultural, working, and natural lands, to ensure that the state does not miss the opportunity to meet its equally important goals relative to food resilience, farmland conservation, and carbon capture potential.

At present, DACF does not have the authority to regulate soil siting. There is no existing state statute that requires the assessment of impacts to agricultural soil or important forestlands for a development project. The DEP's Site Location of Development Act (SLODA, 38 M.R.S. §481 - §489-E) reviews projects greater than 20 acres in size or having 3 acres of impervious surface; however, the current law does not

assess agricultural soil impacts per se. The DEP's Natural Resources Protection Act (NRPA, 38 M.R.S. §480-A - §480-JJ) regulates certain activities that occur in, on or over certain protected natural resources. Agricultural soils are not currently protected natural resources.

At DACF, we have taken multiple steps to develop and share information with solar developers and landowners to encourage thoughtful siting practices. We have produced a page dedicated to this topic on our department website and also developed the document: *DACF Technical Guidance for Utility-Scale Solar Installations and Development on Agricultural, Forested, and Natural Lands*. (Appendix C)

Agriculture Solar Stakeholder Group Process & Final Report

The Department began organizing the stakeholder effort in spring 2021, before LD 820 was passed, as Maine Won't Wait also recommended the creation of a stakeholder group to begin discussing how to "develop policies by 2022 to ensure renewable energy project siting is streamlined and transparent while seeking to minimize impacts on natural and working lands." As such, the scope of this group was not completely aligned with LD 820's charge. The co-chairs of the Agricultural Solar Siting Stakeholder Group were Celina Cunningham, Deputy Director of the Governor's Energy Office (GEO), and Nancy McBrady, Director of the Bureau of Agriculture, Food and Rural Resources at DACF. The Stakeholder Group, which met eight times between June and December 2021, was assembled to reflect the diverse and multi-faceted landscape representing agriculture and solar development. The perspectives of farmers, solar developers, agricultural service providers, natural resource conservation groups, and municipal representatives were sought. Information about the Stakeholder Group members and process can be found in their final report: Final Report of the Agricultural Solar Stakeholder Group. (Appendix D)

The Stakeholder Group spent time discussing the Maine solar industry's landscape and the state's agriculture and solar development potential. It reviewed other states 'solar and siting policies, including those in Massachusetts, New Jersey, and Vermont. Maine Audubon presented on its Maine Renewable Energy Siting Tool, and the group broadly discussed the need for additional, robust information and data tracking regarding solar development in the state. Maine Municipal Association presented on the impacts to local communities facing solar development proposals and its perspective on the current use tax laws of the state that prevent certain qualifying lands from being taxed at higher rates. Maine Revenue Service provided an overview of the state's Farmland Tax Program. The Maine Department of Environmental Protection presented on the current environmental permitting and review process for solar development.

Representatives from Nexamp and BlueWave Solar presented their experiences with solar development in Maine and elsewhere and provided input on dual-use solar projects. A farmer from Monmouth explained how the farm decided to put 45 acres of its 1,000 acres into solar development. Doing so allowed the remaining farmlands to remain in operation.

As part of its report, the Stakeholder Group also created a matrix "tool" that enumerated "siting and array options for consideration on agricultural lands, including options that allow farmland to remain in production." The matrix encouraged consideration of dual-use solar project siting in a number of instances, including actively farmed locations with prime soils and soils of statewide importance. The Department supports this recommendation in concept *if* the pilot studies are ultimately able to demonstrate economically viable dual-use models for Maine farmers. In addition, while the Stakeholder Group noted that they did not spend time discussing potential downsides to pushing renewable energy siting onto lands that are currently forested, the matrix also encouraged co-located solar projects on

farm woodlots. The Department believes this merits further discussion and consideration of the State's Climate Action Plan and the Forest Carbon Program Task Force's recommendations that pertain to forests and forest management.

Stakeholder Report Recommendations and Further DACF Comment:

Recommendation 1: Creation of a centralized clearinghouse of information

The Stakeholder Group recommends the creation of a publicly-accessible database of key characteristics, including spatial data, related to approved and constructed renewable energy projects, including solar projects. The data should be submitted in a format and on a schedule determined by GEO by all interconnecting solar projects upon final site decision-making following approval of state and local permitting agencies. Where applicable, this information should be made publicly available in an appropriate format by GEO. This information can be used by DACF, other natural resource agencies, and the public, as needed, to identify potential trends. GEO may need additional resources or staff support to implement this recommendation.

DACF Comment: DACF supports robust data collection and transparent distribution of information regarding permitted and constructed renewable energy projects, given that information regarding such projects is currently hard to find and often incomplete. Access to this data will allow a solid understanding of existing (or soon to be developed) solar sites and locations in the state, enabling the calculation of impacted lands, acreage, soil type(s), and other important trends. It will also allow stakeholders to ascertain whether there appears to be overdevelopment occurring in certain areas and to consider strategies to avoid that.

Recommendation 2: Dual-use pilot program

The Stakeholder Group recommends the establishment of a robust pilot program to support the growth of dual-use projects in Maine. The pilot would allow DACF to work with GEO, the Public Utilities Commission, and other agencies, to further explore the potential for dual-use in Maine. Projects meeting dual-use criteria should be supported with a financial incentive, location-based waiver, or other benefit, as determined by the program. The pilot should also provide opportunities to conduct necessary research on compatible crops and other dual-use systems to determine best practices for dual-use within a defined timeframe or capacity limit. The Stakeholder Group recommends that the DACF and GEO develop the pilot program in collaboration with other state agencies and research institutions. The pilot program design should include innovation and data collection as priorities, encompass at least 20 MW of dual-use development, and outline the financial mechanisms necessary to appropriately support the pilot program and participants. The group recommends that this pilot program development be completed by October 2022, in time for potential enabling legislation and funding support in 2023.

DACF Comment: The Department supports the creation of a dual-use pilot program, which would provide the opportunity to conduct critical research on compatible crops and livestock in Maine to determine viability for farmers interested in pursuing solar energy generation on their land. In particular, the pilot should assess the economic benefits of dual-use on various types of farms producing a multitude of crops, as well as crop productivity in fruit and vegetable operations, the quality and quantity of forage in livestock systems, and the efficacy of energy generation. The pilot program should

include further assessment of dual-use data generated by other states, and policies enacted based on that data. The results of this pilot will be instrumental in proving out the various recommendations of the Stakeholder Group, which include further policy development (as discussed below) favoring dual-use projects. However, without additional resources for DACF to staff a position to support the pilot design process - and depending on the timing of additional resources if made available - it may not be feasible to expect completion of pilot program development by October 2022.

Recommendation 3: Consideration of current use taxation

The Stakeholder Group recommends further consideration of the treatment of land enrolled in the farmland current use taxation program when such land is housing a dual-use project. For example, such land could be treated as not subject to the withdrawal penalty if the farming operations continue to meet the farmland current use taxation requirements. Notwithstanding further consideration around current use taxation, the Stakeholder Group further recommends solar equipment located on land enrolled in the farmland current use taxation program that primarily serves the farm's electrical load be classified as agricultural infrastructure or equipment. The Stakeholder Group recommends that the Legislature consider advancing this recommendation as expeditiously as possible through coordinated efforts of the Legislature's Joint Standing Committee on Agriculture, Conservation and Forestry and Joint Standing Committee on Taxation.

DACF Comment: The Department understands that the existing current use tax structure would penalize farmers from removing their lands from the farmland program to develop a solar project. Provided dual-use projects are proven to be viable, by way of the pilot projects, it could be productive to explore further whether changes to the farmland current use taxation would be advisable.

Recommendation 4: Consideration of standards for dual-use and co-location in permit-by-rule review

The Stakeholder Group recommends that dual-use and/or co-location standards be considered for inclusion as permitting criteria in future development of permit-by-rule processes by the Department of Environmental Protection and other relevant permitting agencies.

DACF Comment: DACF supports this recommendation, as we understand that regulatory efficiency, such as through shorter Permit-By-Rule review, is valuable to developers. In particular, offering Permit-By-Rule review to proposals that incorporate dual-use and/or co-location practices offers an incentive to developers to include more agriculture-friendly design considerations into their projects. DACF would like this recommendation to go one step further, however, and also have Permit-By-Rule review be applicable to solar proposals sited on marginal agricultural land, contaminated lands (brownfields and PFAS), rooftops, gravel pits, and previously developed parcels to prioritize and incentivize projects that safeguard and/or avoid valuable agricultural land.

Recommendation 5: Development of hosting capacity maps

The Stakeholder Group recommends the development of detailed hosting capacity maps that include analysis from the utility perspective and that can help developers become more efficient at targeted site selection for all sizes of solar projects. Comprehensive data that indicates which areas of the grid have capacity for additional interconnections can minimize land use stress, including agricultural lands, in any one location. Comprehensively mapping and updating the grid could increase reliability, resiliency, and support bringing three-phase power to rural locations. The Stakeholder Group views the Distributed

Generation Stakeholder Group established in 2021 by LD 936 and convened by GEO to be the appropriate venue for consideration of this recommendation.

DACF Comment: The Department supports this recommendation, as detailed hosting capacity maps that include analysis from the utility perspective could help developers become more efficient at targeted site selection for all sizes of projects. Comprehensive data that indicates which areas of the grid are saturated and which have the capacity for additional interconnections can minimize land use stress in any one location. Further, this information could help developers minimize interconnection costs, thereby increasing their ability to choose to pursue higher-cost dual-use or co-location sites.

Recommendation 6: Increased support for municipal planning capacity

The Stakeholder Group recommends more robust technical assistance capacity and/or financial support for planning be provided by natural resource agencies directly to municipalities, councils of governments, or other networks to help municipalities welcome solar development. The Stakeholder Group views DACF and GEO as well-suited to provide such assistance and requests that the Legislature consider providing sufficient funding to establish and maintain new programmatic staff positions for this purpose in both DACF and GEO.

DACF Comment: The Department supports increasing support for municipal planning capacity. We understand the constraints municipalities are facing at the local level when it comes to solar development and their need for additional support and resources, such as specific training and informational resources about land use considerations. The Department is not aware of any current legislation that proposes establishing these positions at DACF or GEO.

Recommendation 7: Consideration of program preference based on agricultural site characteristics

The Stakeholder Group recommends that future state-sponsored programs to support the development of solar resources through long-term contracts or other compensation mechanisms include consideration of agricultural siting characteristics consistent with the program's design. For example, if the Public Utilities Commission were directed to procure solar resources, evaluation and scoring of proposed projects 'agricultural and natural resource impacts (with support from natural resource agencies) when selecting projects could be incorporated. Alternatively, if a tariff program were developed, including an adder could be a significant market-based financial incentive to site dual-use solar.

The Stakeholder Group views the Distributed Generation Stakeholder Group established in 2021 by LD 936 and convened by the GEO as an appropriate venue for consideration of this recommendation, given its direction to consider mechanisms to limit siting impacts. The Agricultural Solar Stakeholder Group recommends that the Distributed Generation Stakeholder Group invite members of the Agricultural Solar Stakeholder Group to be a part of conversations specific to siting distributed generation projects, so that the Distributed Generation Stakeholder Group may benefit from the careful consideration already given to this topic.

DACF Comment: The Department supports considering agricultural site characteristics – *and* natural resource characteristics – be incorporated into future state long-term contracts or compensation mechanisms (such as adders, which would provide financial incentives for developers to design on-farm arrays for dual-use or co-location projects). Having the PUC evaluate and score proposed projects '

agricultural and natural resource impacts could ultimately encourage well-designed and sited projects limiting impacts to valuable agricultural lands. DACF encourages that in addition to assessing agricultural and natural resource impacts, this procurement process also include criteria assessing whether the project is being developed on the built environment, brownfields, or other contaminated lands, or whether it will be a dual-use or co-location project. With respect to natural resource impacts, criteria should be developed to assess natural and working land biological diversity values, specifically important wildlife and fisheries habitats, rare plant populations, and rare and exemplary natural communities.

DACF recognizes that the Distributed Generation Stakeholder Group is the viable place to further this discussion, yet at a minimum, the Department advocates that agricultural stakeholders must be at the table, beyond the recommendation to engage with the broader membership of the Stakeholder Group.

Additional DACF Recommendations

DACF acknowledges and appreciates the work and commitment of the Stakeholder Group over seven months to craft this final report. With the diverse perspectives and priorities in play, the report's recommendations reflect areas of consensus based on substantive discussion and in-depth information analysis. It is important to note, however, that while the Stakeholder Group did spend some time talking about solar development of marginal lands (such landfills, brownfields, rooftops, carports, gravel pits, mining sites, other previously developed parcels, and contaminated lands such as those with per- and polyfluoroalkyl substances (PFAS)), there was no explicit policy endorsement by the Stakeholder Group to pursue or prioritize projects on these lands, which the Department recommends be advanced as part of further policy development.

The Department also suggests the following policy recommendations be further considered:

1. **In Lieu Fee**: In lieu fee is a mechanism where, if impacts to significant environmental or natural resources (or agricultural resources) cannot be avoided by the proposed development, the developer pays a mitigation fee. That fee is then utilized to fund natural resource, wildlife, or in this case, farmland protection elsewhere in the state. Such programs exist in Maine already: the Maine In Lieu Fee Compensation Program (ILF) and Maine Natural Resource Conservation Program (MNRCP). The ILF is a *voluntary* program that allows entities impacting natural resources, primarily wetlands, to make a payment directly to the DEP as an alternative to the traditional mitigation process. Fees are deposited into funds allocated to specific biophysical regions in which the impacts occurred. DACF suggests that it and other stakeholders review the current New York in lieu fee program that is in development to understand its parameters and possible applicability to Maine.

2. **Soils Education**: Enhancing the general understanding of developers, policymakers, and the general public regarding the importance of our farmland soils (and what opportunities are lost as a result of farmland development to non-agricultural uses) is critical as the state continues to move forward with policy discussions and development surrounding solar siting. The Department proposes that its new Healthy Soils Program, to be developed in the coming year, should include an educational component that focuses on this general outreach and effort.

3. **Definition of Natural Resources**: As further policy discussions continue around agricultural solar siting, defining the term natural resources is important when considering potential impacts. Natural resources include, beyond agricultural soils, important wildlife and fisheries habitats, rare plant populations, and rare and exemplary natural communities. The definition should also include wetlands, ponds, and streams which are protected by the DEP via the Natural Resources Protection Act and Shoreland Zoning. This definition would better align with the use of the term by the State's natural resources agencies.

Next Steps

In closing, the Department appreciates the opportunity to have engaged with various stakeholders in 2021 regarding the challenges and opportunities posed by solar development as it relates to Maine agriculture. There is much work that still must occur in order to fashion strategic policies that will enable the state to reach its renewable energy goals while protecting and enhancing our agricultural, natural, and working lands.

The Department recognizes that there are currently bills pending in the Legislature that could serve as vehicles for moving important solar initiatives forward this session. The Department welcomes the opportunity to work with Legislators interested in the intersection between agricultural lands and solar siting in the near-term, and in future legislative sessions.

In particular, DACF recommends that the following be prioritized:

1) pursue the development of a centralized clearinghouse of solar development information created as outlined in the Stakeholder Report Recommendation #1;

2) the establishment of a robust dual-use pilot program as outlined in the Stakeholder Report Recommendation #2; and

3) increase support for municipal solar planning as outlined in the Stakeholder Report Recommendation # 5.

Next, DACF strongly encourages further analysis of a potential in lieu fee program focusing on solar development on agricultural land. And lastly, as discussed in Stakeholder Group Recommendation #7, we encourage the Distributed Generation Stakeholder Group to fully assess agricultural and natural resource siting characteristics and/or compensation mechanisms and allow for agricultural representatives to actively engage in that group process.

Success of these initiatives hinges on DACF having adequate staffing resources in the form of one full-time position to successfully implement these recommendations. This position would also be able to help DACF more fully prioritize and scope the additional recommendations outlined in this report for future policy development.

APPENDIX A:

LD 820

RESOLVE LANGUAGE

APPROVED
JUNE 8, 2021
BY GOVERNOR

CHAPTER
26
RESOLVES

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-ONE

S.P. 206 - L.D. 820

Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays

Sec. 1. Department of Agriculture, Conservation and Forestry to convene working group. Resolved: That the Department of Agriculture, Conservation and Forestry shall convene a working group of stakeholders to develop plans and consider ways to discourage the use of land of higher agricultural value and encourage the use of more marginal agricultural lands when siting a solar array. The department shall submit its report and recommendations, including any suggested legislation, to the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources no later than January 14, 2022.

APPENDIX B:

MAINE WON'T WAIT:
A FOUR YEAR CLIMATE ACTION PLAN


A FOUR-YEAR PLAN FOR CLIMATE ACTION
MAINE
WON'T WAIT
DECEMBER 2020
MAINE CLIMATE COUNCIL

FROM GOVERNOR JANET T. MILLS

In the fall of 1970, 11-year-old Suzanne Clune wrote a letter to her United States senator.

She lived on the banks of the Little Androscoggin River, a once-pristine tributary where deer could see their reflection when drinking from the water and where spring pine and chokeberry blossoms "filled the air with the sweetest smell on earth." That was before toxic chemicals polluted the waters and before noxious waste formed swells of thick discolored foam that ran downstream and coated the river banks.

"Now in any season," Suzanne wrote to Senator Edmund S. Muskie, "you can smell the most sickening smell on earth, a stench that left frogs 'gasping for air.' I am sick of the river like this. Please do something about it." Suzanne signed her letter, "One who loves Maine."

Suzanne's letter sparked Senator Muskie's career-long fight for clean air and clean water. Today, as a result of his actions, the Little Androscoggin River is restored as a pristine waterway, like the Androscoggin, the Kennebec, and the Penobscot rivers — places where we now fish and sail and swim, places we love.

I am grateful that Suzanne did not wait to act.

Before us now is another threat — one that jeopardizes not only Maine's natural resources but our state's economic and social wellbeing, too. From our rocky coast to the western foothills, our pine tree forests, our bountiful farmland, and the people and creatures of all kinds who call these places home, the climate crisis poses a direct and immediate threat.

When I think about the current crisis, I think about Suzanne. I think about Senator Muskie, Senator George Mitchell, Senator William Cohen, former legislators like Harry Richardson, Hoddy Hildreth, and Sherry Huber — environmental champions bound not by ideology or political party but by a shared commitment to preserve and protect our cherished home, Maine.

I think of Maine's indigenous people whose longtime stewardship and connection to the land is threatened by global warming. I think of thought leaders like Pope Francis, who requested an international conversation about the future of the planet, a conversation "which includes everyone, since the environmental challenge we are undergoing, and its human roots, concern and affect us all." I think of our children and grandchildren and of generations yet to come.

With this crisis on our doorstep, we — like Suzanne Clune — can't wait.

We must act now to honor the legacy of Maine's environmental stewards who bequeathed this precious place to us, to preserve our state for our children and grandchildren to enjoy as we do, and to build a thriving economy with opportunities for growth far into the future.

Maine can't wait to heed the warnings of scientists who tell us we cannot delay reducing carbon emissions to stem climate impacts, or preparing our communities to withstand extreme weather events, flooding, and warming that climate change is causing as we speak.

Maine can't wait to improve the lives of Maine people through climate action: weatherizing homes and installing heat pumps to provide both comfort and savings; improving transportation options; increasing access to broadband; and creating greater energy efficiency to lower the maintenance and costs of our homes, cars, buses, and businesses.

Maine can't wait to strengthen our economy by investing in renewable-energy infrastructure and providing good-paying jobs in clean energy and energy efficiency.

Maine can't wait to stem the loss of more than $4 billion a year which we send to out-of-state fossil-fuel companies every year, and instead keep that money here at home and transition to homegrown clean and renewable energy to power our homes, fight climate change, and move us toward energy independence.

Maine won't wait to protect our natural resources and the industries that depend on them — forest products, agriculture, fishing and aquaculture — and support efforts to fight climate change while innovating and expanding our workforce.

Most of all, Maine can't wait to make the most of this extraordinary moment in time. This plan against climate change comes in the midst of an unprecedented pandemic which has caused significant economic and social turmoil in Maine, across the country, and around the globe. It might be easier to put off climate action until calmer times. But Maine can't wait. Maine shouldn't wait. And Maine won't wait.

This pandemic has only highlighted the need to diversify our economy, expand Maine's workforce, and address the devastating consequences of climate change. The opportunity for a brighter, sustainable future is here and now. And the need is greater than ever before.

As Governor, this is what I propose:

We more than double the number of Maine's clean-energy and energy-efficiency jobs by 2030. These 30,000 jobs will fight climate change while providing new opportunities to Maine working men and women and advancing long-term prosperity for our state.

I pledge that my Administration will support the outcomes laid out in this Climate Action Plan in every way possible.

I will submit bold legislation and proposals for public and private investment. We will seek federal officials etc. as partners in this effort, and keep a steady focus on our progress.

Eleven-year old Suzanne Clune's letter to Senator Muskie 50 years ago was a call to action of that era.

Let this plan be today's call to action — once again to protect the natural beauty of our state, to improve the lives of our families and the livelihoods of our people, and to ward off future natural disasters and economic crises.

Because, like Suzanne, we too are "ones who love Maine," and we must do our best to preserve and protect it.

Sincerely,

Janet T. Mills
Governor

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FROM THE CO-CHAIRS

Climate change represents the greatest threat of our age. There is widespread consensus on the urgent need to take action. But, during Maine's first major planning process on climate in more than a decade, the COVID-19 pandemic and resulting recession put an unprecedented strain on our communities, businesses, and people.

The fast-moving devastation of COVID-19 exposed weaknesses in our national crisis response that mirrored the gradual effects of climate change, from inherent challenges of emergency preparedness and global supply chains, to the inequities and unequal burdens that economic and social disruptions have on vulnerable populations.

As the pandemic raged, grim reminders of climate change continued to emerge in Maine. The hottest ocean temperatures in the Gulf of Maine in a single day were recorded, and the most severe fire season and drought conditions in years punished the state, with devastating consequences for farmers.

Nevertheless, over the course of 14 months, hundreds of Maine people — despite the pandemic, while working from home and straining Internet connections, with kids learning remotely and dogs barking in the background — spent hundreds of their precious hours, one Zoom call at a time, considering and recommending actions to combat climate change.

Thousands more Maine people offered their climate concerns, observations, ideas, and encouragement to the Maine Climate Council, which was strongly urged to look past present-day pandemic challenges to set a course for bold action. Their dedication despite COVID-19 helped us all find our strength.

We are blessed to live in a state with world-class scientific institutions and researchers who helped us expand our knowledge. The expert Scientific and Technical Subcommittee created a foundation for the Council to understand the latest data, facts, and projections, as we know them today, about the effects of climate change in Maine.

The Council's working groups — Transportation; Buildings, Housing, and Infrastructure; Energy; Natural and Working Lands; Coastal and Marine; and Community Resilience Planning, Emergency Management, and Public Health – presented robust, united strategies for action, sourced from the diverse expertise, interest, and concerns of their members including communities, businesses, organizations, government leaders, and youth.

The Maine Climate Council — a group of 39 committed leaders, experts, and advocates — took these detailed strategies and added groundbreaking economic and equity analyses and greenhouse emissions modeling to further inform their decision-making to develop this plan.

Lastly, we agreed — with full consensus — on this four-year plan for climate action. While we didn't always agree easily, the plan reflects many of the diverse challenges Maine faces in the fight against climate change. It is centered on data-driven outcomes to achieve the ambitious emissions reductions goals laid out in law — a 45% reduction by 2030 and 80% by 2050.

Beyond reducing greenhouse gas emissions, the Plan also focuses on several other key goals. First is creating economic opportunity as we undertake climate and energy transitions. Second is preparing our communities, people, and economy for the impacts of climate change like rising sea levels, increased flooding, and changing weather conditions.

And finally, to advance equity as we undertake this work, to ensure communities and citizens who are often left behind can benefit from climate solutions by having access to opportunities and protection from threats.

Consistent and bold action on climate, over the next four years and into the decades beyond, will create a better future for our state and the next generations.

It will create thriving new economic sectors — from clean energy and efficiency to the forest products economy of the future, while ensuring a clean environment. It will save money for Maine people, towns, schools, and business each month from lower heating bills. It will improve rural transportation systems and open access to food grown and harvested by our fellow Mainers.

The pandemic also taught us that action to improve public health and emergency management systems, and to better prepare our communities, people, and infrastructure for the next crisis is critically important and saves lives.

Every individual, business, organization, and leader in Maine can play a role in making this plan a reality. This collective effort will be key to our success against the crisis that climate change poses for our state, nation, and world.

This starts with meeting the challenges of climate with action. That's what this Plan does. And with your help and your action, we can make the most of this moment to address the challenge of our age.

But we can't do it alone. Please join us in building a better future for Maine.

Hannah Pingree, Director
Governor's Office of Policy Innovation and the Future

Melanie Loyzim
Acting Commissioner, Department of Environmental Protection

EXECUTIVE SUMMARY

In June 2019, Governor Janet Mills signed LD 1679 into law, with strong support from the Maine Legislature, to create the Maine Climate Council. The Council — an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens — was charged with developing this four-year Climate Action Plan to put Maine on a trajectory to decrease greenhouse gas emissions by 45% by 2030 and 80% by 2050, and achieve carbon neutrality by 2045.

Starting in September of that year, the Council and six working groups and a subcommittee — totaling more than 200 Maine people with a diverse set of experiences and backgrounds — began this work. This four-year Climate Action Plan, Maine Won't Wait, is the consensus result of those months of painstaking study, dialogue, discussion, and public deliberation to determine the steps Maine must take to combat climate change.

Backed by the first comprehensive scientific and technical assessment about climate change in Maine in a decade, Maine Won't Wait outlines the urgency with which Maine must slow the effects of climate change to make a meaningful contribution to global efforts, while also taking bold action to prepare Maine people, communities, and environment for climate-related harms to come.

At the same time, Maine Won't Wait details how addressing climate change presents transformational economic opportunities, such as from the growth of clean-energy sources and incentives for significant consumer, business and industrial investment in energy efficiency through weatherization, cutting-edge building materials, and alternative energy sources. These considerations take on added importance given the economic disruption caused by COVID-19.

Staving off climate change also protects the character of Maine — the pristine forests, rugged coastlines, and local farms that depend on strong, healthy, and vibrant natural ecosystems. These important natural and working lands are most at risk from climate change, and yet their ability to store carbon is a powerful tool against the harmful effects of climate change.

The failure to act against the effects of climate change carries a great risk for Maine, as doing nothing will cause costly damage to Maine's buildings and infrastructure, vulnerable ecosystems, iconic species, and public health.

This is why Maine won't wait, and why hundreds of volunteers gave their time and talents to develop this Climate Action Plan, and countless more Maine people offered insights, opinions, and inspiration during the process to inform this set of strategies that truly represents a plan that is right for Maine.

MAINE'S CLIMATE ACTION PLAN GOALS

Reduce Maine's Greenhouse Gas Emissions

While Maine has been among the leading U.S. states when it comes to mitigating greenhouse gas emissions, significant progress must still be made to meet the state's 2030 and 2050 targets.

Avoid the Impacts and Costs of Inaction

Maine must take action to ensure that our people, environment, economy, and society are more resilient to the impacts of climate change that are now occurring. While mitigating the causes of climate change and better preparing Maine for its impacts will require significant public and private investment, inaction will cost Maine substantially more, and those costs will accelerate over time.

Foster Economic Opportunity and Prosperity

Today, as Maine charts the course for economic recovery, many of the proposed solutions in this Climate Action Plan can leverage Maine's strengths and reverse workforce trends by supporting good-paying jobs that attract new workers and families, growing the economy, protecting key economic sectors most at risk from climate change, and fostering innovation in new business sectors that will drive climate solutions.

Advance Equity through Maine's Climate Response

Like other dislocations and disruptions to society, from recessions to pandemics, the costs of Maine's inaction on climate change will be acutely borne by vulnerable communities, which should be given foremost consideration for opportunities and support from climate action. A new Equity Subcommittee of the Maine Climate Council will support ongoing planning and implementation of Maine's climate strategies to ensure shared benefits across diverse populations of Maine people and to understand any concerns for implementation.

STRATEGY A
Embrace the Future of Transportation in Maine

Transportation is responsible for 54% of Maine's annual greenhouse gas emissions. To meet our emissions-reductions goals by 2030 and 2050, our state must pivot to the future by pursuing aggressive transition strategies and innovative solutions within this important sector.

1
Accelerate Maine's Transition to Electric Vehicles

- **Achieve emissions-reduction goals by putting 41,000 light-duty EVs on the road in Maine by 2025 and 219,000 by 2030.**
- **By 2022, develop a statewide EV Roadmap to identify necessary policies, programs, and regulatory changes needed to meet the state's EV and transportation emissions-reduction goals.**
- **By 2022, create policies, incentives, and pilot programs to encourage the adoption of electric, hybrid, and alternative-fuel medium- and heavy-duty vehicles, public transportation, school buses, and ferries.**

2
Increase Fuel Efficiency and Alternative Fuels

- **Continue to support increased federal fuel-efficiency standards.**
- **Significantly increase, by 2024, freight industry participation in EPA's SmartWay program.**
- **Increase, by 2024, local biofuel and biodiesel production and use in Maine transportation sectors, especially heavy-duty vehicles (assuming Maine biofuels production becomes viable).**
- **Establish a time-limited incentive program, targeted to low- and moderate-income drivers, to encourage drivers to upgrade to higher-efficiency vehicles in the near term.**

3
Reduce Vehicle Miles Traveled

- **Reduce light-duty VMT over time, achieving 10% reductions by 2025 and 20% by 2030.**
- **Reduce heavy-duty VMT by 4% by 2030.**
- **Deploy high-speed broadband to 95% of Maine homes by 2025 and 99% by 2030.**
- **By 2024, establish state coordination, strengthen land-use policies, and use state grant programs to encourage development that supports the reduction of VMT.**
- **Increase public transportation funding to the national median of $5 per capita by 2024.**
- **Relaunch GO Maine to significantly increase shared public commuting options by 2022.**

STRATEGY B

Modernize Maine's Buildings: Energy-Efficient, Smart and Cost-Effective Homes and Businesses

Heating, cooling, and lighting of buildings are responsible for almost one-third of Maine's greenhouse gas emissions. Maine can reduce greenhouse gases by modernizing our buildings to use cleaner energy, increase energy efficiency, and utilize lower-carbon building materials.

1

Transition to Cleaner Heating and Cooling Systems, Efficient Appliances

- **Install at least 100,000 new heat pumps in Maine by 2025, ensuring that by 2030, 130,000 homes are using between 1-2 heat pumps and an additional 115,000 homes are using a whole-home heat-pump system. Install at least 15,000 new heat pumps in income-eligible households by 2025.**
- **Implement Maine Appliance Standards requirements by 2022.**

2

Accelerate Efficiency Improvements to Existing Buildings

- **Double the current pace of home weatherization so that at least 17,500 additional homes and businesses are weatherized by 2025, including at least 1,000 low-income units per year.**
- **Weatherize at least 35,000 homes and businesses by 2030.**

"My prize thing is my heat pump. It worked out well for us financially, as well as it stabilizes our home."

—Jim Fecondo, 86, Eagle Lake

3

Advance the Design and Construction of New Buildings

- **By 2024, develop a long-term plan to phase in modern, energy-efficient building codes to reach net-zero carbon emissions for new construction in Maine by 2035.**
- **Enhance existing training on building codes and expand these programs to support ongoing education of contractors and code-enforcement officials.**

4

Advance the Design and Promote Climate-Friendly Building Products

- **Develop and enhance innovation support, incentives, building codes, and marketing programs to increase the use of efficient and climate-friendly Maine forest products, including mass timber and wood-fiber insulation.**

5

"Lead by Example" in Publicly Funded Buildings

- **Use procurement rules and coordinated planning efforts for state government to promote high-efficiency lighting, heating, and cooling; climate-friendly construction materials; and renewable energy use for reduced operating costs and emissions reductions. The state will produce a "Lead by Example" plan for state government by February 2021.**
- **Enhance grant and loan programs to support efficiency and renewable energy programs in municipal, tribal, school, and public-housing construction and improvements. Provide recognition programs for those projects making outstanding efforts.**

6

Renewable Fuels Standard

- **Investigate options for establishing a Renewable Fuels Standard (RFS) for heating fuels.**

7

Replace Hydrofluorocarbons with Climate-Friendly Alternatives

- **Adopt hydrofluorocarbons phase-down regulations in 2021 to be implemented by 2022.**

STRATEGY C

Reduce Carbon Emissions in Maine's Energy and Industrial Sectors through Clean-Energy Innovation

Sectors with high greenhouse gas emissions, such as transportation and heating, must shift their energy sources from fossil fuels to electricity and low-carbon fuels to achieve Maine's climate goals. This makes it even more essential to produce and consume electricity that is increasingly clean and from lower-emission resources. This transition must be managed effectively to ensure affordability and reliability.

1

Ensure Adequate Affordable Clean-Energy Supply

- **Achieve by 2030 an electricity grid where 80% of Maine's usage comes from renewable generation.**
- **Set achievable targets for cost-effective deployment of technologies such as offshore wind, distributed generation, and energy storage, and outline the policies, including opportunities for pilot initiatives, necessary to achieve these results.**

2

Initiate a Stakeholder Process to Transform Maine's Electric Power Sector

- **Establish a comprehensive stakeholder process in 2021 to examine the transformation of Maine's electric sector and facilitate other recommendations of the Maine Climate Council.**

3

Accelerate Emissions Reductions of Industrial Uses and Processes

- **Launch an Industrial Task Force to collaboratively partner with industry and stakeholders to consider innovations and incentives to manage industrial emissions through 2030 and reduce total emissions by 2050.**

4

Encourage Highly Efficient Combined Heat and Power Facilities

- **Analyze policies, including the potential for long-term contracts, needed to advance new highly efficient combined heat and power production facilities that achieve significant net greenhouse gas reductions.**

STRATEGY D
Grow Maine's Clean-Energy Economy and Protect Our Natural-Resource Industries

Climate change threatens vital natural-resource sectors of Maine's economy, like our forestry, farming, and fishing industries. Climate change will also impact community and economic infrastructure and leading economic sectors like tourism and hospitality — as sea levels rise and warming winters impact iconic Maine places and seasons.

Transitioning to cleaner energy generation and greater energy efficiency offers exciting new economic opportunity. Maine currently spends roughly $4.4 billion annually on imported fossil fuels. Clean and renewable energy solutions can help keep those energy dollars in Maine, catalyzing a transformative economic impact, while significantly reducing emissions.

1

Take Advantage of New Market Opportunities

- **Support the ability of Maine's natural-resource economies to adapt to climate-change impacts.**
- **Grow Maine's forest-products industry through bioproduct innovation, supporting economic growth and sustainable forest management and preservation of working lands.**
- **Establish the University of Maine as the coordinating hub for state-applied research on forestry, agriculture, and natural land-related climate concerns, including research and development of climate-friendly bio-based wood-market innovation; and research around climate-friendly agricultural practices.**
- **Increase the amount of food consumed in Maine from state food producers from 10% to 20% by 2025 and 30% by 2030 through local food system development.**
- **Launch the Maine Seafood Business Council by 2022.**

2

Clean-Energy Jobs and Businesses in Maine

- **Launch a workforce initiative by 2022 that establishes ongoing stakeholder coordination between industry, educational, and training organizations to support current and future workforce needs.**
- **Establish programs and partnerships by 2022 for clean-tech innovation support to encourage the creation of clean-energy and climate solutions.**

"Maine's clean-energy economy is building great opportunities for Maine-based contractors and providing incentives for students to consider careers in innovative energy generation right here at home."

—Matt Marks, CEO of AGC Maine, Member, Maine Climate Council

STRATEGY E

Protect Maine's Environment and Working Lands and Waters: Promote Natural Climate Solutions and Increase Carbon Sequestration

Climate change and development are harming Maine's natural and working lands and waters, which are key to the state achieving its carbon neutrality commitment by 2045. Protecting natural and working lands from development maintains their potential to draw back carbon from the atmosphere, as well as provide important co-benefits. Maine's coastal and marine areas also store carbon, while supporting our fishing, aquaculture, and tourism industries.

1

Protect Natural and Working Lands and Waters

- **Increase by 2030 the total acreage of conserved lands in the state to 30% through voluntary, focused purchases of land and working forest or farm conservation easements.**
  - » **Additional targets should be identified in 2021, in partnership with stakeholders, to develop specific sub-goals for these conserved lands for Maine's forest cover, agriculture lands, and coastal areas.**
- **Focus conservation on high biodiversity areas to support land and water connectivity and ecosystem health.**
- **Revise scoring criteria for state conservation funding to incorporate climate mitigation and resiliency goals.**
- **Develop policies by 2022 to ensure renewable energy project siting is streamlined and transparent while seeking to minimize impacts on natural and working lands and engaging key stakeholders.**

2

Develop New Incentives to Increase Carbon Storage

- **DEP will conduct a comprehensive, statewide inventory of carbon stocks on land and in coastal areas (including blue carbon) by 2023 to provide baseline estimates for state carbon sequestration, allowing monitoring of sequestration over time to meet the state's carbon neutrality goal.**
- **Establish by 2021 a stakeholder process to develop a voluntary, incentive-based forest carbon program (practice and/or inventory based) for woodland owners of 10 to 10,000 acres and forest practitioners.**
- **Engage in regional discussions to consider multistate carbon programs that could support Maine's working lands and natural-resource industries, and state carbon-neutrality goals.**

3

Expand Outreach to Offer Information and Technical Assistance

- **Increase technical service provider capacity by 2024 to deliver data, expert guidance, and support for climate solutions to communities, farmers, loggers, and foresters at the Department of Agriculture, Conservation and Forestry, Maine Forest Service, Department of Inland Fisheries and Wildlife, the Department of Marine Resources, and the University of Maine.**
- **Launch the Coastal and Marine Information Exchange by 2024.**

4

Enhance Monitoring and Data Collection to Guide Decisions

- **Establish a "coordinating hub" with state and non-state partners for key climate-change research and monitoring work to facilitate statewide collaboration by 2024.**

- **Create the framework and begin pilot for a coordinated, comprehensive monitoring system by 2024.**
- **Incorporate climate research and climate-change-related technologies into Maine's research and development priorities such as those developed by the Maine Innovation Economy Advisory Board and the Maine Technology Institute.**

STRATEGY F
Build Healthy and Resilient Communities

As Maine reduces greenhouse gas emissions to combat climate change, we must also respond to climate impacts occurring now and expected soon. State support for communities to be proactive about understanding, planning, and acting to reduce their risk from climate change is essential.

1
Empower Local and Regional Community Resilience Efforts

- **Provide state leadership for robust technical assistance and funding to communities by 2024 to support local and regional climate-resilience initiatives.**

2
Adopt Official Sea-Level Rise Projections

- **Incorporate official state sea-level rise projections into regulations by 2022 and require regular updates to ensure the projections utilize the latest scientific data.**

3
Emphasize Resilience Through Land-Use Planning and Legal Tools

- **Develop and implement updated land-use regulations, laws, and practices by 2024 in order to enhance community resilience to flooding and other climate impacts.**

4
Strengthen Public-Health Monitoring, Education, and Prevention

- **Develop and implement more robust public-health monitoring, education, and prevention practices by 2024 to achieve better health outcomes against climate-change impacts.**

STRATEGY G
Invest in Climate-Ready Infrastructure

Maine must improve the climate readiness and resilience of infrastructure so that it serves Maine better under day-to-day conditions and functions reliably during emergencies.

1
Assess Climate Vulnerability and Provide Climate-Ready Design Guidance

- **Complete a statewide infrastructure-vulnerability assessment by 2023, as well as develop and implement design standards for resilience in infrastructure projects.**

2

Establish the State Infrastructure Adaptation Fund

- **Launch a State Infrastructure Adaptation Fund and predevelopment assistance program in 2021, designed to leverage federal recovery support in the short term, and in the long term to address the significant and ongoing infrastructure adaptation needs.**

STRATEGY H

Engage with Maine People and Communities about Climate Impacts and Program Opportunities

Effective communication about Maine's climate strategies will be critical to the success of the Maine Climate Action Plan. Highlighting leadership and climate innovations can help people better understand the challenges and the opportunities. Maine students should understand the science of Maine's changing natural systems and climate and be prepared with the necessary skills to meet future workforce opportunities.

1

Raise Awareness About Climate-Change Impacts and Opportunities

- **Launch a multifaceted, ongoing communications effort in 2021 based on the Climate Action Plan to raise public awareness and understanding about climate change in Maine, the state's climate-response actions, and climate-related programs and opportunities.**

2

Increase Public Education Offerings Related to Climate and Energy

- **Develop enhanced educational opportunities for climate science and clean-energy careers in Maine public schools to meet increasing interest from students and educators. Launch a process in 2021 to engage key stakeholders including students, older youth, educators, and state leaders in next steps.**

3

Start the "Maine Climate Corps" for Climate-Related Workforce Development

- **Partner with service-learning organizations and nonprofit organizations to launch a Maine Climate Corps program by 2023.**

4

Recognize Climate Leadership by Maine Businesses and Organizations

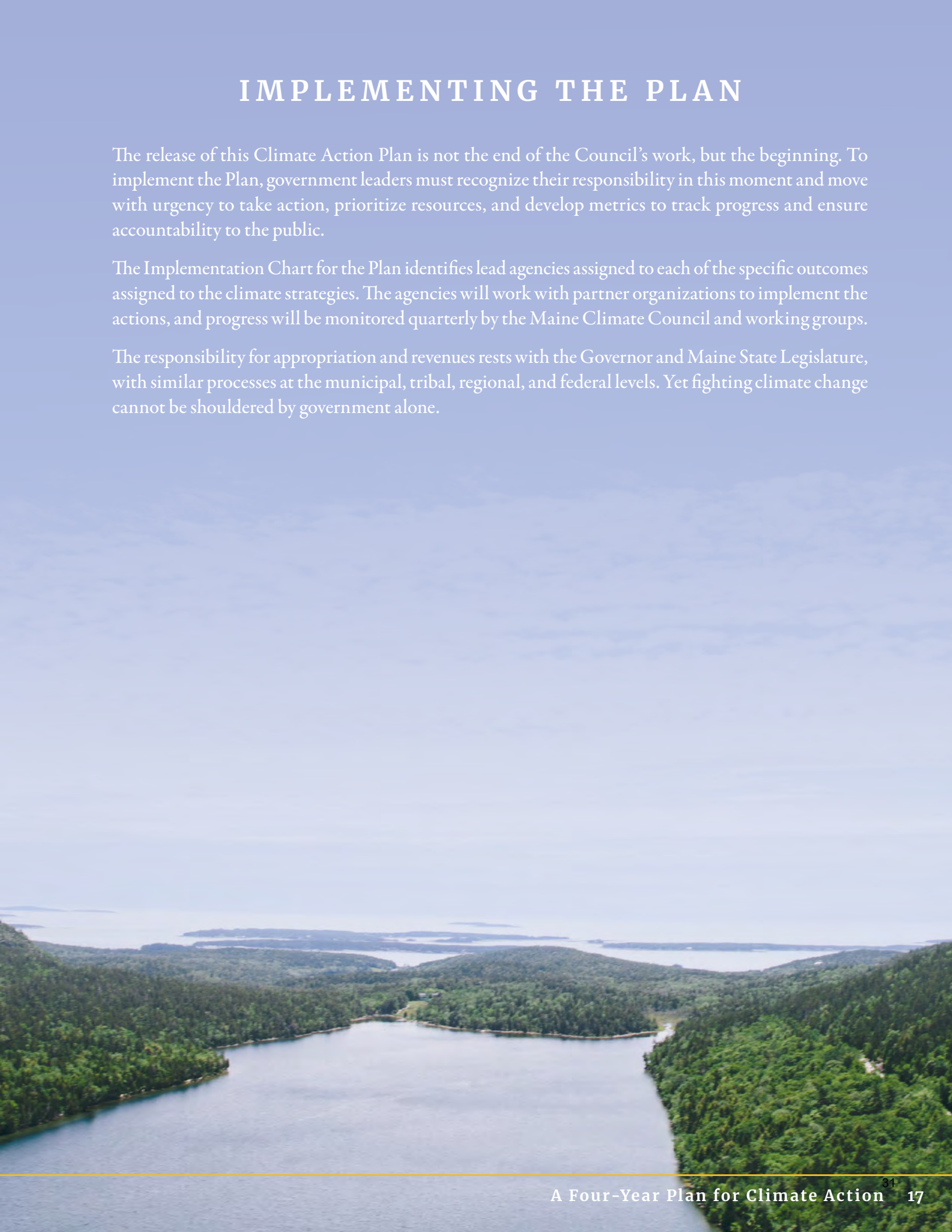
- **Launch the Governor's Climate Leadership Council in 2021 to increase private-sector commitment toward voluntary climate actions.**

IMPLEMENTING THE PLAN

The release of this Climate Action Plan is not the end of the Council's work, but the beginning. To implement the Plan, government leaders must recognize their responsibility in this moment and move with urgency to take action, prioritize resources, and develop metrics to track progress and ensure accountability to the public.

The Implementation Chart for the Plan identifies lead agencies assigned to each of the specific outcomes assigned to the climate strategies. The agencies will work with partner organizations to implement the actions, and progress will be monitored quarterly by the Maine Climate Council and working groups.

The responsibility for appropriation and revenues rests with the Governor and Maine State Legislature, with similar processes at the municipal, tribal, regional, and federal levels. Yet fighting climate change cannot be shouldered by government alone.



PUBLIC INPUT AND SUPPORT

Hearing directly from Maine people — stakeholders, experts, local and regional leaders, legislators, businesses, youth, and the general public — was central in creating this plan and will continue to be important in the work ahead to turn the plan strategies into action.

From the beginning, Council working groups included 30-40 members with diverse perspectives and expertise. Each working group developed its draft recommendations in public via public meetings, conference calls, surveys, and individual and organizational input — a process that endured the rapid transition to virtual communication demanded by the COVID-19 pandemic.

In summer 2020, the Maine Climate Council released feedback surveys on climatecouncil.maine.gov about climate change and the working group strategies, which garnered more than 4,400 responses from more than 75% of Maine's zip codes.

The Council also received many comments through its website from hundreds more people, stakeholders, advocacy, and industry groups. Staff, working group chairs, and members also conducted several presentations to stakeholder and community groups about aspects of the Plan.

This meant some communities, especially those with insufficient access to the Internet, are underrepresented in this Plan. As the Plan is implemented, Council leaders and staff will work to continue to find additional ways to reach these communities such as lower-income and rural residents, older adults, tribal communities, people of color, and new Mainers.

For this plan to be successful, the support and engagement of Maine people is critical: to mobilize a broad coalition of state, local, regional, and tribal governments, nonprofits, academic intuitions, and private interests taking collaborative, decisive action.

PLAN METRICS

To monitor progress, clear metrics for Maine's climate goals are critical for both informing the public about whether policies are having intended outcomes, and for making evidence-based adjustments, enhancements, or replacements to policies in pursuit of our 2030, 2045, and 2050 targets. Suggested metrics to help Maine gauge its progress towards climate change goals are outlined on page 106.

FUNDING AND FINANCING

Climate action requires leveraging a variety of funding sources and innovative financing mechanisms to support sector-level transformations and the ability of Maine lenders to make crucial long-term investments in climate-focused projects and initiatives.

This Plan, however, is emerging amid unprecedented conditions caused by the COVID-19 pandemic, which is stretching state revenues and many family budgets and has had a dangerous and disproportionate effect on Maine's most vulnerable citizens.

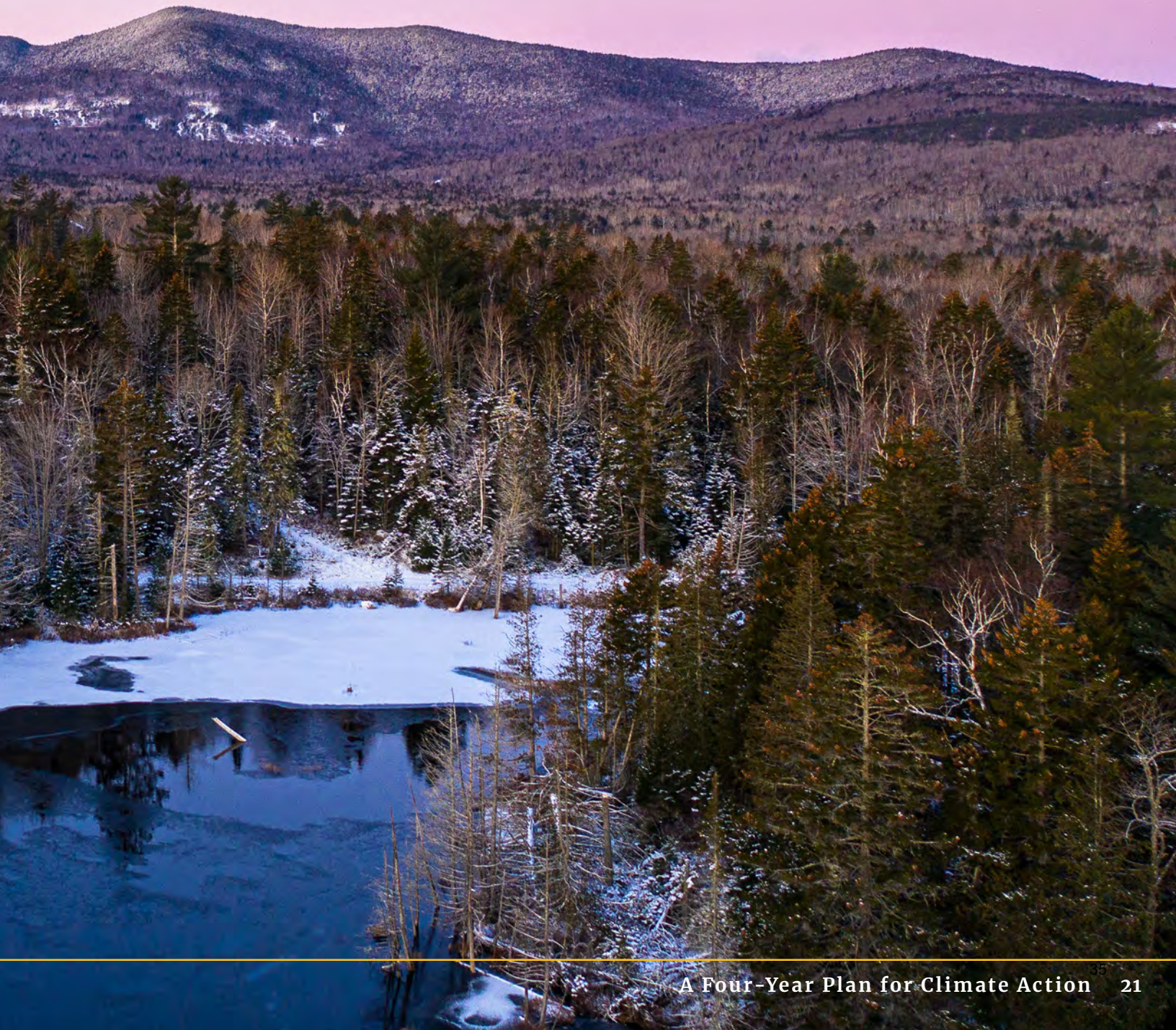
This grave situation illustrates the urgent need to prepare our people, communities, and economy for disruptions that climate change will cause. Investments to create a sustainable economy that is less reliant on global supply chains and imported fossil fuels, while leveraging Maine's abundance to source essential goods, from fresh food to building supplies, will reinforce the bedrock of Maine's economy and enable families to withstand major challenges in the future.

For a detailed funding and financing options for the Climate Action Plan, see page 103.

SOURCING AND CITATIONS

Facts and figures cited in the Plan come from several sources. Where sources are not otherwise specified in the text, data sources include analyses and references from the Scientific and Technical Reports produced for the Maine Climate Council (page 111); reports from Council working groups, the Intergovernmental Panel on Climate Change, the National Climate Assessment, United States Climate Alliance, U.S. Census National Oceanic and Atmospheric Administration, and the Maine Department of Environmental Protection.

THE EFFECTS OF CLIMATE CHANGE ON MAINE



From increasing land and ocean temperatures, to rising sea levels, more frequent severe storms, shortening winters and disrupted agricultural seasons, and more prevalent public-health risks, scientists have cataloged, and continue to catalog, the current and expected harms of climate change on our state. The Maine Climate Council's expert Scientific and Technical Subcommittee (STS) is leading this charge. They identified the impacts on Maine from climate change in their exhaustive report, "Scientific Assessment of Climate Change and its Effects in Maine."

The Assessment, which represents the contributions of nearly a hundred leading scientists and other experts, is the most comprehensive analysis of climate change's effect on Maine in more than a decade. Its findings informed the work of the Maine Climate Council as it developed this Climate Action Plan.

The report's conclusion is unequivocal: There is an urgent need for Maine to reduce harmful greenhouse gas emissions to support global efforts to slow climate changes and to prepare for the impacts of climate change.

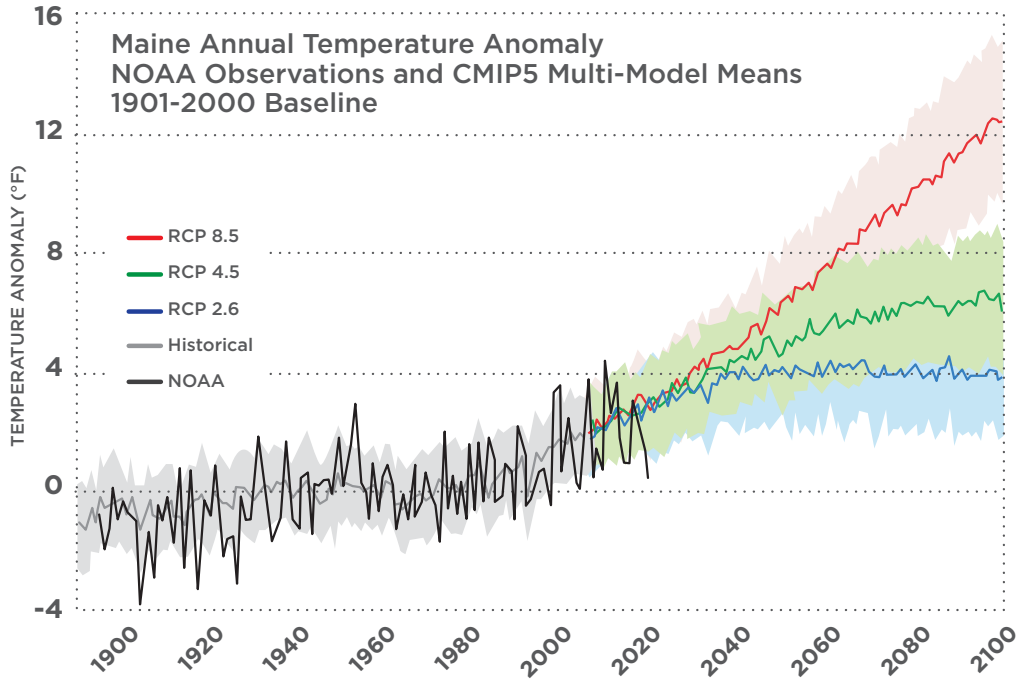
As greenhouse gas emissions drive dramatic changes in Earth's climate systems, the warming trends documented in Maine are more prominent than those observed by scientists globally.

Since 1895, Maine's statewide annual temperatures have risen by 3.2°F (1.8°C), with coastal areas warming more than the interior of the state. Of all the seasons, winters in Maine have warmed the most, which has caused Maine's agricultural growing season to increase by two weeks. Extreme weather conditions in Maine, such as drought and large rain events, are harming agriculture, shellfisheries, and freshwater and coastal ecosystems susceptible to climate change effects.

Climate models suggest Maine may warm by an additional 2 to 4°F by 2050 and up to 10°F by 2100, depending on the success of curbing greenhouse gas emissions.

Nearly two-thirds of Maine's plants and animals, habitats, and at-risk species are either highly or moderately vulnerable to climate change. If warming remains unchecked, our most sensitive plant and animal species

Figure 1: Historical trends in Maine's temperatures and projections of potential future temperatures.



Observed (black line) and model-projected (gray and colored lines) potential future temperature anomalies for Maine under different socio-economic/emissions scenarios (RCPs – Representative Concentration Pathways). Anomalies are the difference between the temperature in a particular year and the 1901-2000 baseline average. See the Scientific Assessment of Climate Change and its Effects in Maine, Climate chapter for more details.

on land and sea are expected to shift their ranges further northward in pursuit of their preferred environmental conditions.

Human and animal health are effected by climate change and will continue to be into the future. Temperature extremes, extreme weather, tick- and mosquito-borne diseases, food- and water-borne infections, and pollen pose some of the highest risks to Mainers' health.

Exposure to climate-related events and disasters, such as extreme storms, flooding, drought, and extreme heat, can cause negative mental as well as physical health effects, and people with existing mental illness are often disproportionately vulnerable to climate-related events.

Warming is also causing Maine to become wetter overall, with statewide annual precipitation (rainfall and snowfall) increasing by 6 inches (152 mm) since 1895. Heavy storms of 2 to 4 inches of precipitation are becoming more frequent, which increases the probability of floods that will erode infrastructure and degrade water quality in ponds, lakes, streams, rivers, and coastal areas.

The impact of warming is perhaps most evident in the vibrant subarctic ecosystem of the Gulf of Maine, where surface temperatures have increased faster than most other ocean regions on Earth, a foreboding trend expected to continue through at least 2050.

This continued warming will result in additional warmer-water species and fewer subarctic species in the Gulf of Maine, an ecosystem shift that would have substantial negative impacts on Maine's marine resources and coastal communities, as well as important industries such as commercial fishing and aquaculture.

Rising greenhouse gases will also cause rapid ocean acidification — which has risen at least 30% on average globally — to continue. Ocean and coastal acidification most affect marine organisms that produce calcium carbonate to build shells, such as scallops, clams, mussels, and sea urchins.

Looking ahead, if greenhouse gas emissions are brought under control so that global temperatures do not rise more than 2.7°F (1.5°C) above pre-industrial levels, it's possible the southern coast of Maine may have an ocean climate akin to Massachusetts or Rhode Island today by the end of the century.

However, if emissions remain unchecked, even the eastern coast of Maine may feel like Rhode Island, with temperatures rising and exceeding 5.4°F (3°C) above the baseline by the year 2100.

Two effects of warming oceans are melting ice and rising sea levels, of which the latter in Maine is accelerating. Sea levels along Maine's coast have risen about 1 foot/century (approximately 0.1 inches/year) in the last few decades, after rising at 0.6 to 0.7 feet/century since the early 1900s. About half of the last century's sea-level rise in Maine has occurred since the early 1990s.

As Maine's relative sea level rises, coastal communities and ecosystems will see increased frequency of nuisance flooding, inundation of coastal lowlands with saltwater, erosion, and loss of dry beaches, sand dunes, and other habitats. A 1.6-foot sea-level rise may submerge 67% of Maine's coastal sand dunes and reduce the dry beach area by 43%, which could happen by 2050 or earlier and would have significant impacts on coastal tourism.

Figure 2: Historical trends in Maine's sea levels based on Portland tide gauge data and projections of potential future sea-level rise scenarios.

Sea level has risen in Maine over the last century and is expected to continue rising along Maine's coastline well beyond 2100. The Scientific and Technical Subcommittee recommends the State commit to manage for 1.5 feet of relative sea-level rise by 2050 and 3.9 feet of relative sea-level rise by 2100 (green arrows in the figure), and consider preparing to manage for 8.8 feet of sea-level rise by 2100, especially for low-risk-tolerant infrastructure. (See the Scientific Assessment of Climate Change and its Effects in Maine, Sea Level Rise and Storm Surge chapter for more details.)

As part of its report, the Scientific and Technical Subcommittee developed sea-level rise projections for Maine's coastal areas. Based on those projections, the Maine Climate Council recommends the state ***commit to manage*** **for 1.5 feet of relative sea-level rise by 2050, and 3.9 feet by 2100.** The Council also recommends the state ***prepare to manage*** **for 3 feet of relative sea-level rise by 2050 and 8.8 feet by 2100.**

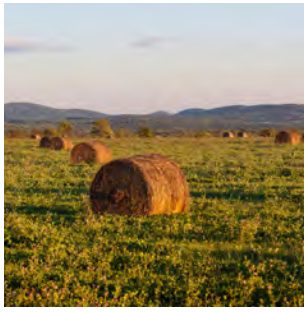
This scientific, scenario-based approach to sea-level rise allows Maine to consider a range of potential outcomes, as well as the risk tolerance of different kinds of infrastructure, and it has been adopted by several New England states and municipalities.

Changing climate conditions, particularly more extreme precipitation and declining snowpack from warmer winter seasons, create significant stress in Maine's forests, which cover 89% of the state and support an important forest industry sector that has at least an $8 billion direct economic impact. Maine also has some of the highest densities of non-native forest pests in the United States, further stressing important tree species.

Maine's forests and forestry sector are important resources for meeting our climate goals. Forests sequester over 60% of our annual carbon emissions (approximately 75% including forest growth and durable products).

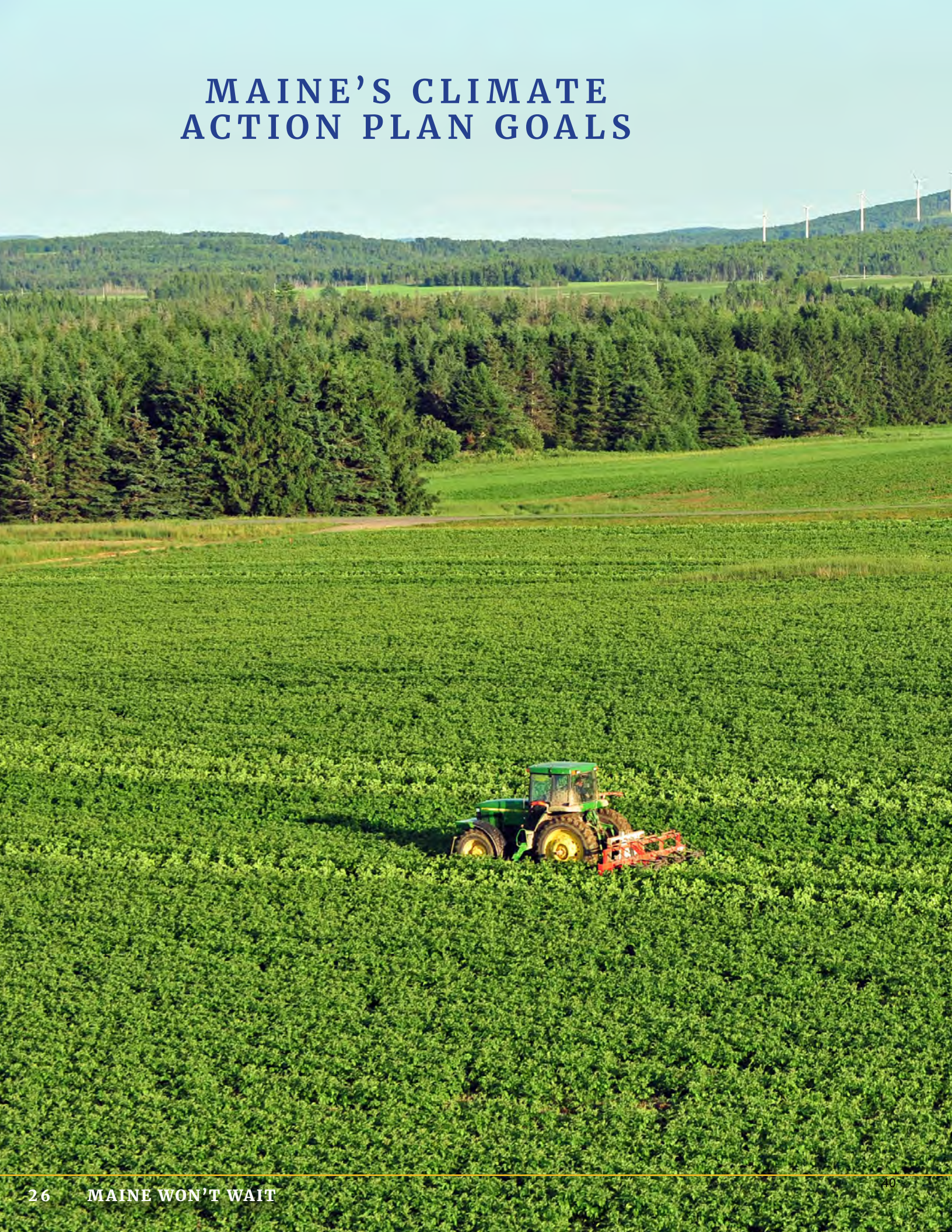
Climate shifts are also affecting Maine's diverse agriculture sector, which generates over $660 million of direct value into Maine's economy. Warming temperatures and increasingly variable precipitation, including droughts and extreme weather events, are causing damage to farm livelihoods, impacting farmers, workers, crops, and livestock. Warming temperatures may provide a new season and opportunities, a potential transition and benefit.

Climate change will affect all sectors of Maine's economy, from tourism, agriculture, and forestry to transportation and trade. Warmer temperatures, more rain, and sea-level rise will increase the incidence of flooding and damage to property and infrastructure.

All told, the scientific assessment of climate change in Maine is clear. Our state must prepare for the harmful impacts from climate change now, while striving to reduce our greenhouse gas emissions to avoid potential worst-case scenarios that may otherwise lie ahead.

MAINE'S CLIMATE ACTION PLAN GOALS



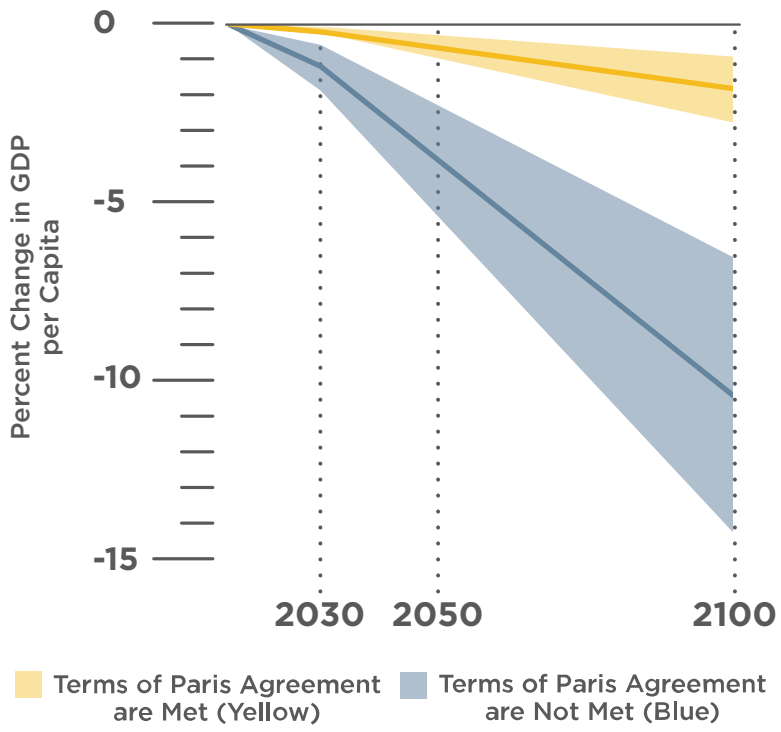
REDUCE MAINE'S GREENHOUSE GAS EMISSIONS

The consensus of climate scientists worldwide is that the world is facing unprecedented challenges associated with climate change as a result of human activities — primarily the combustion of fossil fuels that emits carbon dioxide (CO_2) and other greenhouse gases. The increased challenges of extreme weather activity and rising temperatures highlight that these changes are already here.

Greenhouse gas emissions are rising at increasing rates in the United States and around the world. Global average atmospheric carbon dioxide levels reached 409.8 ± 0.1 parts per million in 2019 — a level of CO_2 not experienced on Earth for at least 3 million years.

Climate science indicates at least 1.8° F (1.0°C) of global warming has happened since pre-industrial times, and that the Earth will likely warm by 2.7°F (1.5°C) between 2030 and 2052 at current emissions rates. The Intergovernmental Panel on Climate Change (IPCC) has determined the risks from climate change to people, species, and natural systems are much higher if global warming reaches 2.0°C than if warming is limited to 1.5°C or less. To accomplish this, the IPCC has found that we need to globally reach net zero CO_2 emissions, meaning that emissions sources are balanced by uptake of CO_2 by ecosystems and other processes, and greatly reduce other greenhouse gas emissions by 2050.

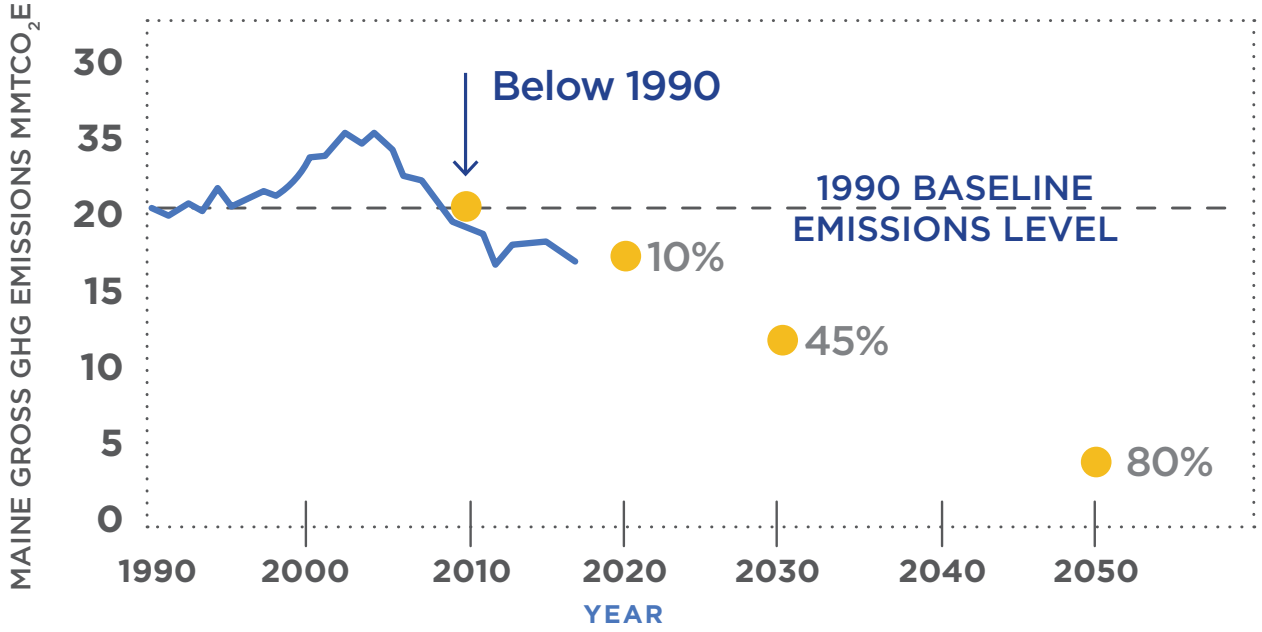
Figure 3: The Costs of Climate Change in GDP.



Wide band of color displays rate of adaptation to climate change.
Top of band = rapid, Center/solid line = moderate, Lower = very slowly

Source: "Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis." by Matthew E. Kahn et. al. National Bureau of Economic Research, August 2019

Figure 4: Maine's Annual Greenhouse Gas Emissions and Reductions Goals.



Source: Maine Department of Environmental Protection 8th Report on Progress toward GHG Reduction Goals.

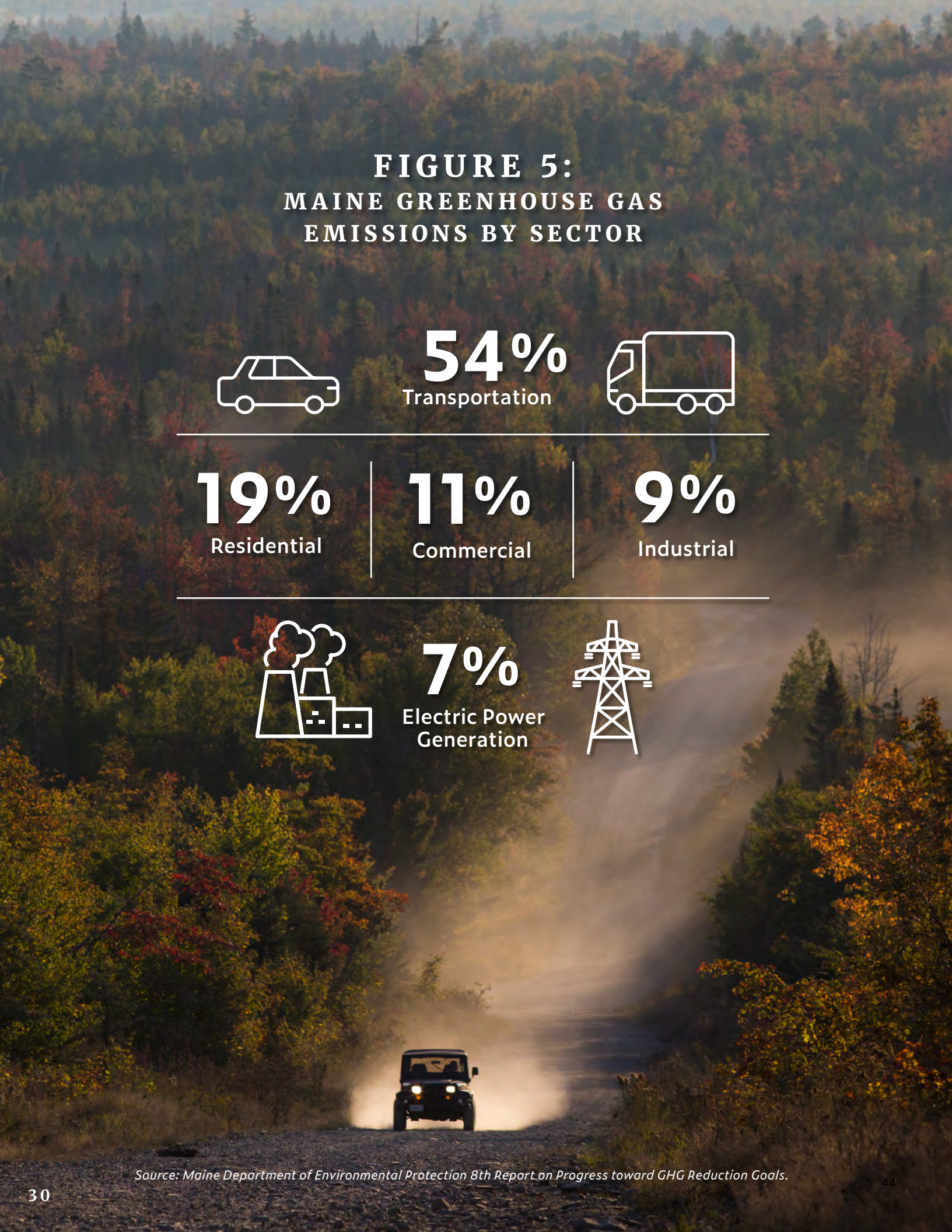
To limit warming and reduce the severe impacts of climate change, the science is clear that the world must reduce greenhouse gas emissions as quickly as possible. In 2019, Governor Janet Mills signed legislation to require the reduction of Maine's greenhouse gas emissions 45% by 2030 and by at least 80% by 2050, and to create Climate Action Plans every four years to ensure the state has a roadmap for actions to accomplish these targets. In addition to these reductions set forth in law, Governor Mills has signed an Executive Order committing Maine to an additional target of carbon neutrality by 2045.

The strategies in this Climate Action Plan offer specific actions that support the state's meaningful contributions to the international efforts to slow global climate change, in alignment with the scientifically rigorous emissions reductions goals recommended by the IPCC. The 2016 Paris Climate Agreement aims to keep a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. These same goals have been adopted by the United States Climate Alliance (USCA), a bipartisan coalition of 25 states including Maine formed when the U.S. withdrew from the Paris Climate Agreement.

While Maine has been among the leading U.S. states when it comes to mitigating greenhouse gas emissions, reducing our annual emissions from a high of 26.53 million metric tons of CO_2 equivalents ($MMTCO_2e$) in 2002 to 17.5 $MMTCO_2e$ in 2017 (a reduction of 34% from 2002 levels, or 17.5% from 1990 levels), significant progress must still be made to meet the state's 2030 and 2050 targets.

In 2017, most of Maine's greenhouse gas emissions came from transportation, followed by residential and commercial buildings and operations, then industrial sources, and lastly from electricity generation. This Climate Action Plan outlines strategies to reduce emissions from all sectors, with an emphasis on the most significant sources of Maine's emissions.

FIGURE 5:
MAINE GREENHOUSE GAS EMISSIONS BY SECTOR



Source: Maine Department of Environmental Protection 8th Report on Progress toward GHG Reduction Goals.

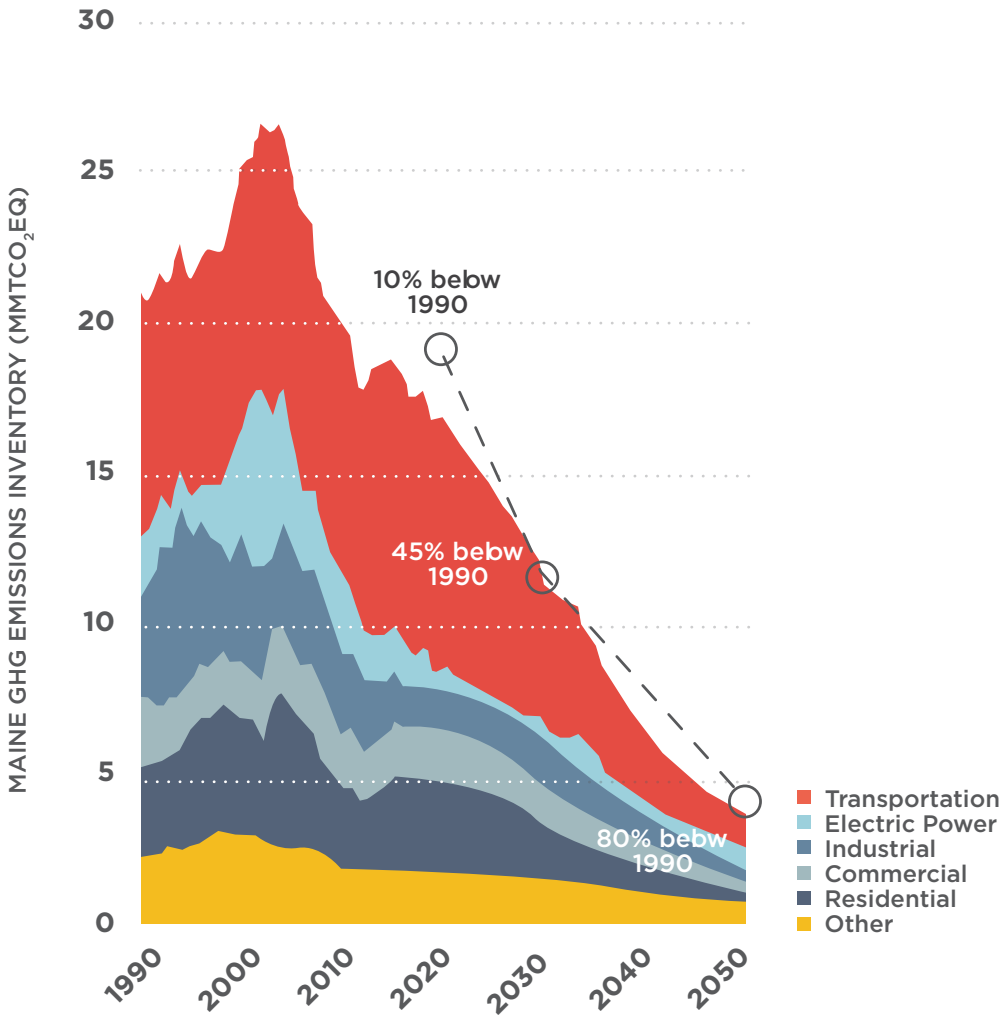
The Maine Climate Council analyzed the future scenarios for Maine's greenhouse gas emissions, modeling different pathways for reductions and the status quo. There is always some uncertainty in projections and models, but they are a valuable tool for quantifying the impacts of particular strategies and clarifying the timing required to achieve our state's emissions-reductions goals.

The analysis showed that if Maine continues on a "business as usual" path, emissions will slowly decline through 2030 and then flatten out in later years. Under that scenario, our 2050 emissions will be 13.8 million metric tons, which is 9.6 million metric tons greater than our 2050 target. In this scenario, transportation accounts for 41% of emissions in 2050 and remains Maine's largest emissions source.

Figure 6 demonstrates a potential pathway that utilizes the strategies proposed by the Maine Climate Council in this plan, including a transition over time to a largely electrified transportation and buildings sector, combined with a transition to a clean electricity sector, allowing for significant greenhouse emissions reductions.

This pathway meets Maine's 2030 and 2050 emissions-reduction goals. By 2030, total emissions are 11.67 million metric tons, equal to the target of 45% below 1990 levels. Total emissions in 2050 are 3.72 million metric tons, or 82% below 1990 levels.

Figure 6: Maine Emissions by Source, 1990–2050 Modeling.



Source: Synapse Energy Economics.

Table 1: Projected Emissions by Sector, 2017-2050

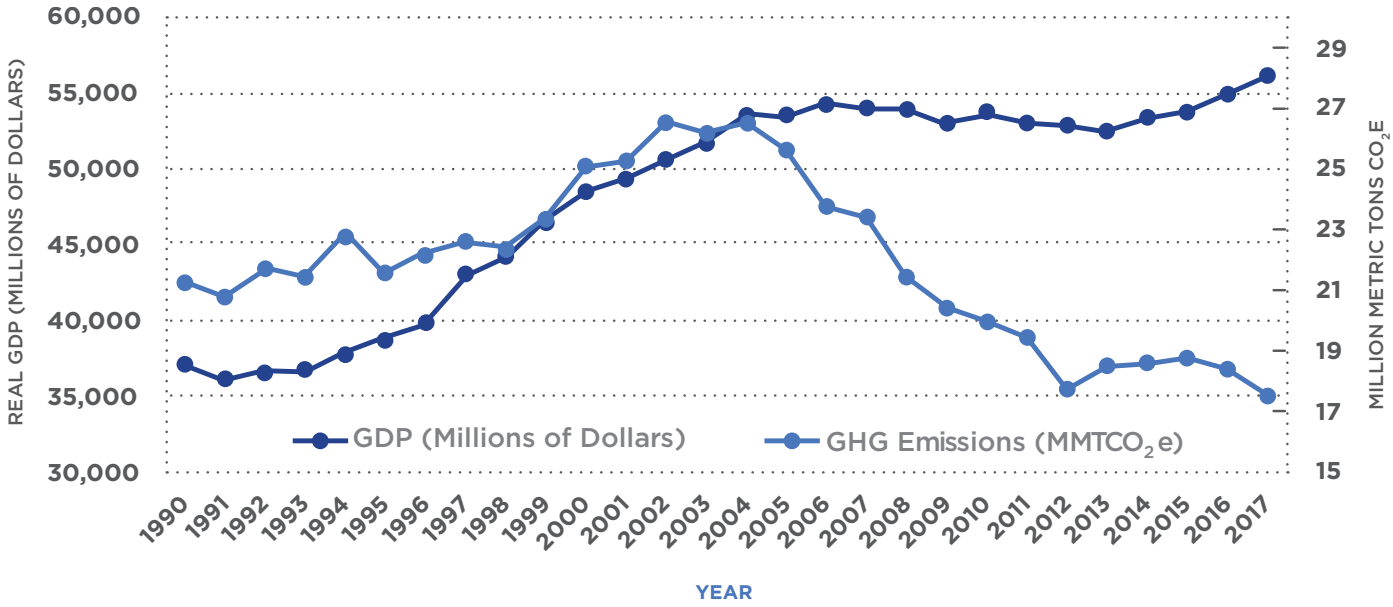
SECTOR	2017 GHG Inventory ($MMTCO_2e$)	2030 Projected Emissions	2050 Projected Emissions
Transportation	8.57	5.19	1.10
Electric Power	1.03	0.39	0.70
Industrial	2.46	2.37	0.78
Commercial	1.71	1.31	0.36
Residential	3.00	1.83	0.30
Other	0.74	0.59	0.49
Total	17.51	11.68	3.73

Source: Synapse Energy Economics.

Even as we reduce our greenhouse gas emissions to meet our reduction goals, Maine's carbon neutrality goal of net-zero emissions by 2045 will require our natural and working lands — such as forests, farms, and coastal lands — to store carbon (or sequester that carbon in natural materials) for decades to come. Enhancing these systems for greater carbon storage capacity, while continuing to provide critical economic, recreation, and habitat benefits and drinking-water protection, will help Maine reach our goals and support healthy natural and working forests, farmland, and coastal lands.

Curbing emissions can also be done while growing a state's economy. The 25 states of the United States Climate Alliance, including Maine, are reducing emissions and growing their economies at a faster pace than non-USCA states. Maine cut emissions by 32% from 2005 to 2017 while the state's GDP grew.

Figure 7: Greenhouse Gas Emissions and Gross Domestic Product (GDP).



Source: Maine Department of Environmental Protection 8th Report on Progress toward GHG Reduction Goals.

Economic benefits, including job and business creation as well as savings for consumers, are also expected through advancements in technological innovation, particularly in the transportation, energy, and industrial sectors. In addition, bold renewable-energy production targets now enshrined in Maine law for the electricity sector —

80% renewable sources by 2030 and 100% by 2050 — are strong incentives for emissions reductions and concurrent sustained economic growth. Utilizing renewable energy produced in Maine to replace fossil fuels imported from elsewhere will spur significant economic benefit.

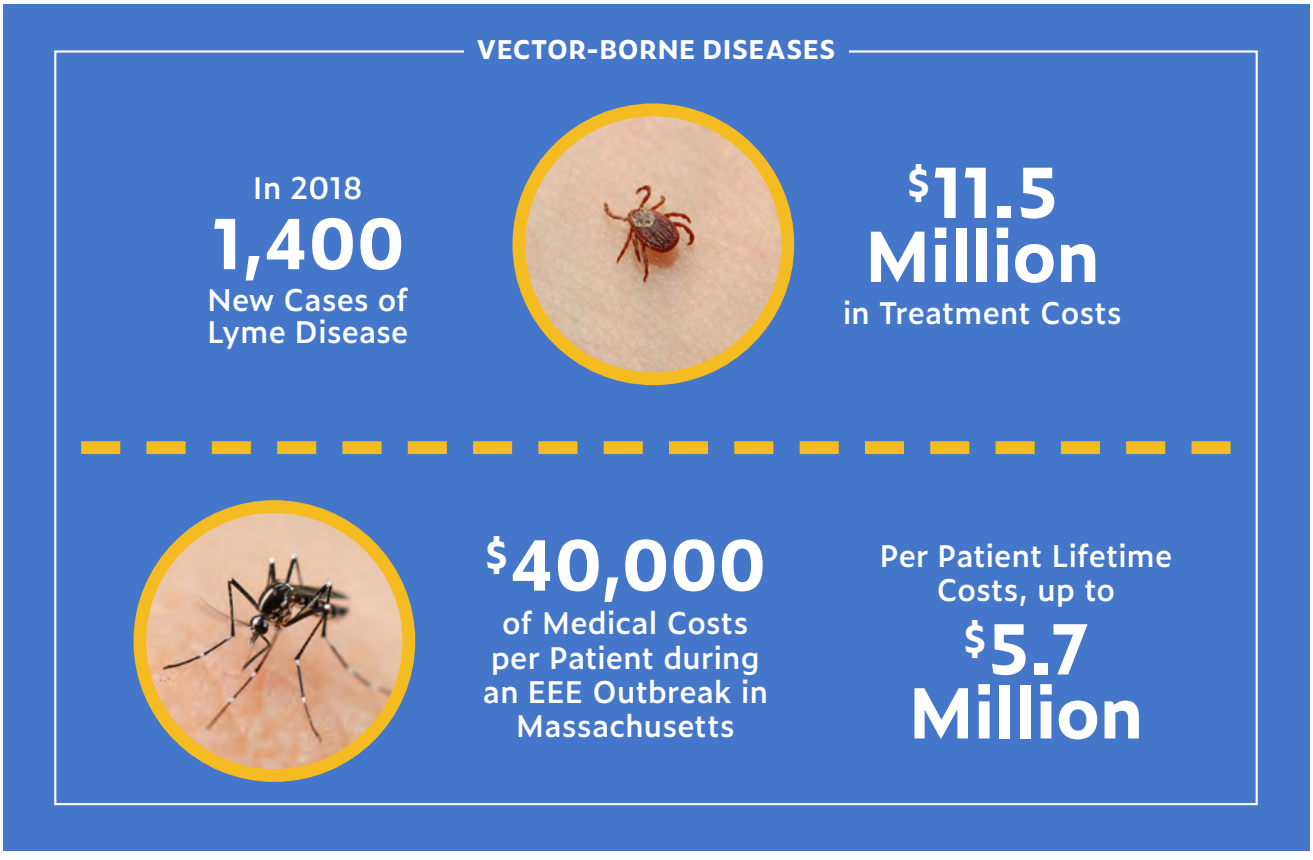
AVOID THE IMPACTS AND COSTS OF INACTION

Maine must take action to ensure that our people, environment, economy, and society are more resilient to the impacts of climate change. While mitigating the causes of climate change and better preparing Maine for its financial impacts will require significant public and private investment, inaction will cost Maine substantially more, and those costs will accelerate over time.

As part of the research to inform this Climate Action Plan, a detailed report evaluated the "costs of doing nothing" about climate change in Maine. This analysis found choosing to do nothing more would inflict significant consequences and costs on Maine people, businesses, and communities. In many cases, these costs are orders of magnitude greater than the cost of prevention, adaptation, or mitigation.

The health consequences from climate change are significant. Vector-borne diseases like Lyme disease and Eastern equine encephalitis (EEE) are debilitating, expensive to treat, and carry long-term health effects. Cases of both are expected to increase in Maine as a warming climate expands the range of disease-carrying ticks and mosquitoes.

In 2018, Lyme disease treatments cost $11.5 million cumulatively for 1,400 new cases in Maine, not including ongoing medical costs for people suffering from chronic Lyme symptoms. Direct medical costs for EEE during an outbreak in Massachusetts were in excess of $40,000 per patient, and because EEE can cause complications for years, lifetime costs may reach $5.7 million per patient.



Of the multiple threats Maine faces from climate change, flooding carries the largest financial risk. For coastal communities, unaddressed sea-level rise and repeated storm-surge flooding could cost Maine $17.5 billion in building damage from 2020 to 2050. In inland communities, the value of buildings threatened by flooding from intense storms between 2020 and 2050 is estimated at $1.8 billion.

For coastal communities, modeling showed 21,000 jobs may be lost due to the cumulative impact of coastal storms and sea-level rise between 2020 and 2050. Similarly, flood risk to inland communities could put nearly 3,300 forestry, agriculture, and tourism jobs at risk.

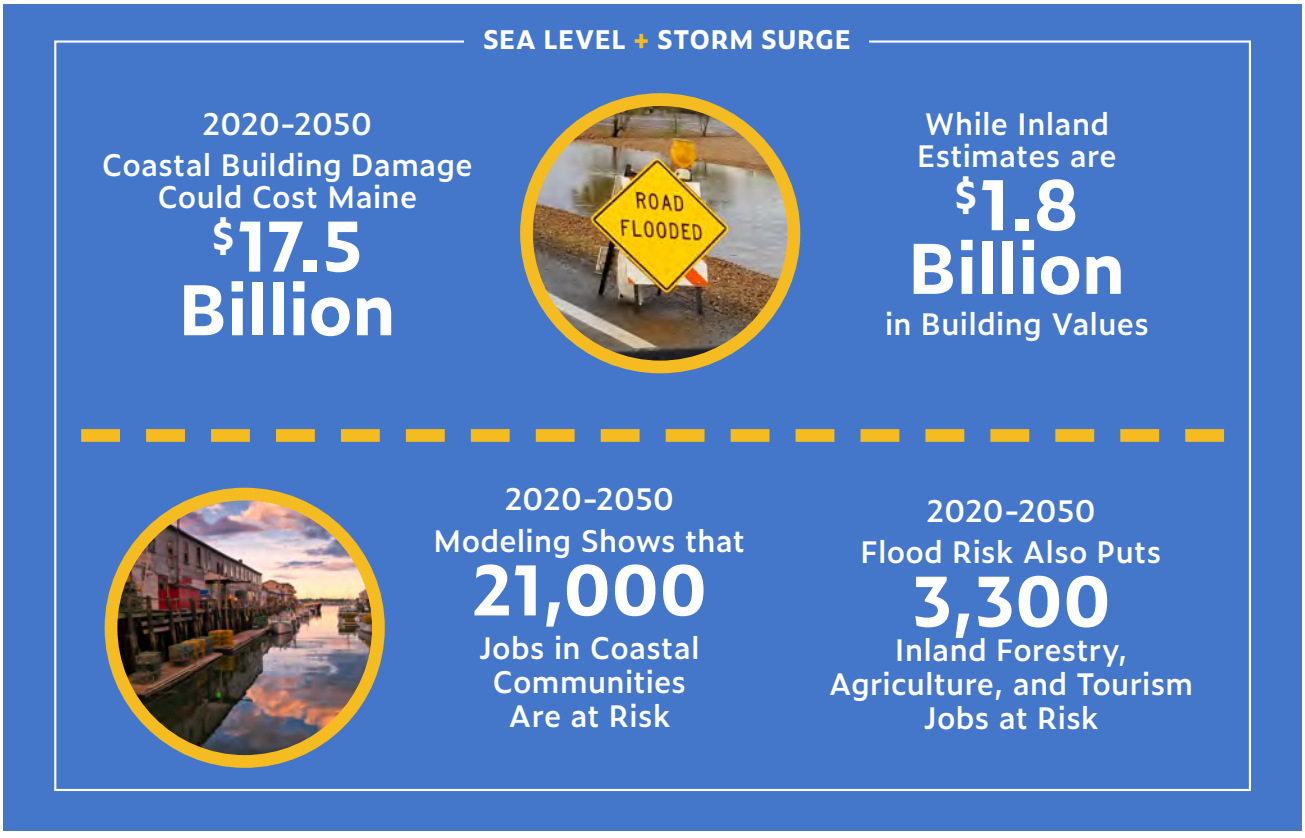
Vulnerability mapping of Maine also shows that, unless action is taken, at least six wastewater treatment plants will be at risk of permanent inundation from sea-level rise by 2050. The replacement costs for these facilities will be $31 million to $93 million.

Coastal beaches and dunes draw more than 13 million visitors each year, which in turn supports many coastal tourism economies. Coastal visitors spent $1.7 billion in 2018 — an average of $125 per person.

By 2050, sea-level rise and erosion may shrink Maine's total dry beach area by 42%, decreasing visits by more than 1 million people and lowering annual tourism spending by $136 million.

If Maine's coastal dunes, saltmarshes, and eelgrasses are lost to erosion and sea-level rise, valuable ecosystems will be wiped out. Coastal dunes protect buildings, infrastructure, and sensitive wildlife habitat from pounding waves and flooding, an ecosystem service valued at $72 million annually. Saltmarshes and submerged eelgrasses protect coastlines from erosion and provide critical fish-spawning habitat, nitrogen removal, and other ecosystem services that support Maine's coastal communities and commercial fisheries. The loss of these ecosystem services due to sea-level rise is estimated at between $34 million and $104 million by 2030 and between $103 million and $260 million by 2100.

Nearly $700 million in direct value annually (and more in supporting businesses) from fisheries and aquaculture are also at risk from warming and acidifying ocean waters. Maine's lobster fishery alone had landings worth $485 million in 2019. Southern



New England's precipitous drop in lobster landings over the last few decades coincided with warming waters, offering a clear warning to Maine. As lobster populations move northward with their preferred cooler habitats, some projections suggest lobster abundance in the Gulf of Maine could decline 45% by 2050. If this occurs, Maine's cumulative GDP would fall by approximately $800 million over 30 years and reduce the state's economic output by $1.3 billion.

Maine's forests, saltmarshes, and coastal eelgrasses provide many economic benefits and ecosystem services, but their ability to absorb and store large amounts of carbon at low cost is reason alone to conserve these areas. This Climate Action Plan estimates 10,000 acres of forest are being lost to development each year and may accelerate to 15,000 acres per year by 2030.

Based on the high but avoidable costs of doing nothing more, the strategies outlined by this Climate Action Plan include providing support and technical assistance to Maine communities, businesses, and citizens who will be most impacted by climate change to withstand its impacts through proactive actions.

Without additional climate mitigation (to support emissions reductions) or adaptation, Maine's vulnerabilities could be further exposed. Through October 2020, the United States had experienced 16 weather/climate disasters with damages of $1 billion. Preparing for action now to mitigate and adapt to climate change will ensure a stronger future for Maine.

FOSTER ECONOMIC OPPORTUNITY AND PROSPERITY

Even before the downturn as a result of the COVID-19 pandemic, Maine faced structural economic challenges. While the state's 10-year Economic Development Strategy highlighted opportunities through innovation in new and heritage industries, and clear intersections between global trends and Maine's assets like abundant natural resources, long-standing demographic challenges and an aging workforce remain obstacles to growth.

Today, as Maine charts the course for economic recovery, many of the proposed solutions in this Climate Action Plan can leverage Maine's strengths and reverse workforce trends by supporting good-paying jobs that attract new workers and families, growing the economy, protecting key economic sectors most at risk from climate change, and fostering innovation in new business sectors that will drive climate solutions.

The public and private investment required for climate change solutions represents a significant economic and workforce development opportunity for Maine in a broad range of career sectors, from existing fields such as engineering and the construction trades, to emerging fields like solar installation, offshore wind, and new advanced wood-products manufacturing.

Maine has a backlog of infrastructure projects for working waterfronts, roads and bridges, wastewater and water systems, and broadband deployment that will also create jobs and significant economic opportunities, support local communities and their economies, and increase Maine's resilience to the impacts of climate change.

Maine is poised to expand its clean-energy economy through continued development of renewable energy and energy efficiency. A report prepared for the Maine Climate Council, *Strengthening Maine's Clean Energy Economy*, outlines emerging job-growth trends in Maine and across the country, as well as near-term opportunities in clean energy that can support immediate economic recovery from the COVID-19 downturn and long-term career prospects in the emerging clean-energy and clean-tech sectors.

The report highlights the present economic momentum of renewable energy projects across the state, as well as the burgeoning, homegrown innovations in sustainable forest products, construction trades, and Maine-grown offshore-wind technology that offer significant opportunities, particularly in rural areas hardest hit by past losses of manufacturing jobs.

Coupled with bold targets for action and growth in energy-efficiency and electrification projects, such as doubling the pace of weatherization and installing at least 100,000 more high-efficiency heat pumps by 2025, the clean-energy economy is already creating jobs, reducing energy emissions, and providing cost savings to Maine consumers, as well as keeping energy dollars here in the Maine economy instead of exporting them out of state.

These strategies offer improvements in quality of life for Maine people, as homes are made more comfortable and affordable to operate. Heat-pump technology provides efficient heating, as well as cooling, which will be needed as summers get hotter. Electric vehicles have enhanced performance and cheaper operating and maintenance costs. These are critical co-benefits to the reductions in emissions that come through the reduced reliance of fossil fuels.

Climate change creates urgency for developing a clean-energy economy. At the same time, Maine's employment is projected to decline over the coming decade, due to demographic trends that see a large swath of the workforce entering retirement age. The clean-energy economy offers a long-term opportunity for attracting, retaining, and growing a skilled, younger Maine workforce.

By committing to a set of targeted investments, policies, and workforce strategies that match the state's ambitious clean-energy and climate-action goals, Maine will experience both immediate and long-term benefits for the people, the businesses, and the communities of our state.

ADVANCE EQUITY THROUGH MAINE'S CLIMATE RESPONSE

Like other dislocations and disruptions to society, from recessions to pandemics, climate change creates the greatest hardships for marginalized communities, many of whom are most vulnerable to its effects.

The costs of Maine's inaction on climate change will also be acutely borne by vulnerable, lower-income communities, which are least able to recover from a disruption.

Floods affect more than buildings and infrastructure; they have devastating impacts on communities, businesses, local economies, and public health. If infrastructure is not adapted to better withstand sea-level rise, riverine flooding, and increased storm activity, small, rural, and under-resourced communities will struggle to rebuild their livelihoods and economies.

At the same time, high heat days and nights are a health risk for Maine people, especially older and lower-income residents, who are both vulnerable to these impacts and least able to afford improved insulation for cooling or air conditioning. Exposure to extreme heat is linked to a range of negative health outcomes, including heatstroke, exacerbation of existing respiratory and diabetes-related conditions, and effects on pregnant mothers and their babies.

The healthcare dollars required to treat high heat risk are also expected to escalate. With treatment costs at $224,000 for 200 cases of heat illness in 2019, and healthcare costs forecast to be nine to 14 times higher in 2050, heat-related illnesses could cost as much as $3.2 million annually, if hospital admissions remain proportional to the number of days in Maine with a heat index over 90°F.

These are just two examples of climate change's unequal effects and how Maine must calibrate its response to identify and promote solutions to help its most vulnerable populations. In addition, the benefits of climate-related job growth also require

attention to support opportunities in communities and among workers in the greatest economic distress. Deeply considering those impacts and maintaining an ongoing focus on issues of equity is essential in Maine's response to climate change. Throughout implementation of this Climate Action Plan, continuous engagement with diverse groups of Maine people and communities, especially those most impacted by climate and climate actions, is required for the development of fair and effective programs and policies.

A new **Equity Subcommittee** of the Maine Climate Council will support ongoing planning and implementation of Maine's climate strategies to ensure shared benefits across diverse populations of Maine people and to understand any concerns for implementation. The Equity Subcommittee will be tasked in 2021 with setting clear equity outcomes for proposed actions, monitoring progress, and making recommendations to ensure that programs and benefits reach the intended populations and communities.

An Equity Assessment of Maine's Climate Goals was conducted by the University of Maine's Mitchell Center for Sustainability, at the request of the Maine Climate Council and the Governor's Office of Policy Innovation and the Future, and provided high-level recommendations and detailed considerations for many of the proposed climate strategies in this plan. Where the Equity Assessment called for further analysis of equity impacts, the Equity Subcommittee's ongoing engagement with diverse communities will inform the development of climate policies and programs.

Why is climate an important issue to you and the Penobscot Nation?

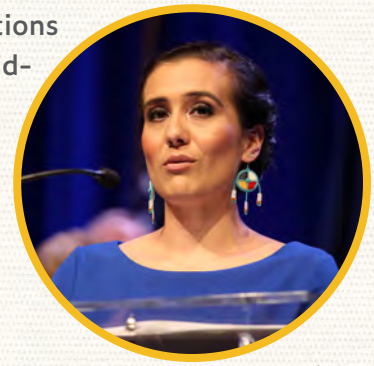
The Penobscot Nation, like the other Wabanaki and Indigenous Nations in North America, sees the earth as a living breathing being that is part of our families, communities, and central to our survival. It is part of our culture to be stewards of the earth, and as we grow and evolve we hold steady to that part of our philosophy as a people. I was honored to be asked to sit on the Climate Council because part of the tensions between the tribes and the state has to do with natural resources, and part of the healing should be coming together when we can for the common good of Maine.

How will an equity focus on climate contribute to the Plan's success?

Frontline communities like tribal nations, new Mainers, those in poverty, people of color, and more are disproportionately affected by the climate crisis. If we overlook their needs and experiences, we are not only doing them a disservice, we are setting back all of our work because it will be less effective in meeting our goals. A society is only as strong as its most vulnerable populations, and this holds true in climate work. As we make policy, we need to work from a place of inclusivity and equity to make sure our work is lasting and meaningful.

What do you want the Equity Subcommittee to accomplish?

I hope to continue important discussions around the intersections of climate and equity. As a subcommittee, we can inform the Council's work as well as the legislative process. I am hoping to shed a light on the experiences of marginalized people in Maine and how the climate crisis affects us, as well as solutions based on thoughtful consideration of these stories.



—Ambassador Maulian Dana, Penobscot Nation, Co-Chair, Equity Subcommittee and Member of the Maine Climate Council

STRATEGY A

EMBRACE THE FUTURE OF TRANSPORTATION IN MAINE


Transportation is responsible for 54% of Maine's annual greenhouse gas emissions. To meet our emissions-reductions goals by 2030 and 2050, our state must pivot to the future by pursuing aggressive transition strategies and innovative solutions within this important sector.

When emissions are analyzed by vehicle type, 59% of Maine's transportation-related emissions are from light-duty passenger cars and trucks; 27% are from medium- and heavy-duty trucks; and the remaining 14% come from rail, marine, aviation, and utility equipment vehicles.

The most significant reductions of greenhouse gas emissions in Maine's transportation sector will come through the long-term and large-scale electrification of our transportation systems, combined with strategies to increase the efficiency of gas- and diesel-powered vehicles, and to reduce the number of miles Mainers drive through expanded options and funding for public transportation, increased broadband deployment across the state, and support for policies that encourage development of housing, schools, and shopping areas in pedestrian-friendly downtowns and villages.

In addition to reduced carbon dioxide (CO_2) emissions to achieve Maine's emissions-reduction goals, there are also major health benefits associated with cleaner air from reduced transportation emissions, including reduced nitrogen oxides, sulfur dioxide, and particulate matter.

Maine's rural character and relatively low emissions from other sectors — like electricity generation — make our transportation emissions disproportionately high compared to other states. The average Maine vehicle travels approximately 12,000 miles per year. An analysis of vehicle miles traveled (VMT) in Maine found that 65% of our driving occurs on rural roads, with 35% in urban and suburban areas. Most of these total miles are driven in the southern half of Maine.

Maine's transportation emissions also include emissions attributable to visitors to Maine — an estimated 37.4 million seasonal visitors and tourists in 2019, according to the Maine Office of Tourism.

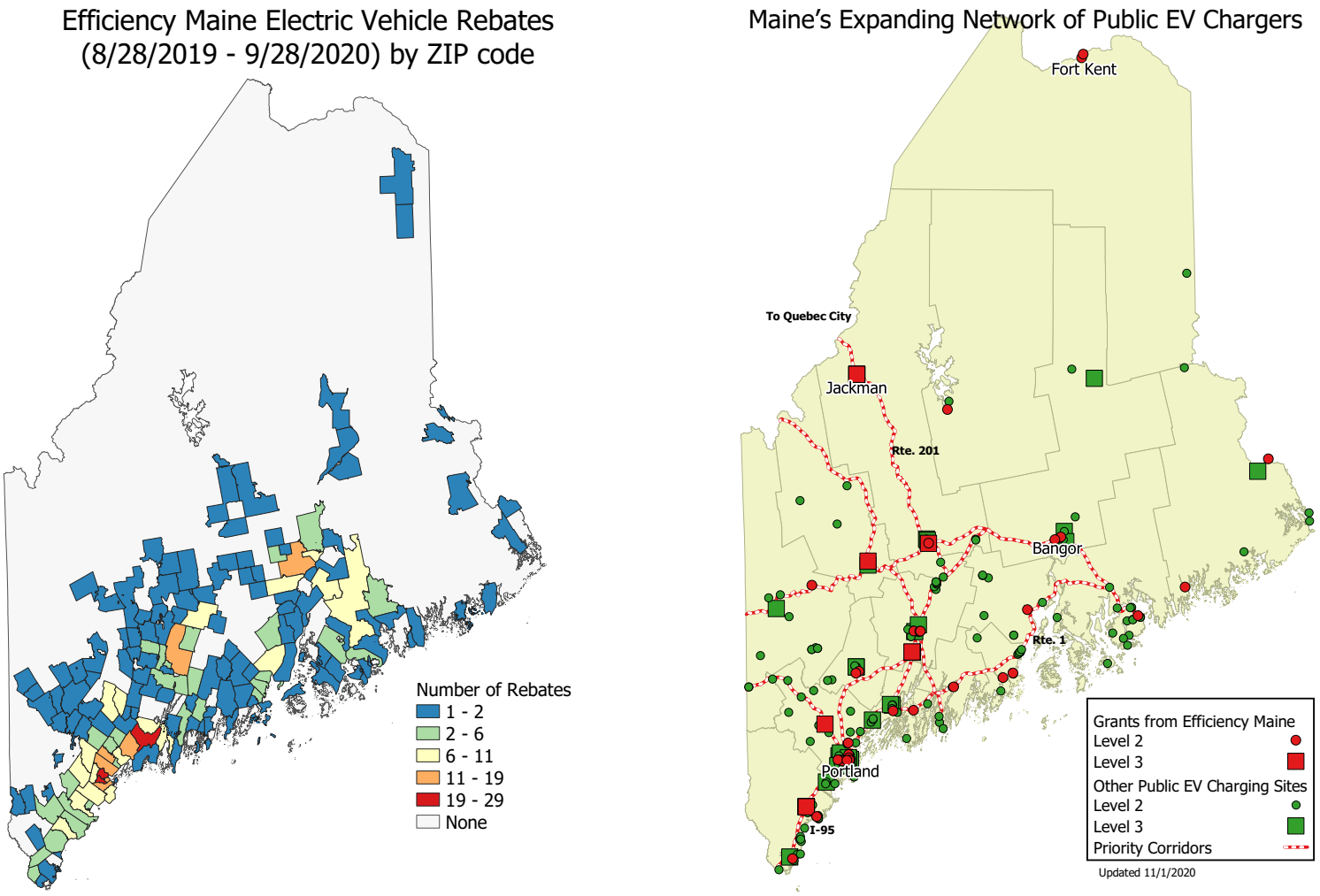


Figure 8: Year 1 of Maine's EV Rebate Program and State-wide Charging Infrastructure Distribution.

These visitors generate emissions when they arrive and travel through Maine by road, boat, air, or rail. In order to help Maine meet its climate-change goals we should consider options that shift some of the burden for emissions reductions and associated costs to these visitors.

The Equity Assessment prepared for the Maine Climate Council identified several considerations for transportation strategies, with an emphasis on ensuring affordability and access to emerging transportation options for low- to moderate-income Mainers.

These considerations include targeted incentives for low- to moderate-income drivers, such as for purchasing new or used electric vehicles (EVs) including plug-in hybrid electric vehicles (PHEVs). Public and shared transit was noted for its importance to aging Mainers and Maine people without other transportation options.

In addition, the Assessment highlighted the equity benefits of expanding broadband and online services, bringing virtual educational, health, work, and business opportunities to more people, while reducing the need for driving and associated emissions.

In 2021, ecomaine of Portland is expected to become the first company in the U.S. to use all-EVs for waste hauling powered by its own waste-to-energy operation. The purchase of the EVs to replace diesel-powered trucks was made possible in large part by a combined grant from the U.S. Environmental Protection Agency's Diesel Emissions Reduction Act program and the Maine Department of Environmental Protection. The grant, combined with funds matched by ecomaine, allowed the company to secure two electric trucks from the Lion Electric Company of St. Jerome, Quebec. In addition to reduced maintenance costs, ecomaine expects to save 75% on fuel compared to diesel over the first six years.

1

Accelerate Maine's Transition to Electric Vehicles

- **Achieve emissions-reduction goals by putting 41,000 light-duty EVs on the road in Maine by 2025 and 219,000 by 2030.**
- **By 2022, develop a statewide EV Roadmap to identify necessary policies, programs, and regulatory changes needed to meet the state's EV and transportation emissions-reduction goals.**
- **By 2022, create policies, incentives, and pilot programs to encourage the adoption of electric, hybrid, and alternative-fuel medium- and heavy-duty vehicles, public transportation, school buses, and ferries.**

Maine's clean electric grid means that EVs emit significantly less greenhouse gas emissions per mile compared to gas or diesel vehicles. EVs currently account for less than 0.5% of registered vehicles in Maine. However, the market for, and supply of, EVs is expected to increase in coming years, due to advancements in technology, reductions in cost, and growth in consumer demand. Maine is also one of 13 states that has adopted California's emissions standards under the Clean Air Act, a foundational policy for accelerating EV adoption.

Adoption targets to incentivize the EV market are also growing; California, New Jersey, and Quebec have committed to reach 100% zero emission new car sales by 2035, with other states considering similar goals. Delivery companies like Amazon, UPS, and FedEx are also shifting to electrify their delivery fleet, while other companies, like furniture giant IKEA, have directed their supply chain to "use electric vehicle or other zero-emissions solutions" for delivery.

PHEVs can also be part of a potential transition to increased electric driving, with more and more vehicles on the market getting from 20 to as many as 100 miles from a single charge before utilizing their gas engine.

EVs and other zero-emissions vehicles in the heavy-duty market are also a key target for emissions reductions, with early examples like school buses, garbage trucks, and public transit buses arriving in Maine in late 2020 and 2021. The heavy-duty market is important to long-term emissions reductions. Evolving technology innovations with new electric and hydrogen vehicles emerging in both national and international markets will help support reduced emissions in this sector.

To outline a specific plan to accelerate the widespread adoption of EVs, PHEVs, and other clean-car technologies in Maine, an "EV Roadmap" will be completed by 2022. This statewide EV Roadmap will identify necessary policies, programs, and regulatory changes needed to meet the state's EV and transportation emission reduction goals, including strategic planning, incentive programs, charging infrastructure, consumer engagement, as well as transition and equity considerations.

Equitable access to EVs and PHEVs and charging is key — ensuring all Maine people have an opportunity to these new, lower-emissions transportation options that can save families money in operations and maintenance costs.

Utilizing current settlement dollars, Maine has both established a state EV-incentive program and has been installing charging infrastructure across the state through the Efficiency Maine Trust. While federal tax incentives for many vehicles are attractive (at $7,500 for many EV models), as currently designed they decrease and disappear entirely with more EV adoption (for example, Tesla and GM have both exceeded the limits on number of vehicles and are no longer eligible). A renewal of the federal incentives is needed. Additional purchase incentives and targeted program design, including enhanced rebates, supportive charging infrastructure and utility policies, used clean-vehicle options, and potential financing support, should be part of the Roadmap planning to ensure access to EVs, regardless of income and location.

2

Increase Fuel Efficiency and Alternative Fuels

- **Continue to support increased federal fuel-efficiency standards.**
- **Significantly increase, by 2024, freight industry participation in EPA's SmartWay program.**
- **Increase, by 2024, local biofuel and biodiesel production and use in Maine transportation sectors, especially heavy-duty vehicles (assuming Maine biofuels production becomes viable).**
- **Establish a time-limited incentive program, targeted to low- and moderate-income drivers, to encourage drivers to upgrade to higher-efficiency vehicles in the near term.**

With ambitious goals of widespread EV adoption in the light-duty vehicle market later in the coming decade, Maine must also seek, where possible, to reduce transportation emissions from cars and trucks currently on the roads. A time-limited incentive program that encourages drivers to upgrade to higher-efficiency vehicles would drive emissions reduction in the short term and create financial benefits for Maine drivers, especially those in rural areas, by reducing fuel costs. The program would provide incentives to income-eligible Maine households to purchase new and used higher-fuel-efficiency and hybrid vehicles.

In the heavy-duty freight transportation sector, EPA's SmartWay program helps improve efficiency and save money with new technologies such as aerodynamic

TRAVIS RITCHIE

Travis Ritchie, a STEM teacher at Geiger Middle School in Lewiston, is co-founder of the Maine Electric Vehicle Association (a community of EV enthusiasts) and a former EV mechanic. He leads "EV 101" seminars for prospective EV owners looking to flip the switch — which Maine will need to reach projected EV targets for curbing greenhouse gas emissions.

Why does an EV make sense for you?

I like driving but not commuting. I struggled between having a car I enjoyed and a great commuter that cut my driving costs. Prior to my EV, I would tally my fuel and maintenance expenses from commuting and say, 'What a waste.' Now, I have the best of both worlds using an EV as a daily driver. It costs pennies to get to work, and I have the instant torque to keep me interested in the drive.

What do you think is the biggest obstacle to EV adoption?

Range and cost are clearly the two most obvious hurdles, but I would say education is a close third. I think if more people understood how EVs work, how you don't need a public charger if you can plug in at home, the reduced maintenance costs, and winter driving characteristics, they'd look forward to owning one someday. Most people I know can't buy a new car, but once there is a better market for used EVs (choice and all-wheel-drive options), they will be on board.

What do you think of the Council's recommendation on EVs?

The fact that they are considering the environment as well as the economy makes me impressed already. I am worried about the future of our planet, and I think EVs are one of many steps that must happen to transition to a sustainable future. I am already taking action, and hope to continue driving EVs and eventually switch to sustainable energy sources for heat and electricity in the future. I think the governor and legislature should try to find a way to include small, local businesses in the implementation of this plan wherever possible.

design, low-resistance tires, and reduced idling. Voluntary participation should be encouraged in Maine to significantly increase participation through loans or grants, by ensuring technology is available, and recognizing excellence within the program.

Maine should promote the increased production and use of biofuels in applications where electrification is not currently practical. Unlike petroleum-based diesel, biofuels are based on plant- or algae-based carbon that was recently in the atmosphere, which means that when these fuels are burned, net emissions are lower than for fossil fuels. When these fuels are produced in Maine, there are economic benefits from their production that support both the forest-products industry and rural communities, and further emissions reductions from reduced fuel-transportation costs.

Federal fuel-economy standards (the National Highway Traffic Safety Administration's Corporate Average Fuel Economy [CAFE] standards) regulate how many miles vehicles must travel on 1 gallon of fuel, and these standards have already led to emission reductions in Maine's transportation sector. The Trump Administration rolled back the Obama-era CAFE, so the current standards are very weak. Maine has adopted California vehicle standards which are more stringent than federal standards. The state should continue to support efforts to push ongoing improvement in national CAFE standards.

3

Reduce Vehicle Miles Traveled

- **Reduce light-duty VMT over time, achieving 10% reductions by 2025 and 20% by 2030.**
- **Reduce heavy-duty VMT by 4% by 2030.**
- **Deploy high-speed broadband to 95% of Maine homes by 2025 and 99% by 2030.**
- **By 2024, establish state coordination, strengthen land-use policies, and use state grant programs to encourage development that supports the reduction of VMT.**
- **Increase public transportation funding to the national median of $5 per capita by 2024.**
- **Relaunch GO Maine to significantly increase shared public commuting options by 2022.**

By enabling and encouraging Mainers and visitors to drive less, while offering more alternative transportation options, we can reduce our greenhouse gas emissions.

Greater access to virtual work, medicine, education, and other opportunities that allow people to utilize online services without driving is key to this strategy. This action has assumed greater interest and relevance due to the COVID-19 pandemic with the growing prevalence of remote work, but it's dependent on expansion of high-speed broadband Internet access.

Expanding broadband is also a key recommendation in the state's 10-year economic strategy and was one of the top priorities identified by the Governor's Economic Recovery Committee to stabilize Maine's economy against the economic damage caused by COVID-19.

These recommendations align with a recent finding that one in six Americans is expected to switch permanently to remote work for at least two days each week after the pandemic subsides, and that over 33% of U.S. companies say the practice will remain "more common" at their company after the pandemic is over.

Expanding public transportation and ride-sharing programs, such as the GO Maine commuter service, and developing innovative public transportation options in rural areas can replace the number of single-occupancy trips and also reduce household vehicle and commuting costs. Public-private partnerships like the Island Explorer (at far left) in Acadia National Park have shown that increased public transportation can support both commuting options for Maine residents and also decreased emissions from tourists.

To make the improvements necessary to expand participation and access for Maine people without other transportation options, funding for public transit needs to increase. Maine currently spends less than the national median of $5 per capita.

Transportation emissions can be reduced when commuting is reduced. Development strategies that locate schools, workplaces, and shopping opportunities near where people live will reduce the need for driving.

These kind of cities, villages, and communities facilitate walking and biking, and support easier public transportation and ride-sharing options. Co-benefits include improved public health, reduced costs of infrastructure, and support for aging in place.

Supporting development in Maine's village centers, cities, or rural crossroads would require effective local, regional, and state land-use policies and would include encouraging state capital investments such as affordable housing and schools, and safe pedestrian and bicycling infrastructure in these areas.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STRATEGY B

MODERNIZE MAINE'S BUILDINGS

Energy-Efficient, Smart, and Cost-Effective Homes and Businesses

Heating, cooling, and lighting of buildings are responsible for almost one-third of Maine's greenhouse gas emissions. Maine can reduce greenhouse gases by modernizing our buildings to use cleaner energy, increase energy efficiency, and utilize lower-carbon building materials.

Building codes to improve energy efficiency, heating and cooling homes and businesses with heat pumps and heat-pump water heaters, and weatherization are among the most cost-effective ways to reduce greenhouse gas emissions. Promoting innovative wood products will reduce greenhouse emissions while supporting economic development in Maine's forest products sector. Implementing appliance standards will further reduce emissions.

These actions will make Maine's homes and businesses safer, healthier, more comfortable, and more affordable. Maine already has incentive programs for efficiency measures such as heat pumps and weatherization that can be further expanded to achieve our goals.

Low-income households, especially rural low-income households, often pay a higher percentage of their income to meet their home energy needs. To meet Maine's climate and equity goals, weatherization and heat-pump incentive programs should continue to expand to reach more Maine people, with special efforts to engage diverse communities and geographies, especially those with the greatest energy cost burdens.

In addition, targeted programs that support weatherization and efficiency in affordable housing — both existing and new — along with new opportunities for renewable energy and electric vehicle charging in these locations will expand future options for residents and homeowners.

1

Transition to Cleaner Heating and Cooling Systems, Efficient Appliances

- **Install at least 100,000 new heat pumps in Maine by 2025, ensuring that by 2030, 130,000 homes are using between 1-2 heat pumps and an additional 115,000 homes are using a whole-home heat-pump system. Install at least 15,000 new heat pumps in income-eligible households by 2025.**
- **Implement Maine Appliance Standards requirements by 2022.**

Maine should encourage households, businesses, and institutions to switch to cleaner heating and cooling systems. **About 60% of Maine households rely on heating oil as their primary home heating source — the highest percentage in the country — with an additional 12% utilizing propane.** There is a growing opportunity in Maine to transition to new technologies for heating that produce lower greenhouse gas emissions.

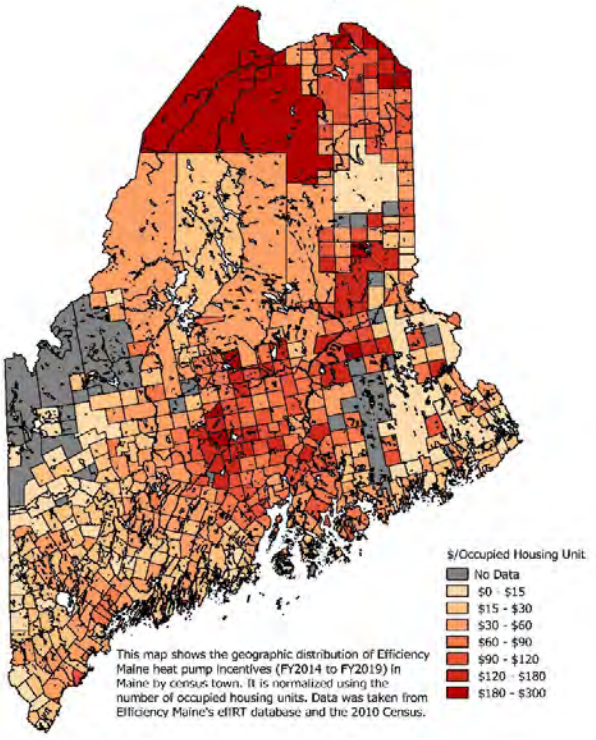
New high-performance electric heat pumps have 60% lower carbon dioxide (CO_2) emissions than oil burners. They are a cost-effective way to reduce emissions while saving homeowners money. Heat pumps have the added benefit of providing cooling in the summer months, which will be even more important as the number of high-heat days increases due to warming trends caused by climate change. These products have been shown to work well, even with Maine's cold winters, particularly as technology has continued to improve.

Annual operating costs of heat pumps are lower than for oil furnaces. Rebates available from Efficiency Maine can help to reduce upfront costs. To ensure equity, Maine should target financial incentives to those who most need the assistance to upgrade their heating systems.

With assistance from Efficiency Maine Trust incentives, more than 60,000 high-performance heat pumps and 35,000 heat-pump water heaters have been installed in Maine in the past several years. These are nation-leading installation results that will lower emissions and energy bills for Maine people.

Modern high-efficiency wood heating is also an opportunity that supports Maine's forest products industry and heating with a renewable Maine-grown heat source, as compared to oil or propane systems.

Figure 9: The Distribution of Heat-Pump Incentives in Maine.



Appliance standards set performance requirements for home appliances, plumbing products, and lighting products in homes and businesses. They can help Maine meet our greenhouse gas emissions goals by reducing energy use and emissions. States can set standards for

products not covered by national standards, which are set by the U.S. Department of Energy, such as computers, portable air conditioners, and water coolers. Maine should join with other U.S. states to adopt a consistent set of standards for appliances not yet covered by national standards. We can accomplish this by partnering with states who have already developed programs and standards.

2

Accelerate Efficiency Improvements to Existing Buildings

- **Double the current pace of home weatherization so that at least 17,500 additional homes and businesses are weatherized by 2025, including at least 1,000 low-income units per year.**
- **Weatherize at least 35,000 homes and businesses by 2030.**

Many of the 550,000 existing homes in Maine are aging and energy inefficient. More than half of owned and two-thirds of rented housing units were built in 1960 or earlier. Maine should expand weatherization programs to reduce emissions and save home and business owners money on their utility bills by improving insulation and reducing air leakage.

Maine has successfully implemented weatherization programs to improve the energy efficiency of approximately 20,000 market-rate homes since 2010, and many thousands more through the low-income programs of Maine Housing and the Community Action Programs.

These programs should be accelerated and expanded to include commercial property owners, making thousands more homes, public buildings, and businesses energy efficient and saving millions in heating and operating costs. Disclosure of energy usage in commercial buildings will also incentivize continuous improvements.

The U.S. healthcare sector is responsible for nearly 10% of all greenhouse gas emissions, and hospitals make up more than one-third of those emissions. Given the importance of climate issues and health, public-health professionals recommended that the state encourage incentives specifically targeted toward Maine's healthcare sector, supporting reductions of emissions and energy costs through efficiency and renewable energy.

Cross-laminated timber, a value-added and climate-friendly construction material in lieu of steel, is used during construction of a 40-unit apartment building in Portland in summer 2020.

3

Advance the Design and Construction of New Buildings

- **By 2024, develop a long-term plan to phase in modern, energy-efficient building codes to reach net-zero carbon emissions for new construction in Maine by 2035.**
- **Enhance existing training on building codes and expand these programs to support ongoing education of contractors and code-enforcement officials.**

The most cost-effective time to improve a new building's energy efficiency is during the initial design and construction.

To increase energy efficiency and reduce greenhouse gas emissions in the buildings sector, Maine should adopt more stringent building codes over time, reaching net-zero-emissions building codes by 2035. Net-zero buildings serve to combine energy efficiency and renewable energy generation to create homes with very low utility and operating costs and emissions. As a part of the transition to modern codes, transparency and disclosure requirements will support consumer information about building operational costs and incentivize high performance.

4

Advance the Design and Promote Climate-Friendly Building Products

- **Develop and enhance innovation support, incentives, building codes, and marketing programs to increase the use of efficient and climate-friendly Maine forest products, including mass timber and wood-fiber insulation.**

Training for code officers and contractors to improve code compliance and support for communities to improve enforcement will improve the effectiveness of the building code and support Maine's builders and contractors.

Maine should promote the use of building materials such as mass timber and wood-fiber insulation. These innovative wood products reduce greenhouse emissions in construction, as wood products have lower "embodied carbon" values compared with steel, concrete, and many insulation products, while storing carbon for the life of the product. These products, if produced in Maine, also support economic development opportunities in Maine's forest-products sector.

The state should seek opportunities to use mass-timber building technologies in state-funded construction projects and should also continue to encourage innovative wood-construction material manufacturing facilities to locate in Maine.

Maine-based startup GoLab is expected to start making climate-friendly wood-fiber insulation in this former Madison paper mill in 2021.

Efficiency Maine Trust

Efficiency Maine Trust (EMT or Efficiency Maine) is the independent administrator for programs to improve the efficiency of energy use and reduce greenhouse gases in Maine. By delivering education, training, and financial incentives on the purchase of high-efficiency equipment or changes to operations, EMT helps Maine customers save electricity, natural gas, and other fuels used in the state's economy. Funding for EMT programs comes from assessments paid by Maine's gas and electric utility ratepayers, revenues from the sale of interstate Regional Greenhouse Gas Initiative (RGGI) carbon allowances, the Forward Capacity Market payments at ISO-New England, settlements (such as the Volkswagen emissions cheating case), and government grants.

EMT's current residential incentives include rebates for heat pumps and heat-pump water heaters along with weatherization. Greater incentives are available for low-income households. For businesses, towns, institutions, and manufacturers, EMT offers larger incentives to reduce the cost of energy-efficiency projects as well as tailored energy-efficiency and distributed-generation projects that require site-specific engineering analyses.

HEAT-PUMP TECHNOLOGY FOR HEATING, COOLING, AND HOT WATER

Modern heat-pump technology can achieve exceptionally efficient heating and cooling powered by electricity, saving on monthly heating bills and reducing emissions, when paired with a clean electricity supply. Heat pumps can be used for space heating in homes and businesses and for domestic hot-water heating. The combined heating and cooling ability is another advantage of heat pumps over gas and oil systems. A typical high-performance heat-pump unit rebated through Efficiency Maine's programs can deliver a unit of heat with 60% less emissions today than an oil-fired furnace or boiler.

As the electric grid converts to renewable energy, the emissions reductions achieved by transitioning to electric heat pump will increase. Recent evaluations in Maine and Vermont confirm that high-performance heat pumps, engineered to operate in cold climates, can effectively deliver heat even when the outside temperature falls well below 0°F. Over the life of the product, a heat pump will save homeowners, on average, from $300 to $600 per year in operating costs compared with heating-oil or propane costs.

Heat pumps may be effective for multiple types of heating and cooling scenarios. The most common configuration in Maine today is the installation of a "mini-split" ductless heat pump connected to one or more indoor heads, and retrofitting one or more units enables a home to displace a significant portion of the current heating system and emissions. Other configurations include "whole house" heat-pump systems, which may use a central heat pump to distribute heating (and cooling) throughout the entire building using ducts or multiple mini-split units. A scalable system of ductless heat pumps can also serve a larger commercial space like an office building or school.

A high-performance home unit costs between $2,500 and $5,000 installed, depending on the model and the complexity of the installation. Efficiency Maine offers rebates of between $500 and $1,000 per unit for most customers, and up to $2,000 for lower- and moderate-income customers, with support for LIHEAP customers through Maine Housing. Incentives are also offered for heat pumps at businesses and public buildings.

Since Efficiency Maine started promoting heat pumps in 2013, more than 60,000 high-performance units have been installed across the state. Despite a pandemic, the program is on pace to install more than 15,000 units in 2020, showing ongoing progress toward market transformation. The supply chain of manufacturers, distributors, and Maine-based installers has ramped up capacity to meet the growing demand.

A similar story of market transformation is unfolding with water heaters. Last year Efficiency Maine's heat-pump water-heater initiatives rebated roughly 8,500 units, bringing the total installed over the last several years to 33,000 (including more than 3,000 installed in low-income households at no cost to the customer). The geographic distribution of heat pumps and water heaters is widespread, with the highest percentage of incentives per home going to northern Aroostook County.

5

"Lead by Example" in Publicly Funded Buildings

- **Use procurement rules and coordinated planning efforts for state government to promote high-efficiency lighting, heating, and cooling; climate-friendly construction materials; and renewable energy use for reduced operating costs and emissions reductions. The state will produce a "Lead by Example" plan for state government by February 2021.**
- **Enhance grant and loan programs to support efficiency and renewable energy programs in municipal, tribal, school, and public-housing construction and improvements. Provide recognition programs for those projects making outstanding efforts.**

The state should take a leadership role in reducing emissions from the buildings sector by requiring best practices in design and construction, including building materials selection; heating, cooling, and lighting systems; and enhanced efficiency and weatherization.

This will save taxpayers money and show how modern design and construction materials, combined with efficient systems and practices, can reduce both emissions and the operating costs of state and local government buildings, schools, universities, and affordable housing.

6

Renewable Fuels Standard

- **Investigate options for establishing a Renewable Fuels Standard (RFS) for heating fuels.**

An RFS for the heating sector would require that a certain percentage of heating fuels be lower carbon or carbon neutral in order to replace or reduce the quantity of fossil heating fuels in residential, commercial, and industrial sectors. This could encourage the development of renewable fuels and technologies in Maine, such as biofuels made from wood biomass, biodiesels from used vegetable oils, and fuels made from anerobic digesters on farms or in other waste environments. These projects would create jobs in Maine's rural communities and reduce both carbon and methane emissions, while reducing heating and operating costs. Maine should investigate the options for an RFS for heating fuels.

7

Replace Hydrofluorocarbons with Climate-Friendly Alternatives

- **Adopt hydrofluorocarbons phase-down regulations in 2021 to be implemented by 2022.**

Hydrofluorocarbons (HFCs), often referred to as climate "super pollutants," are greenhouse gases with hundreds to thousands of times the heat-trapping power of CO_2. HFCs are synthetic gases used in air-conditioning systems, aerosol propellants, foam-blowing agents, solvents, and flame retardants. These gases were first developed as alternatives to ozone-depleting chemicals, but their release to the atmosphere during manufacturing processes and leakage during use, servicing, and disposal of equipment poses a significant climate threat. Maine should join other U.S. states and the international community to adopt a rapid phase-down schedule of the use of HFCs and replace them with climate-friendly alternatives where available.

"LEAD BY EXAMPLE"

In January 2020, Governor Mills signed an executive order to require Maine state government to *Lead by Example* through energy efficiency, renewable energy, and related emissions reductions and savings, promoting health and sustainability in the workplace and building resilient infrastructure. It requires that state government will strive to equal or exceed Maine emissions-reductions targets and seek cost efficiencies for taxpayers and that new state facilities will be designed with greater resilience to new climate conditions.

Maine joins more than 20 states whose initiatives achieve substantial cost savings and demonstrate energy and environmental leadership. *Lead by Example* programs raise public awareness of the ways that clean-energy and energy-efficiency technologies save public funds while reducing emissions, improving air quality, and encouraging markets for cleaner and safer products and services.

The state will prioritize energy and fuel efficiency when upgrading building systems such as lighting and heating, ventilation, and cooling (HVAC), install renewable energy and EV charging stations on state properties, invest in EVs and lower-emissions state fleet vehicles, and encourage telework to reduce vehicle miles traveled by state employees.

The state will identify opportunities to *Lead by Example* in the procurement of Maine-sourced and climate-friendly goods and services, such as carbon-storing mass timber for state construction projects, biofuels for state vehicles, and locally produced food. The state will also pursue efforts that lead to healthier workplaces and reduce solid waste from government facilities.

The state will also seek to support similar efforts in local community buildings, including energy-efficiency retrofits and renewable-energy projects on municipal and tribal government properties, and climate-friendly practices and materials for school construction and affordable housing. Many Maine communities have already led the way with efficiency, renewable energy, and clean transportation investments.

STRATEGY C

REDUCE CARBON EMISSIONS

in Maine's Energy and Industrial Sectors Through Clean-Energy Innovation

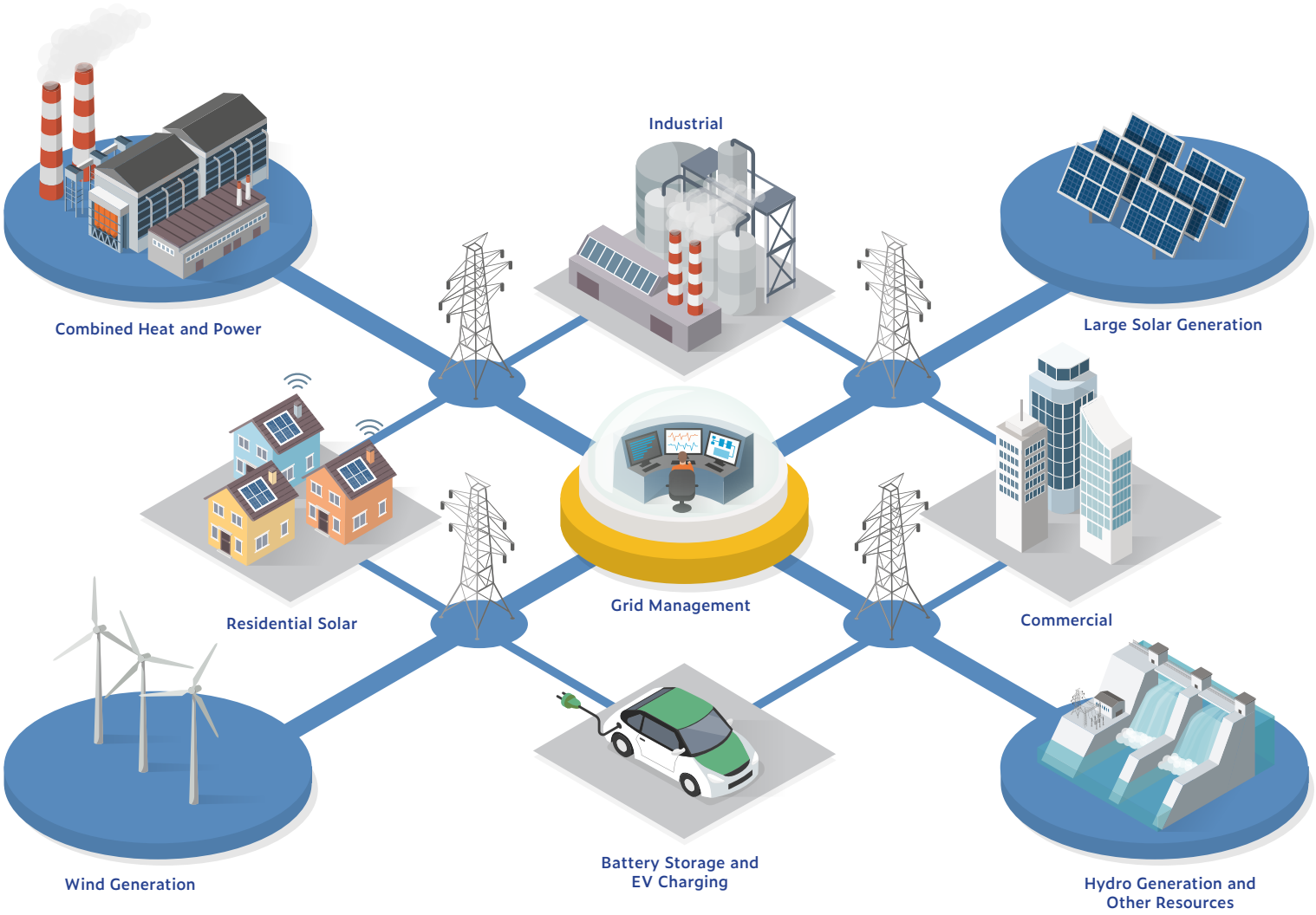
Sectors with high greenhouse gas emissions, such as transportation and heating, must shift their energy sources from fossil fuels to electricity and low-carbon fuels to achieve Maine's climate goals. This makes it even more essential to produce and consume electricity that is increasingly clean and from lower-emissions resources. This transition must be managed effectively to ensure affordability and reliability.

Maine is a member of a cooperative effort by 10 Northeast and Mid-Atlantic states to limit emissions called the Regional Greenhouse Gas Initiative (RGGI). RGGI is the first mandatory, market-based carbon dioxide (CO_2) emissions reduction program in the United States, and it is focused on the power-generating sector. RGGI proceeds in Maine have been used to provide technical assistance and financial incentives to help Maine's residents, institutions, businesses, and industries make investments in energy efficiency.

A Renewable Portfolio Standard (RPS) establishes the percentage of electricity that an electricity supplier is required to provide from renewable resources. To encourage more generation of lower-emissions electricity, Maine has increased the state RPS to 80% by 2030, with a goal of 100% renewable electricity by 2050. Additionally, pairing energy storage with small distributed and large utility-scale renewable resources provides opportunities to maximize the value of renewable energy to our electric grid.

DISTRIBUTED ENERGY RESOURCES

Distributed energy resource (DER) generally refers to small-scale electricity generation and controllable loads that are spread out and are connected to the distribution grid system, as opposed to the larger transmission system, or directly to a building or other host facility. The most common examples of DERs are residential solar installations, but DERs can also include larger solar installations, wind, small-scale hydro, tidal, and even energy storage. Distributed energy systems can also support investments in infrastructure that can lead to overall reduced costs (providing savings for ratepayers and supporting equity goals) and can avoid barriers that often accompany small-scale renewable energy projects.



In Maine, a distributed generation resource is defined by statute as being fueled by renewable technologies, and programs have recently limited the size to being less than 5 MW in capacity. Additionally, DERs can include demand-response technologies and interactive resources, such as electric vehicle smart chargers, smart thermostats, and heat-pump water and space heaters. These resources either provide energy to the electrical grid or allow for greater control of demand for electricity and are located at various geographic locations across the grid system, sometimes "behind the meter."

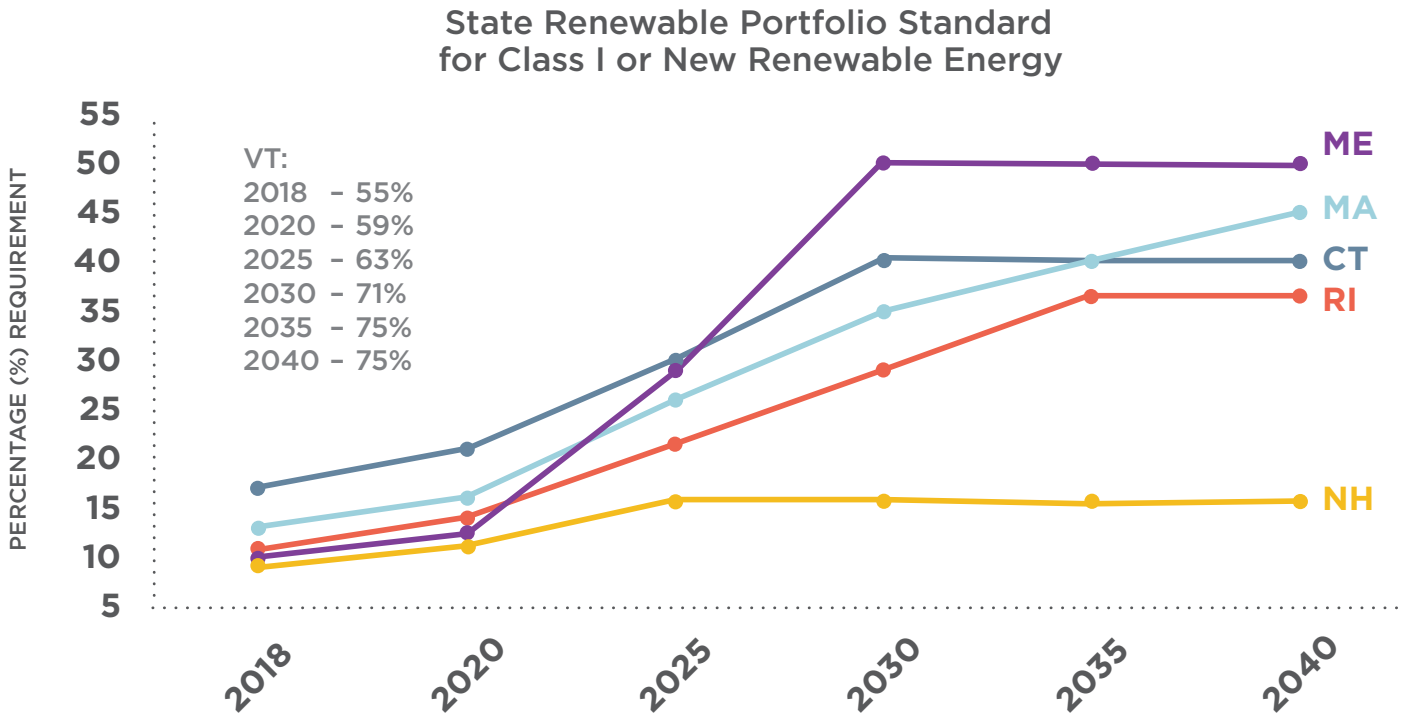
Figure 10 below from ISO New England shows the percentage requirement from Class I (new renewable-energy resources). It does not include Maine's current Class II requirement of 30% which includes the existing forms of renewable energy generation. With these two classes combined, Maine will lead the region in clean power usage after 2025.

Maine's clean-energy resources provide a significant opportunity to embrace energy innovations that can drive economic growth. As overall demand for electricity increases, we must continue to encourage energy efficiency and support shifting use away from high-use time periods (peaks) through demand management and "load flexibility" strategies. This will not only make Maine's grid cleaner, but more reliable and affordable — critical to ensuring a cost-effective transition to electrified heating and transportation sectors.

Reducing emissions and increasing energy generation in Maine carries important equity considerations. The Equity Assessment suggested that associated processes, procurements, and policies for clean-energy development and deployment should seek price stability and affordability for all ratepayers.

Incentives that support targeted programs for low- to moderate-income access to cleaner, money-saving electrification technologies in heating and transportation will be key. In addition, a focus on electric-rate structure, charging availability, and diverse communications with trusted partners about programs and savings will be essential to ensure equity. Clean-energy technology offers benefits like reduced pollution and job opportunities for frontline communities. Therefore to achieve equity outcomes, clean-energy benefits should be targeted to communities who would most benefit.

Figure 10: New England States' Class I Renewable Portfolio Standards.



Source: ISO New England.
This chart is showing just Class I (and Class IA in Maine) resource requirements; the 80% RPS by 2030 includes Class II resources which can make up the remaining 30% in Maine.

1

Ensure Adequate Affordable Clean-Energy Supply

- **Achieve by 2030 an electricity grid where 80% of Maine's usage comes from renewable generation.**
- **Set achievable targets for cost-effective deployment of technologies such as offshore wind, distributed generation, and energy storage, and outline the policies, including opportunities for pilot initiatives, necessary to achieve these results.**

Maine will need to ensure adequate affordable clean-energy supply to meet our 100% RPS goal and any increased load through the development of centralized generating resources, distributed energy resources, and other measures.

To ensure available resources, it will be necessary to create new or expand existing clean-energy procurements in 2021 and 2022 based on the results from the Governor's Energy Office study due in January 2021. The state should analyze how to achieve 100% clean energy earlier than the 2050 goal now in statute.

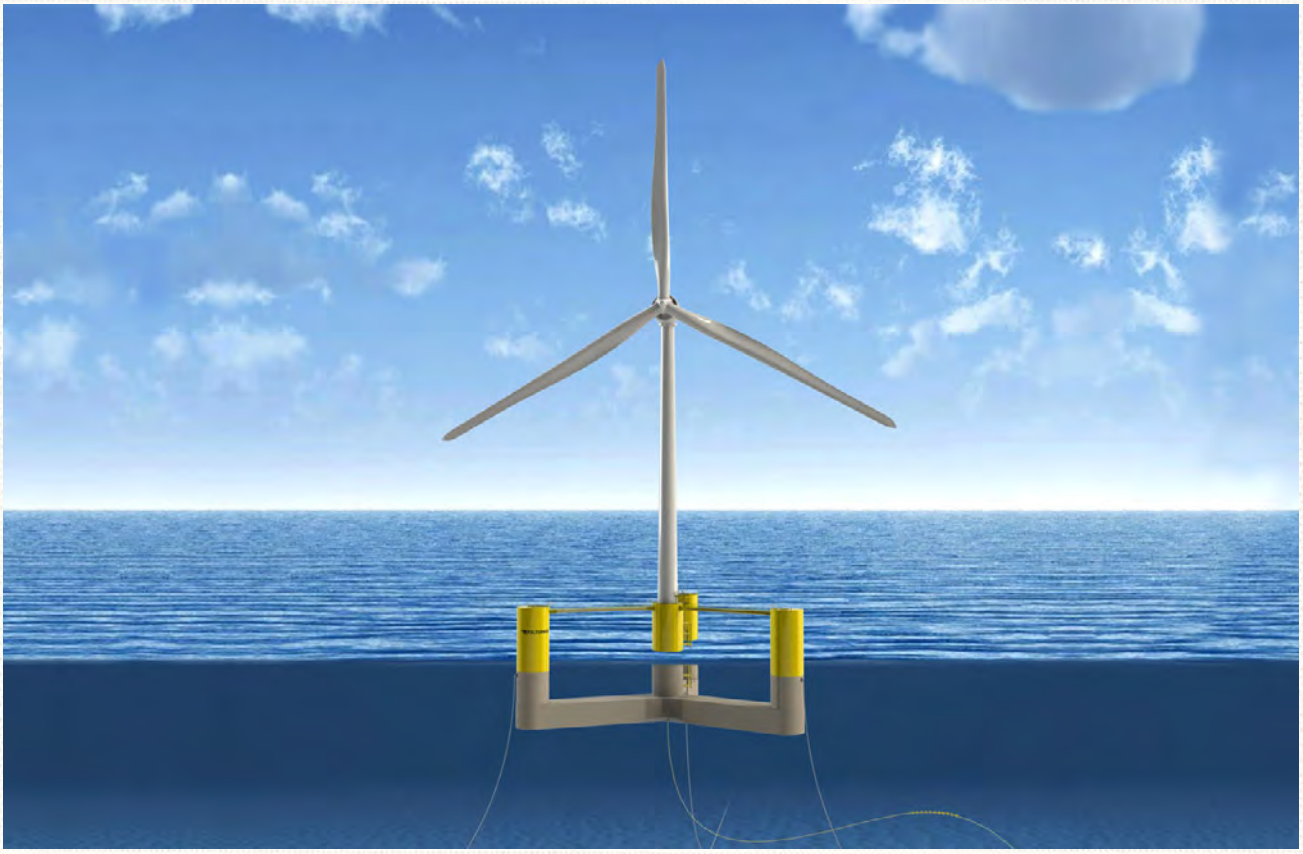
Maine should leverage this development of renewable-energy resources to ensure the highest benefits for our residents and economy. This will require additional procurements of clean-energy supply and could be supported through specific development targets for offshore wind, smaller distributed energy resources, and energy storage. The state should work with landowners, developers, fishermen, and other important stakeholders to develop siting guidelines that seek to minimize impacts to communities, fishing, and the environment, and avoid significant losses of key farmlands.

Research has demonstrated that renewable energy sources can provide energy at a cost lower than or comparable to non-renewable sources. And as renewable-energy technology continues to advance, the cost of renewable energy is expected to further decrease, ensuring lower and more stable energy costs for Maine's families and businesses.

Continued development of clean-energy resources to meet the state's RPS and climate goals will create the opportunity for growth of a clean-energy economy, including the creation of thousands of high-quality jobs. As Maine shifts to a cleaner electricity and heating sectors, efforts should be made to reduce negative impacts on workers in existing Maine-based fossil-fuel businesses, like heating-fuel delivery, giving careful consideration to support the transition for these workers.

ADVANCES IN RENEWABLE ENERGY IN MAINE

Renewable energy technologies have advanced immensely over the last few decades. These advancements, along with supportive state and federal policies, have resulted in deployment of competitively-priced renewable electricity generation. The clean-energy sector in Maine has been experiencing growth, especially following the passage of numerous supportive clean-energy policies in 2019. For example, solar energy generation — from residential projects to large utility-scale projects — has attracted significant investment and development interest. In the most recent RPS procurement in 2020 run by the Public Utilities Commission, solar was the majority of the large-scale generation selected. These projects were highly cost competitive, with first-year energy prices averaging 3.5 cents per kWh.



MAINE'S OFFSHORE WIND
Clean-Energy Opportunity

Offshore wind-energy generation holds great potential in Maine; some of the strongest offshore wind speeds in the country are in the Gulf of Maine. Responsibly sited offshore wind can supply Maine's anticipated growing energy needs, while supporting significant economic opportunity.

As part of the state-initiated Maine Offshore Wind Initiative, Maine is working to position itself to benefit from future offshore wind projects, including opportunities for job creation, supply chain and port development, and offshore wind's impact on the state's energy future. To help fund this effort, the U.S. Economic Development Administration has provided the state with a $2.2 million grant to develop a comprehensive roadmap that will build on Maine's national leadership on floating offshore wind reflecting the substantial work and research done in the state and Gulf of Maine.

This roadmap will assess Maine's competitive advantage on floating offshore wind and the state of associated supply chain, infrastructure, technology, and workforce opportunities. It will also identify gaps in infrastructure and investments needed to best position the state for these opportunities. Combined with the development of innovative floating wind-turbine technologies — namely Aqua Ventus at the University of Maine — there is significant potential for homegrown offshore-wind technology and related opportunity.

This roadmap will assess Maine's competitive advantage on floating offshore wind and the state of associated supply chain, infrastructure, technology, and workforce opportunities. It will also identify gaps in infrastructure and investments needed to best position the state for these opportunities. Combined with the development of innovative floating wind turbine technologies led by the University of Maine and a first-in-the-nation floating research array in the Gulf of Maine, there is significant potential for homegrown offshore wind technology and related opportunity.

Prior to any application for offshore-wind activities in the Gulf of Maine, in federal or state waters, it is essential that the state require meaningful consultation with stakeholders including Maine's fishing industry, on the identification of a site.

Turbines from Fox Island Wind generate power for the neighboring island communities of Vinalhaven and North Haven.

2

Initiate a Stakeholder Process to Transform Maine's Electric Power Sector

- **Establish a comprehensive stakeholder process in 2021 to examine the transformation of Maine's electric sector and facilitate other recommendations of the Maine Climate Council.**

To meet Maine's greenhouse gas emissions reduction targets, large portions of the energy used in our economy will need to be converted from higher emitting sources, like fossil fuels, to electricity — a transition referred to as "beneficial electrification" — and this electricity must increasingly come from cleaner generation sources. In addition, the way we manage energy should change; instead of continually adding expensive infrastructure to meet peak loads, we can manage demand more wisely and improve markets to keep electricity affordable.

Beneficial electrification in heating and transportation may still require significant expansion and investment in Maine's electricity transmission and distribution system, or electric grid. Effective preparation for increased electricity usage requires increased energy-efficiency efforts, thoughtful management of energy uses, modernization of the electricity grid, enhanced grid management systems, greater use of markets and aggregation, and accompanying statutory and regulatory policies to ensure that Maine's power sector evolves efficiently and affordably. These elements reflect a fundamental transformation of the electricity sector that is now underway nationally.

Maine's stakeholder process will examine and provide recommendations regarding the transformation and planning of our electric sector to accomplish the recommendations of the Maine Climate Council, achieve Maine's greenhouse gas reduction requirements and clean-energy goals, and help ensure the state's competitiveness well into the future.

The process will be managed by the Governor's Energy Office in coordination with the Maine Public Utilities Commission. Areas for consideration should include: utility structure, load management, data and information access, grid modernization and expansion, non-wires alternatives, interconnection, distributed energy resources, aggregation, equitable cost allocation, and rate design, integrated grid planning, regional and local electricity markets, regional collaboration, reliability and resiliency, and changes in law and regulation.

3

Accelerate Emissions Reductions of Industrial Uses and Processes

- **Launch an Industrial Task Force to collaboratively partner with industry and stakeholders to consider innovations and incentives to manage industrial emissions through 2030 and reduce total emissions by 2050.**

Industrial facilities in Maine have historically participated actively in energy-conservation programs; however, additional cost-effective opportunities remain to be pursued. Expanding programs like the industrial energy-efficiency program offerings through Efficiency Maine Trust will encourage additional investments that will result in more competitive manufacturing businesses and reduced emissions.

Achieving deep emissions reductions in this sector by 2050 will likely require significant shifts away from petroleum-based fuels to cleaner alternatives. Some fuel-switching opportunities can be both cost effective and reduce greenhouse gas emissions, such as converting from oil to natural gas and increasing efficiencies through combined heat and power (CHP) technologies.

Emissions modeling also shows other greenhouse gas, non-CO_2 emissions sources, as reported in the "other" sector of emissions, which come from industrial processes, agricultural, and landfill emissions along with other types of waste. Best practices and incentives

Beneficial Electrification: Converting from higher-carbon-emitting sources, like fossil fuels, to electricity that is increasingly procured from clean, renewable resources that will advance Maine's climate goals.

can encourage mitigation of these emissions through innovation. Some of these same emissions sources may provide unique opportunities for energy production — including biodigesters or landfill-emissions-capture technologies.

Many industrial facilities in Maine have already made these transitions in recent decades. Other opportunities, such as shifting to renewable fuels (e.g., hydrogen-rich fuels produced using renewable energy electrolysis or utilizing carbon capture and sequestration) are not yet widely commercially available or cost competitive, but they may be in the future. In the longer term, investment in new technologies will support emissions reductions, create new jobs, and secure current industries and employment by making Maine's industrial sector more competitive.

In an effort to stem future industrial emissions increases and find innovative pathways for the long-term reductions required for Maine's 2050 goals, the Maine Climate Council should create an Industrial Task Force of Climate Council members with interest and expertise, as well as outside stakeholders, to focus on solutions to address industrial emissions over time, while supporting continued economic growth in this important sector.

4

Encourage Highly Efficient Combined Heat and Power Facilities

- **Analyze policies, including the potential for long-term contracts, needed to advance new highly efficient combined heat and power production facilities that achieve significant net greenhouse gas reductions.**

CHP, sometimes referred to as cogeneration, is the production of both electricity and thermal energy, at the same location of the energy consumption. Where typically the heat produced by electricity generation is lost to the air, CHP facilities utilize the heat byproduct for on-site activities, resulting in increased overall efficiency.

Highly efficient CHP facilities capture heat from electricity generation to provide steam or hot water for use in space heating and cooling, water heating, and industrial processes, thereby increasing overall facility efficiency and reducing emissions. CHP avoids energy waste, reducing the need for additional energy consumption to accomplish heating and industrial processes. CHP can both reduce Maine's emissions and support existing industrial businesses and large institutions with lower operating costs.

Maine sawmills and wood manufacturers, for example, that have installed boilers to provide steam for drying lumber are increasingly investing in CHP facilities that also generate power from the same wood fuel source. Technological advances are allowing smaller facilities the ability to install efficient burner technologies. These opportunities establish greater efficiencies in wood-derived energy and provide markets for mill waste that might otherwise be landfilled.

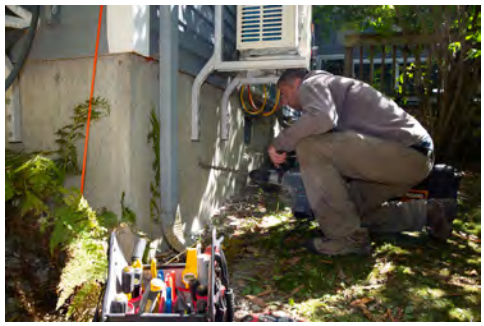
Maine should continue to support the growth of highly efficient CHP facilities, including through the long-term contracting authority of the Maine Public Utilities Commission.

For sawmills and paper mills that produce wood chips, sawdust, and residuals during their manufacturing process, the best option for this material may be a highly efficient combined heat and power facility. At Robbins Lumber (at right), a fifth-generation family-owned white pine sawmill in Searsmont, a newly-installed combined heat and power facility handles the sawmill's residuals, while generating heat to dry lumber, heat buildings, and renewable electricity. This supports the mill's economic viability, adds value to lumber grown through sustainable forestry practices, and provides locally-sourced construction materials that sequester carbon for the long-term.


27


ESB





STRATEGY D

GROW MAINE'S CLEAN-ENERGY ECONOMY

Protect Our Natural-Resource Industries

Climate change threatens vital natural-resource sectors of Maine's economy, like our forestry, farming, and fishing industries. As sea levels rise and warming winters impact iconic Maine places and seasons, climate change will also impact community and economic infrastructure and leading economic sectors like tourism and hospitality.

Some of these same sectors will also have new opportunities in response to climate change. Locally-grown food offers economic development, emissions reductions, and increased carbon sequestration through good soil practices. In the forestry sector, innovative technology can reduce emissions and support carbon-neutrality goals. The Equity Assessment pointed out that these industries often carry associated benefits, such as supporting local jobs, to the rural communities in which they are located.

Transitioning to cleaner energy generation and greater energy efficiency offers exciting new economic opportunity.

Maine currently spends roughly $4.4 billion annually on imported fossil fuels. Clean and renewable energy solutions can help keep those energy dollars in Maine, catalyzing a transformative economic impact while significantly reducing emissions.

Growth in Maine's energy and efficiency sector will require a skilled workforce, creating good career opportunities for thousands of Maine people, especially when paired with focused education and training opportunities, and policies and incentives that reward quality jobs with family-supporting wages and benefits.

Equity considerations for the clean-energy economy include ensuring broad access to job opportunities and important career training pathways into these growing fields, supporting the transition for fossil-fuel-based industries, businesses, and workers and ensuring stability of careers in natural-resource-centric fields that are critical supports for rural communities. The public health benefits from transitioning to clean-energy sources is also a positive benefit for all Maine people, but especially impactful for communities located near power-generation sources.

1

Take Advantage of New Market Opportunities

- **Support the ability of Maine's natural-resource economies to adapt to climate-change impacts.**
- **Grow Maine's forest-products industry through bioproduct innovation, supporting economic growth and sustainable forest management and preservation of working lands.**
- **Establish the University of Maine as the coordinating hub for state-applied research on forestry, agriculture, and natural land-related climate concerns, including research and development of climate-friendly bio-based wood-market innovation; and research around climate-friendly agricultural practices.**
- **Increase the amount of food consumed in Maine from state food producers from 10% to 20% by 2025 and 30% by 2030 through local food system development.**
- **Launch the Maine Seafood Business Council by 2022.**

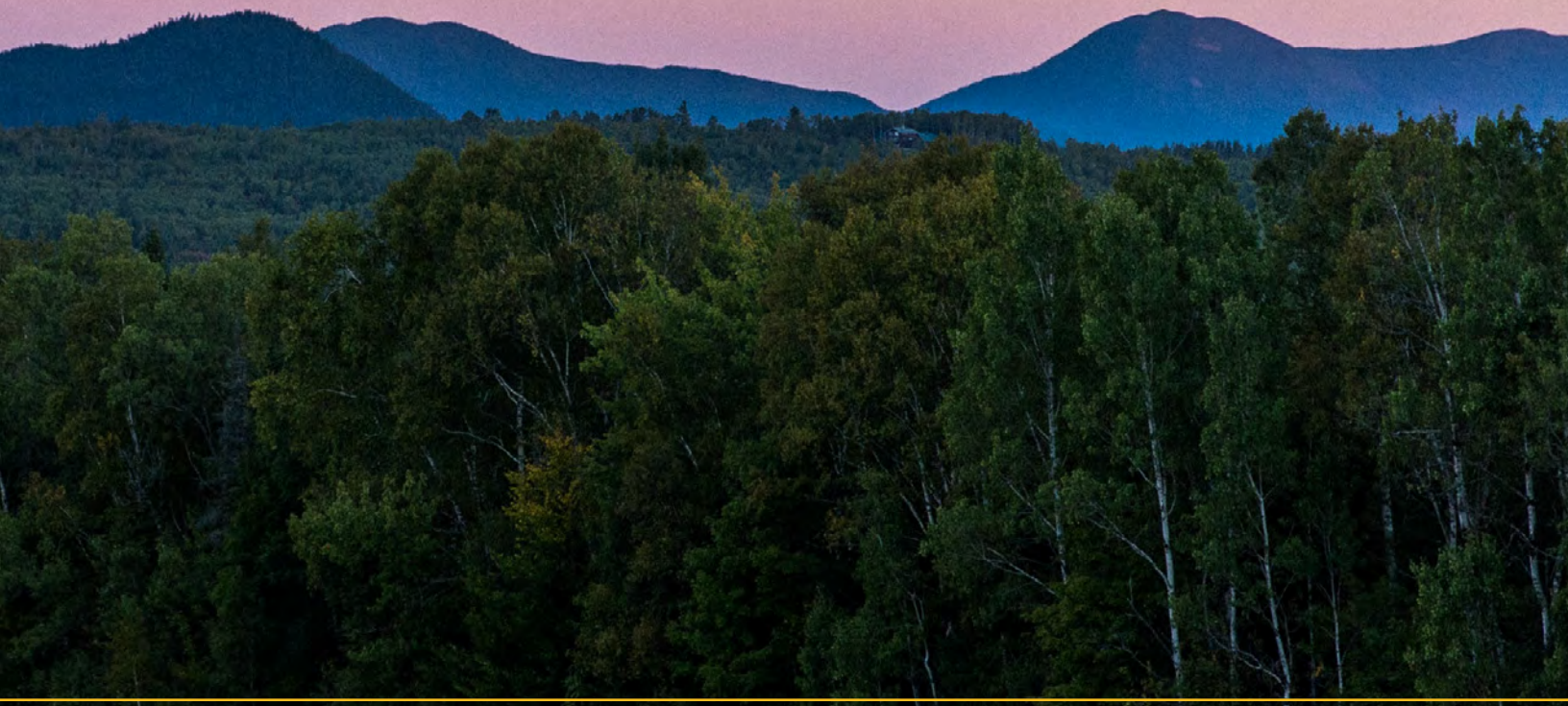
Technical assistance and financial incentives will help Maine's fishing and aquaculture, farming, and forestry businesses and landowners prepare for the rapidly intensifying impacts of climate change. Maine should provide clear information, forecasts, and tools about climate-change impacts that are relevant to business planning, operations, and management.

New markets will offer new economic opportunities and create jobs. Together these strategies will help build resilience within Maine's natural-resource industries while also helping to sequester more carbon by maintaining industries that support the stewardship of Maine's natural and working lands and waters.

FORESTS

Maine's forests cover 89% of the state and support an important forest industry sector that has at least an $8 billion direct economic impact. Global trends for innovative, climate-friendly products offer new markets to diversify and grow Maine's forest-products industry. Supporting industry innovation can make the most efficient possible use of sawmill residuals and other residual biomass from timber, adding value for the industry while also reducing waste that could potentially be landfilled, causing additional climate impacts.

Maine should develop and enhance marketing programs for Maine forest products, in coordination with efforts such as FOR/Maine, focused on products such as mass-timber, biofuels, bioplastics, nano-cellulosic materials, and wood-based insulation products. State construction projects should leverage opportunities to use mass timber and encourage related manufacturing facilities to locate in Maine. The state should continue to invest in the University of Maine research facilities to become a globally recognized hub for climate-friendly bio-based wood-market innovation.



MAINE'S FOREST BIOECONOMY AND CLIMATE CHANGE

Sustaining and developing new markets for Maine's forest products is critical to maintaining the working forests that provide significant benefits to Maine's climate goals by sequestering carbon.

Low-grade wood harvest is an important sustainable forestry tool, which helps landowners grow better quality timber. At the same time, sawmills and paper mills produce a lot of chips, dust, and residuals as waste from the production process. Innovation is driving new market opportunities for these waste wood materials.

Public awareness of global climate change has driven governments, consumers, and manufacturers to recognize that products produced with plant materials (cellulose) from trees and other plant products can be used to replace those made with petroleum products. As new biomass from trees grows and replaces the plant materials used to produce these products, it removes carbon from the atmosphere and contributes to carbon neutrality.

Growing worldwide demand for sustainably-produced climate-friendly products is one of the greatest opportunities recognized by the industry-led effort to build a globally competitive forest industry, called FOR/Maine.

A bioeconomy strategy for Maine relies on diversification of our forest economy through the pursuit of the best and highest use for every part of the tree, resulting in greater environmental and economic resilience and the reduction and repurposing of waste.

Innovative new products include cross-laminated timber, a building material for multi-story buildings that stores carbon for the life of the building; the use of wood cellulose in building insulation products as a replacement to petroleum-dependent fiberglass insulation; biodegradable and recyclable food packaging paper that replaces single-use plastic; and transportation and heating biofuels derived from woody biomass.

FARMS

Maine should provide information, tools, and technical assistance to enhance farm resilience and profitability in the face of climate change. This includes technical tools that translate weather and other environmental data into decision-support resources for farmers, guidance on incorporating climate risk into farm business models including access to crop insurance, the latest information on pest and pathogen risks and strategies to avoid related losses, and guidance to better protect the health of farmers to escalating risks like heat stress and vector-borne disease. It should also include greater access to funding to support implementation of soil-health practices and on-farm energy efficiency and renewable-energy projects. Enhancing on-farm adaptation to climate change with data, support, and incentives is the foundation upon which a resilient and vibrant food system in Maine is built.

A strong local food system will support Maine farmers, fishing and aquaculture harvesters, and other food producers while also supporting more resilient Maine communities. Maine's most recent experiences during the COVID-19 pandemic showed the challenges of global supply chains for a variety of basic needs, including food. Maine should provide financial support to strengthen Maine's food systems so that more food can be produced and processed in-state and distributed efficiently and affordably. This also includes promoting research, development, and planning efforts that support the growth and stability of Maine food systems. Reducing food waste that contributes to Maine's greenhouse gas emissions is an important aspect of a strong local food system.

Approximately 10% of the food that Mainers consume is produced in our state, possibly even more than that since the impacts of COVID-19 on markets accelerated interest in Maine-grown food. Recent legislation directed the Department of Agriculture, Conservation, and Forestry to increase state purchasing of Maine-grown food, and to support institutions' purchases in reaching the goal of purchasing 20% of the food they procure from Maine producers by 2025. Regional efforts to plan for strong local food systems across New England have set goals of increasing consumption of locally and regionally produced food to 35% by 2035 and 50% by 2050.

Maine should play an important role in achieving those goals due to our strong agricultural land base and agricultural and fishing sectors compared to other New England states.

FISHERIES AND AQUACULTURE

Maine should closely monitor species and habitat changes and provide information about ocean temperature, salinity, and acidity changes at the local level to support fishing and aquaculture businesses.

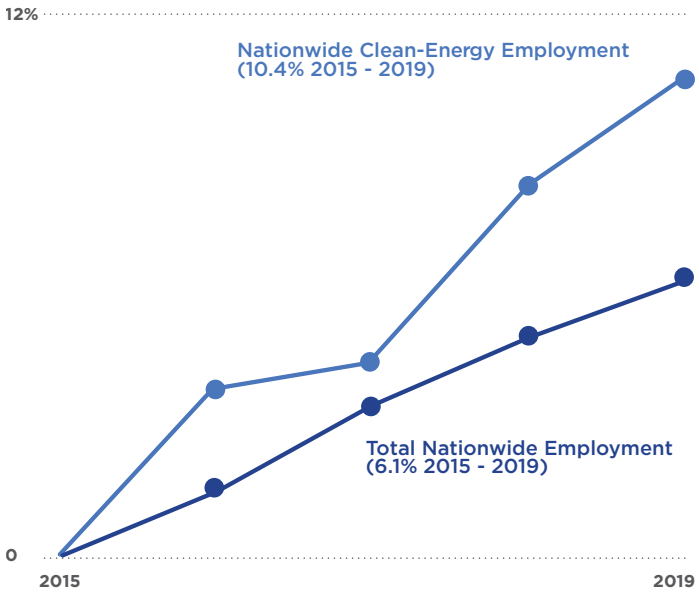
Maine's wild fisheries and aquaculture industries will need to be managed in the context of changing ecosystems and a changing climate. This will require market support to promote stable businesses. It will also require industry groups and the state to work together to develop regulatory and policy changes at the local, state, and federal levels that promote the long-term productivity of valuable marine resources.

A proposed Maine Seafood Business Council will work with Maine's seafood harvesters, shoreside businesses, and working waterfronts to provide them with access to information and tools to support operational decisions, capital investments, and long-range planning to implement climate adaptation and mitigation strategies.

To support diverse markets for Maine fishermen and aquaculture businesses, Maine should expand local and direct marketing opportunities for sustainably produced Maine seafood. Increased local consumption of Maine seafood is an important piece of strengthening our local food systems.

State support for the growing aquaculture sector can serve to increase Maine seafood production, provide important economic opportunities for coastal communities, while also harnessing potential ocean acidification mitigation and other environmental services — especially with crops like seaweed and kelp (that can lower the acidity of surrounding waters), and shellfish, which are known to improve water quality. Technical assistance, financing tools, and policy strategies will be needed to help fishing and aquaculture businesses plan for and transition activities in a changing ocean ecosystem.

Figure 11: Clean-Energy Employment.



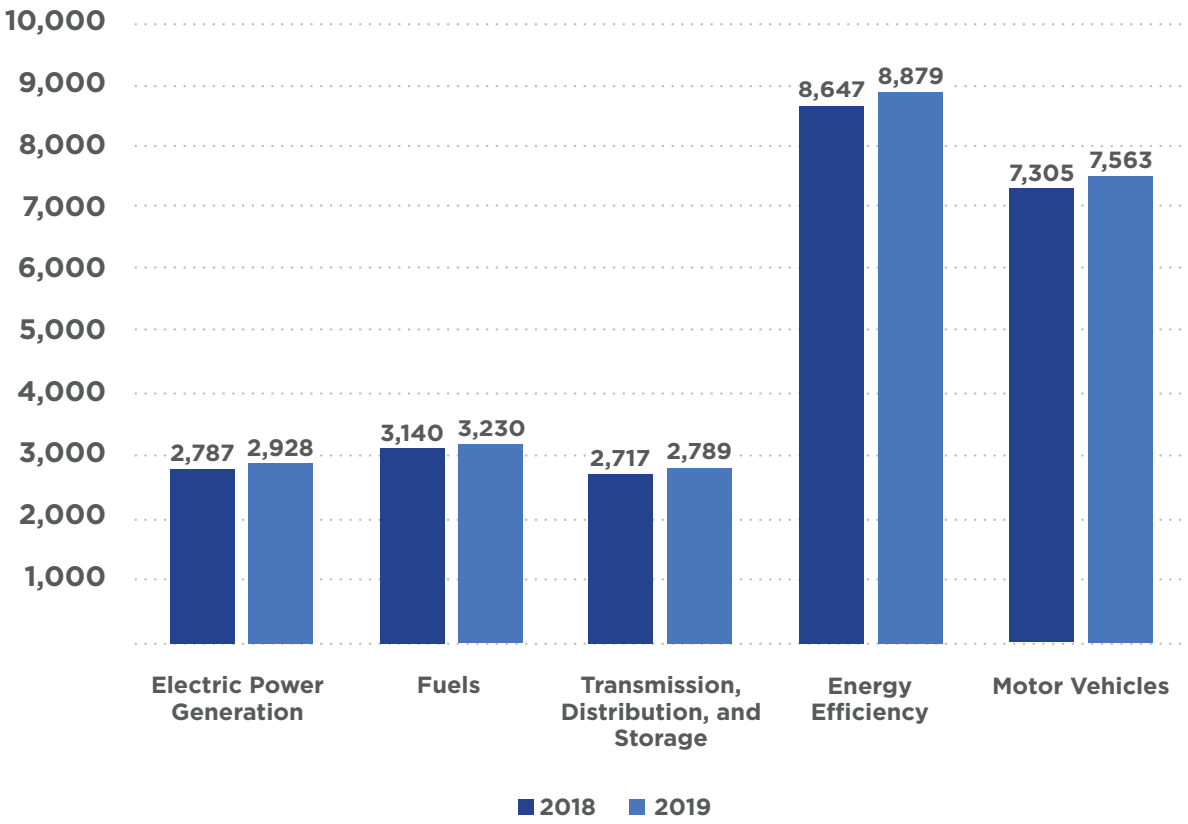
Maine should continue to evaluate and implement changes to Maine's fishery and aquaculture laws and regulations that provide the opportunity to address environmental change and emerging fisheries. And with both federal regulation and co-management roles, partnership and advocacy in regional and federal contexts will also be required.

2

Clean-Energy Jobs and Businesses in Maine

- **Launch a workforce initiative by 2022 that establishes ongoing stakeholder coordination between industry, educational, and training organizations to support current and future workforce needs.**
- **Establish programs and partnerships by 2022 for clean-tech innovation support to encourage the creation of clean-energy and climate solutions.**

Figure 12: Employment by Major Energy Technology Application.



The plan recommends that Maine commit to increasing its current clean-energy workforce, while establishing new supply chains for Maine-based manufacturers to create sustained, good-paying skilled-labor jobs across the state.

Maine's climate goals and renewable energy policies mean that our clean-energy sector is poised for robust growth. A supporting report to this Plan, Strengthening Maine's Clean Energy Economy, describes the opportunity to create economic recovery and good jobs in this fast-growing sector, and outlines the specific targeted investments, policies, and workforce-training strategies that will be needed.

Nationally, the clean-energy economy is growing faster than the economy as a whole. Between 2015-2019, the U.S. clean-energy sector added jobs faster than the rest of the U.S. economy. The plan finds that median U.S. hourly wages for clean-energy jobs are about 25% higher than the median wage. Clean-energy careers also offer a higher prevalence of health insurance and retirement benefits.

In Maine, there were approximately 14,000 clean-energy workers employed in 2019. Of those, nearly 8,900 people are employed in energy-efficiency jobs, roughly the same as the total number of people employed in traditional-energy jobs including electric power generation, fuels, and transmission, distribution and storage combined. From 2018 to 2019 in Maine, all sub-sectors within the energy industry experienced job growth.

At the same time, Maine is projected to lose overall employment in the next 10 years due to demographic trends as older workers retire. The clean-energy industry can help attract younger workers — both from within the state and outside of Maine.

A skilled workforce is a key component of Maine's transition to a clean-energy economy. By supporting educational and training pathways for Maine people to find careers, and attracting a talented, diverse workforce to Maine, the clean-energy industry has the potential to create new, sustained opportunities.

The Strengthen Maine's Clean Energy Economy Plan highlights the importance of encouraging efforts to target the creation of these high-quality jobs through strategies that pair job quality standards with clean-energy investments. Some of these may include prevailing wages, project labor agreements, safety and health protections, community benefit agreements, registered apprenticeship utilization, and local-hire provisions. Domestic content requirements (guarantees of components and contracting with Maine workers and businesses) can also assist in building local supply chain opportunities. These and other related requirements should be considered when developing clean-energy projects and relevant policies.

REBUILDING OUR ECONOMY
Tackling Climate with Shovel-Ready Infrastructure Projects

Investments to prepare our communities and infrastructure for climate-change impacts will create thousands of good-paying jobs in the engineering, design, and construction sectors. Investing in shovel-ready projects during a time of significant economic hardship can help revitalize Maine's economy in the short and long term, while also making our communities and state infrastructure systems more resilient.

Maine should develop a list of climate-related infrastructure projects in early 2021 to utilize for near-term economic recovery, and track over the long term to identify backlogs. Maine communities and the state have already identified critical infrastructure projects aimed at adapting to and reducing climate-change impacts. Many of these projects do not have the necessary funding. This includes a backlog of $325 million in infrastructure projects that local communities have identified to reduce disaster risk.

Much-needed pre-development assistance would help ensure that infrastructure projects are made shovel-ready for state or federal support including design, engineering, and permitting; grant writing; and matchmaking with investors for public-private partnerships.

MOISE MULAMBA KALONJI

Moise Mulamba Kalonji of Portland, a native of the Democratic Republic of the Congo, is an electrical engineering student at Southern Maine Community College.

Why did you choose Maine to live and study?

Prior to the U.S., I earned an engineering degree from the American Christian Liberal Arts University in Kinshasa, studied engineering and energy project management at Technische Universität Berlin, and worked for Greening Africa Together to promote solar energy and access to clean water. When I came to the U.S., I heard that Maine was safe and welcoming to immigrants, and the future here is bright in the clean-energy fields in which I want to work.

What do you want to achieve in clean energy?

My passion is solar, and I want to own my own solar energy company someday. My experiences in Africa and Europe showed me the great potential for clean energy to improve our environment and our economy, which is a sentiment I share with many of my classmates at SMCC. We are all excited about the opportunities the renewable-energy industry could have for us and for Maine.

What should be considered for this Plan as it moves forward?

There is more to be done to ensure new Mainers like me have access to the clean-energy economy, as energy consumers and also to support its growing workforce needs. We must think boldly about our actions and realize what we do in Maine has an effect across the world. And we should rise to the challenge before us — I'm proud to be here for the greening of Maine, and ask others to join in and help our state thrive against climate change.

STRATEGY E

PROTECT MAINE'S ENVIRONMENT AND WORKING LANDS AND WATERS

Promote Natural Climate Solutions and Increase Carbon Sequestration

Climate change and development are harming Maine's natural and working lands and waters, which are key to the state achieving its carbon neutrality commitment by 2045.

By current estimates, Maine loses approximately 10,000 acres of natural and working lands to development each year — a figure which is projected to grow in coming years. This development is a direct source of carbon emissions and hinders the growth of natural climate-change solutions, such as the powerful carbon-storage potential of forested lands. Maine's forests alone can draw back, or sequester, an amount equal to at least 60% of the state's annual carbon emissions, a figure that rises to perhaps 75% if forest growth and durable products are included.

Maine's coastal and marine areas also store carbon, while supporting our fishing, aquaculture, and tourism industries. Coastal and marine areas face rising sea levels and other climate-change impacts, which could turn these areas from sinks of carbon into sources of carbon. Maine's coastal sand dunes, wetlands, and marshes are also a powerful natural climate solution for protecting our coastal communities from flooding and erosion. Conserving and restoring coastal and marine areas will preserve their carbon-storage value as well as their other benefits.

Financial incentives and technical assistance are required to support foresters, landowners, loggers, farmers, fishermen, and communities to reduce emissions, increase their resilience to climate change, and implement enhanced opportunities for carbon-storage initiatives.

Improved monitoring of these lands and waters, and better sharing of that information, will serve to support practitioners in making proactive, informed decisions to combat climate change.

Protecting natural and working lands from development maintains their potential to draw back carbon from the atmosphere, as well as to provide important co-benefits. In addition to storing carbon, Maine's natural and working land supports our farming, forestry, and outdoor-recreation industries. They provide clean drinking water and important wildlife habitat, and help moderate flooding events.

1

Protect Natural and Working Lands and Waters

- **Increase by 2030 the total acreage of conserved lands in the state to 30% through voluntary, focused purchases of land and working forest or farm conservation easements.**
  - » **Additional targets should be identified in 2021, in partnership with stakeholders, to develop specific sub-goals for these conserved lands for Maine's forest cover, agriculture lands, and coastal areas.**
- **Focus conservation on high biodiversity areas to support land and water connectivity and ecosystem health.**
- **Revise scoring criteria for state conservation funding to incorporate climate mitigation and resiliency goals.**
- **Develop policies by 2022 to ensure renewable energy project siting is streamlined and transparent while seeking to minimize impacts on natural and working lands and engaging key stakeholders.**

FORESTS AND FARMS

Protecting natural and working lands is critical to maximize carbon storage, support working farms and forests, ensure valuable ecosystems remain in place for future generations, and contribute to Maine's fight against the effects of climate change.

Conserving forests and farmland through conservation easements is one of the more cost-effective strategies to help reach carbon neutrality by maintaining forest cover and ensuring the lands will be available for future forest and farmland ecosystem services. A 2019 report on land conservation suggested that Maine currently has approximately 20% conserved lands or about 4 million acres.

A combination of voluntary, focused purchases of working forest or farm conservation easements and lands will support robust forest products and agricultural economies, increase carbon storage opportunities, help food security, conserve biodiversity, and enhance climate adaptation and resilience for wildlife, people, and communities.

To that end, Maine should support dedicated and sustained sources of funding to support the conservation target and to protect natural and working lands. This should prioritize providing state-matching funds for the newly-renewed federal Land and Water Conservation Fund for state projects, the Agricultural Conservation Easement Program, and other applicable grant programs that leverage additional dollars.

Additional attention needs to be focused on policies to ensure renewable-energy project siting is streamlined, transparent, and thoughtfully balances potential impacts on working land, engaging key stakeholders.

COASTAL AND MARINE

Along the coast, protecting and restoring coastal and marine ecosystems benefits biodiversity, protects our communities from the impacts of climate change, and stores carbon. Sand dunes and beaches, seagrasses, and tidal salt marshes act as natural barriers to waves. Protecting floodplains, wetlands, and streams helps to reduce flooding damages.

Maine should ensure a network of biologically and geographically diverse lands, which are well connected, to allow plants and animals to move across the landscape to find the places they need to thrive as these habitats change over time.

MELISSA LAW

Melissa Law is the co-owner of Bumbleroot Organic Farm, an organic vegetable and flower farm in Windham, an award-winning entrepreneur, and a member of the Maine Climate Council.

Why is it important for farmers to engage in climate issues?

Farmers are on the frontlines of climate change — our livelihoods literally depend on the weather. As weather becomes less predictable and more severe, it will be increasingly difficult for farmers to grow the food that sustains us all. As a young farmer, I view climate change as the biggest challenge my business will face in the decades to come. I want to make sure young voices are heard, as future generations will bear the burden of this crisis. I view climate action as nonnegotiable.

What is your concern for farming's future with climate change?

The climate crisis threatens farms of all sizes and sectors — from vegetables and specialty crops to dairy, livestock, and commodities. It will undermine crop yields, supply chains, and food security. Supporting farm businesses and strengthening local and regional food systems are key to building resilience to the instability and economic impacts of climate change in our state.

What should farmers know about this plan?

This plan protects farmland from development, promotes climate-friendly practices in agriculture, and strengthens our local food system — all of which are critical for farmers and for Maine communities. Not only will this result in increased carbon sequestration and reduced emissions, this will ensure that our communities have local food producers, enhance food security for Maine people, and reduce our dependence on food transported thousands of miles to our state.

2

Develop New Incentives to Increase Carbon Storage

- **DEP will conduct a comprehensive, statewide inventory of carbon stocks on land and in coastal areas (including blue carbon) by 2023 to provide baseline estimates for state carbon sequestration, allowing monitoring of sequestration over time to meet the state's carbon-neutrality goal.**
- **Establish by 2021 a stakeholder process to develop a voluntary, incentive-based forest carbon program (practice and/or inventory based) for woodland owners of 10 to 10,000 acres and forest practitioners.**
- **Engage in regional discussions to consider multistate carbon programs that could support Maine's working lands and natural-resource industries, and state carbon-neutrality goals.**

With most of Maine's working lands privately owned, policies and incentives for landowners to improve land management are needed to maximize natural carbon sequestration and meet Maine's climate-change goals and objectives. Opportunities to incentivize carbon storage in Maine's coastal and marine areas should be analyzed.

In coming years, Maine will engage in regional discussions to consider multistate carbon programs that could support Maine's working lands and natural-resource industries, and advance the state carbon-neutrality goals. Careful study of the impact of out-of-state carbon markets and the impact they could have on Maine's sequestration targets and potential regional concepts that could support state and landowner goals should be evaluated.

FORESTS Financial incentives should be developed to encourage the adoption of climate-friendly practices and investment in new technologies. Updating Maine's land taxation policies, including updating the Open Space Current Use Taxation Program and maintaining the Tree Growth Tax Law, could provide incentive for landowners to adopt land-management practices with climate mitigation and adaptation benefits to increase carbon storage.

In addition, Maine should establish a stakeholder process to develop a voluntary, incentive-based forest carbon program (practice and/or inventory based) for woodland owners of 10 to 10,000 acres and forest practitioners to increase carbon storage in Maine's forests and encourage good forest management practices while maintaining current timber harvest levels.

Incentivizing high-quality on-the-ground performance by loggers and facilitating the use of low-impact timber-harvesting equipment would also support progress toward achieving climate goals.

FARMS Incentives to adopt climate-friendly agricultural practices that focus on soil health — cover cropping, reduced tillage, and rotational grazing — will help sequester carbon on Maine farms, while improving water-holding capacity and preventing soil erosion, which will help farms to be more resilient in the face of droughts or extreme weather events. Funding for farming infrastructure and technology upgrades, such as renewable-energy generation and reduced fossil-fuel usage, can also reduce greenhouse gas emissions attributed to agriculture.

Existing state programs, policies, and financial incentives should be updated and refocused to address climate-change mitigation and resilience. This includes continuing and updating climate-friendly public land management practices and incentive programs to incorporate current climate science and support landscape and species resiliency.

COASTAL AND MARINE Coastal and marine environments store carbon, and some such as salt marshes may store more carbon per area than land. Maine's approximately 5,000 miles of total coastline is a prime opportunity to create long-term "blue carbon" storage that requires protection from development and sea-level rise.

As part of the comprehensive, statewide carbon inventory conducted by DEP, in partnership with the Scientific and Technical Subcommittee, Maine should determine where and how much blue carbon can be stored by conducting a coastwide survey of coastal environments like salt marshes, seaweeds, and seagrass beds. We should explore innovative solutions like opportunities for seaweed aquaculture to enhance long-term carbon burial and to support targeted reductions of coastal acidification. The state should also explore the opportunity for formal blue-carbon storage incentives or carbon-permit program to encourage blue-carbon habitat conservation and restoration.

3

Expand Outreach to Offer Information and Technical Assistance

- **Increase technical service provider capacity by 2024 to deliver data, expert guidance, and support for climate solutions to communities, farmers, loggers, and foresters at the Department of Agriculture, Conservation and Forestry, Maine Forest Service, Department of Inland Fisheries and Wildlife, the Department of Marine Resources, and the University of Maine.**
- **Launch the Coastal and Marine Information Exchange by 2024.**

By reaching out to communities and stakeholders to offer information and technical assistance on adopting natural climate solutions, Maine can help increase carbon storage and protect Maine's natural and working lands and waters from the effects of climate change.

Increasing the number of field foresters at Maine Forest Service should support landowner and land-manager adoption of climate-friendly practices, as well as efforts to support good forest-management practices.

Natural climate solutions, such as soil-health practices, should be a priority for state agricultural programs. Technical assistance to farmers via Soil and Water Conservation Districts, the University of Maine Cooperative Extension, Natural Resources Conservation Service, and other non-governmental organizations about agricultural practices with mitigation and adaptation benefits should be made more widely available.

The state's "Beginning with Habitat" program at the Department of Inland Fisheries and Wildlife and "Maine Natural Areas Program" at the Department of Agriculture, Conservation and Forestry should be enhanced to support technical assistance to towns, land trusts, land managers, and landowners to protect native species, conserve land and waters vulnerable to climate change, and address climate-related threats such as invasive species.

A new Coastal and Marine Information Exchange should be created by the state or supporting entities to provide accessible and relevant information and support to facilitate climate mitigation and adaptation in Maine's coastal communities and industries.

4

Enhance Monitoring and Data Collection to Guide Decisions

- **Establish a "coordinating hub" with state and non-state partners for key climate-change research and monitoring work to facilitate statewide collaboration by 2024.**
- **Create the framework and begin pilot for a coordinated, comprehensive monitoring system by 2024.**
- **Incorporate climate research and climate-change-related technologies into Maine's research and development priorities such as those developed by the Maine Innovation Economy Advisory Board and the Maine Technology Institute.**

While Maine needs a comprehensive strategy for monitoring and gathering data on a variety of climate-change-related effects, special attention must be paid to both inland and marine ecosystems in order to understand impacts, identify future trends, and monitor economic and social conditions — all to encourage improved and adaptive local decision making.

Research and development of greenhouse gas mitigation and adaption land practices will support Maine's agriculture and forestry sectors, including how to maximize stand carbon dynamics, forest soils, agricultural soils, and coastal environments to sequester carbon.

The state should promote and encourage economic and ecological research that seeks to find a role for carbon storage, especially in the agriculture and forestry industries. There are significant research needs associated with the development of new wood-based products as well as continued development and planning efforts supporting the growth and stability of Maine food systems.

In the marine realm, tracking marine and coastal habitats and species — including economically important, at-risk, and invasive species — will inform improved management practices, planning, and restoration priorities. Monitoring should include temperature, oxygen, and ocean acidification.

Lastly, a comprehensive Maine carbon-cycle analysis is needed for the state to understand and track its progress towards carbon neutrality and allow for accurate potential future participation in carbon-offset markets.

Photos at left: Kelp can provide a natural climate solution to draw down greenhouse gases and reduce acidification and nutrient pollution in coastal waters. As it grows, kelp draws carbon out of ocean water, creating a "halo effect" that can help improve nearby water quality. Scientific researchers, like those shown here from the Bigelow Laboratory for Ocean Sciences, and aquaculture businesses in Maine are now partnering to experiment with growing kelp alongside shellfish growing operations to naturally improve water quality and reduce local acidification.

STRATEGY F

BUILD HEALTHY AND RESILIENT COMMUNITIES

As Maine reduces greenhouse gas emissions to combat climate change, we must also respond to climate impacts occurring now and expected soon. State support for communities to be proactive about understanding, planning, and acting to reduce their risk from climate change is essential.

This support should focus on areas like emergency management, economic development, public health, transportation systems, energy systems, and infrastructure. The state should promote regional collaboration among towns and offer technical assistance, funding, updated land-use planning, as well as expanded public-health efforts.

Enhanced coordination of assistance and funding for community resilience will require meeting the needs of Maine's diverse communities, including small towns, large cities, and coastal and inland communities. This includes making consistent and actionable climate data, tools, and guidance accessible; guiding and incentivizing towns toward activities that enhance community resilience; and funding the planning, implementation, and performance evaluation of resilience activities.

An important component of this assistance is the expansion of guidance products that help communities evaluate climate risk, understand their options, and prioritize actions. This includes case studies, best practices and lessons learned, and peer-to-peer learning opportunities.

Maine should ensure that the lowest capacity and most vulnerable communities are able to participate; the Equity Assessment also advises meaningfully engaging a broad number of stakeholders into planning processes to ensure a variety of perspectives inform climate planning, and to ensure equitable outreach to populations at risk from climate impacts, particularly emergency situations.

KARINA GRAETER + ABBIE SHERWIN

Karina Graeter and Abbie Sherwin are on the front lines of climate resiliency with the Southern Maine Planning and Development Commission in coastal York County, where rising sea levels portend serious economic and environmental damage. As Sustainability Coordinator and Senior Planner & Coastal Resilience Coordinator, respectively, they work collaboratively with several coastal towns on resiliency strategies, a regional approach the Climate Action Plan endorses as a model for other communities to consider.

What inspires you to do this work?

Southern Maine municipalities are on the front lines of climate change, and we're inspired by their enthusiasm to work together in a true regional effort to address climate issues and impacts. In a home-rule state like Maine, there is so much opportunity for communities to test creative and novel approaches to tackle climate challenges, be leaders on climate action, and help protect the places, natural resources, and way of life so valued by our communities for future generations.

What do you think is the biggest obstacle to your work? Or the biggest opportunity?

For our communities, the biggest obstacle to mitigating and adapting to climate change is the lack of capacity, guidance, and support. A regional strategy like ours is the biggest opportunity for addressing these needs. By helping the towns communicate and work together on climate change initiatives, we can leverage peer learning to share knowledge and experiences, and we can pool resources for regional initiatives that have a broader impact.

This sort of regional collaboration is just one piece of the puzzle for understanding and addressing local climate impacts. The Climate Action Plan will help to address some obstacles and information needs, but substantive work on climate change and mobilization of the Climate Action Plan will require coordinated and comprehensive action across all levels of government in Maine.

What would you like the governor or legislature to consider when they read this Climate Action Plan?

When reading the Climate Action Plan, we would like our state decisionmakers to keep in mind that our municipalities enthusiastically support the State's efforts to address climate change, and they are eager to play key roles in meaningful climate action. To do that, municipalities need useful and usable information, technical resources, direct assistance, and financial support for understanding and addressing the impacts of climate change.

1

Empower Local and Regional Community Resilience Efforts

- **Provide state leadership for robust technical assistance and funding to communities by 2024 to support local and regional climate-resilience initiatives.**

Maine communities are coping with a variety of difficult and threatening challenges. Some are climate related while others like COVID-19 are not. To thrive within continuous change and multiple overlapping crises, communities must become proactive in understanding their risks, planning, and taking actions to safeguard their citizens.

"Resilience" will have different meanings to different communities, but generally the foundation of community resilience includes: 1) planning and decision-making processes that absorb information about climate and health risks and evaluate options for action; 2) individuals, committees, or offices in municipal and tribal governments who are responsible for planning, implementing, and monitoring the activities that reduce climate risk, improve health, and build the community's capacity to manage crises; and 3) community dialogue and participation that ensures the voices and needs of the most vulnerable citizens are elevated and prioritized.

Progress on these foundations can also help communities become better prepared to manage unexpected challenges like pandemics and economic crises.

State government's current capacity to provide aid and financial support to towns is significantly undersized compared to the need and falling particularly short in inland towns. Lack of capacity, expertise, and funding are consistently cited by municipalities as reasons why they are not able to address their climate risks. Only 11% of communities in Maine have a town planner on staff, while 72% have no local planner and insufficient or no regional planning support.

On page 86, the left-hand map shows the limited planning capacity of many Maine municipalities. The map on the right highlights those that have both limited capacity and higher social vulnerability to climate impacts based on factors such as socioeconomic status, minority status, household composition and disability, and housing and transportation.

The state should establish cabinet-level leadership (for example, a state resilience officer) and coordination across state agencies and with nonprofits, university experts, and other partners.

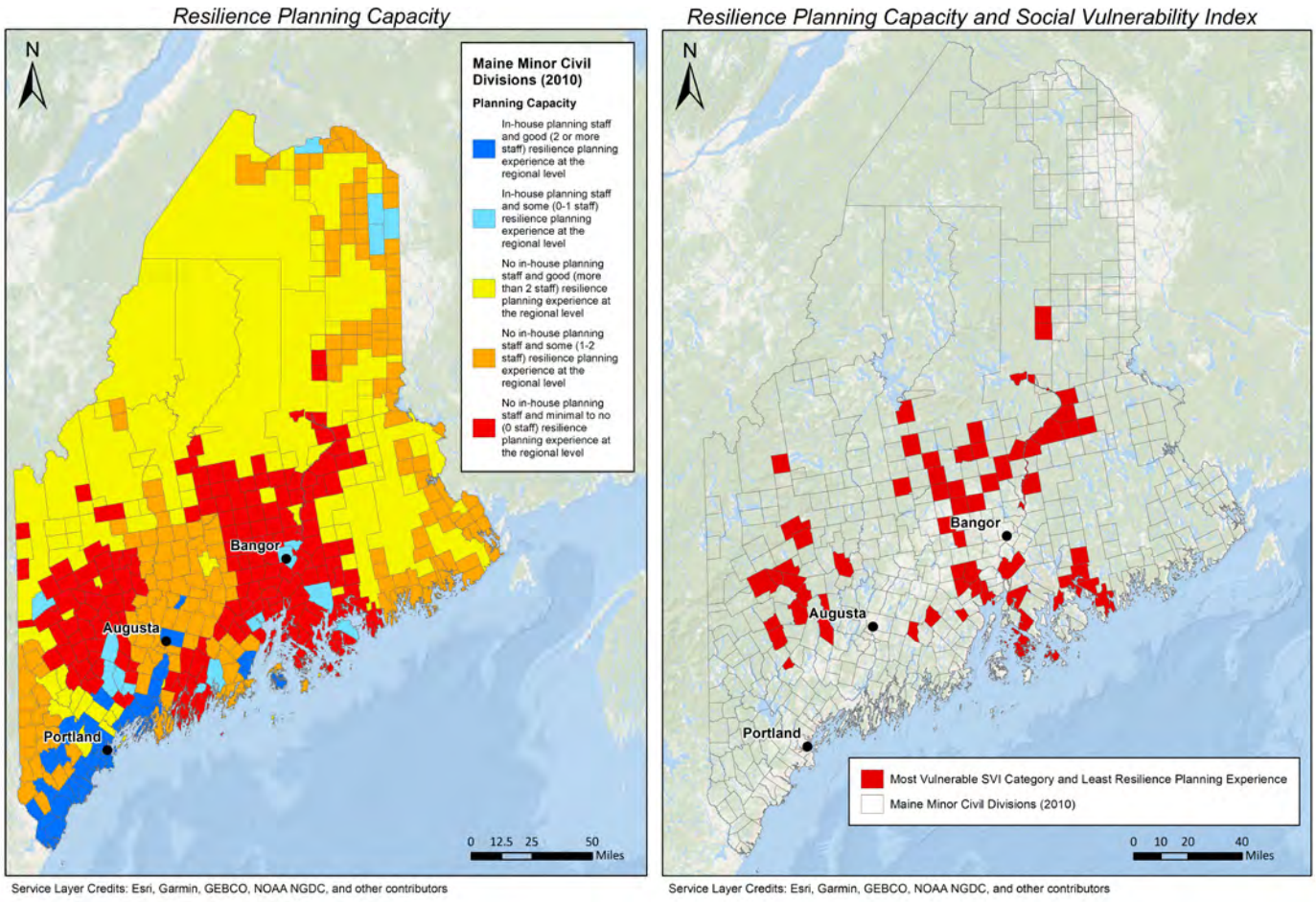
Expanded state assistance should include a clearinghouse for climate information, best practices, case studies, and funding resources to help towns understand climate risk, evaluate options, and prioritize actions. Increased funds should be available to incentivize regional resilience planning and cooperation and the inclusion of climate resilience in local and regional plans, regulations, and capital-investment plans. In addition to building state government's capacity to support communities and improving interagency coordination, regional approaches to planning and pooling resources are also cost-effective ways to build capacity. The state should encourage and support coordination among regional organizations, nonprofits, and the private-sector efforts, many of which are already providing important services and planning capacity for communities.

2

Adopt Official Sea-Level Rise Projections

- **Incorporate official state sea-level rise projections into regulations by 2022 and require regular updates to ensure the projections utilize the latest scientific data.**

Figure 13: Municipal Planning Capacity.



Official projections for sea-level rise will give agencies, municipalities, tribal governments, and the private sector clear guidance for waterfront planning, development, risk reduction, and conservation. The guidance includes projections for 2050 and 2100 of the intermediate and high scenarios for sea-level rise. While the intermediate scenarios may be useful for most planning activities, the high scenarios are important for decisions about long-lifespan infrastructure and facilities that are critical for public safety and local economies.

Following the science-based sea-level rise projections from the Scientific and Technical Subcommittee, the Maine Climate Council is recommending the following be utilized in state planning and regulatory processes:

The Maine Climate Council recommends that the state consider committing to manage for 1.5 feet of relative sea-level rise by 2050, relative to the year 2000, and 3.9 feet of sea-level rise by the year 2100.

Additionally, the Maine Climate Council recommends that the state consider preparing to manage for 3.0 feet of relative sea-level rise by 2050, and 8.8 feet of sea-level rise by the year 2100.

The Scientific and Technical Subcommittee should update these projections every four years for Council and state consideration.

3

Emphasize Resilience Through Land-Use Planning and Legal Tools

- **Develop and implement updated land-use regulations, laws, and practices by 2024 in order to enhance community resilience to flooding and other climate impacts.**

An update of land-use laws and practices will give communities the tools they need to build resilience, enhance ecosystem services, and get out of harm's way. Maine is a home-rule state, which in a climate context means that local governments have the authority and responsibility for planning and implementing most activities for community resilience. In Maine's unorganized territories, the state's Land Use Planning Commission serves the planning function.

The tools communities currently use — including comprehensive planning, zoning, site location of development, and stormwater and floodplain management practices — were not designed with climate change in mind. They need be updated to:

- **Consider climate hazards like sea-level rise**
- **Leverage nature-based solutions**
- **Contain more consistent and scientifically-sound definitions**
- **Provide more utility to communities for building climate resilience**
- **Support development and economic activity in areas less vulnerable to climate impacts.**

The state should lead a process to update Maine's land-use laws, tools, and practices to address the threats communities face from climate-change impacts. The update process must include significant stakeholder participation, especially from vulnerable communities. The rollout of updates must be coordinated with technical assistance, training for planners and code-enforcement officers, and incentives.

This causeway is a vulnerable portion of the only road that connects the communities of Deer Isle-Stonington to the mainland. Yet with increasing severity of storm surge and rising seas, this vital transportation link is threatened.

4

Strengthen Public-Health Monitoring, Education, and Prevention

- **Develop and implement more robust public-health monitoring, education, and prevention practices by 2024 to achieve better health outcomes against climate-change impacts.**

As COVID-19 has demonstrated, the ability to assess and understand the current state of wellbeing in our communities is critical to forming an effective response to stressors that threaten individual and collective health. And like COVID-19, climate change intensifies risks for socially vulnerable populations who have fewer resources to alleviate their hardship. Several key public health strategies are recommended:

MONITORING

Robust monitoring of public-health impacts from climate change should: monitor for air-borne allergens, particulate matter, and ozone; monitor for water-borne diseases, harmful algal blooms, and emerging threats in large lakes and public water supplies; monitor for vector-borne diseases from ticks and mosquitoes; and collect, analyze, and report these data disaggregated by age, race, ethnicity, gender, disability, geography, and other demographic factors to identify impacts on socially vulnerable populations and, accordingly, make interventions.

EDUCATION

Improved monitoring systems should feed information into education and outreach that will raise public awareness and help Maine people understand why it is important to protect themselves and their families. Expanding public education about how climate change affects health and the resources available will help communities manage risks.

Education efforts should include air-quality alerts, high-heat and cold warnings, water contamination and health advisories, private well-water testing, and awareness building of water- and vector-borne diseases.

PREVENTION

Nearly half of Maine people are served by public water systems that rely on surface water bodies like lakes and rivers as the source of drinking water. Every $1 spent on source water protection saves $27 in future water-treatment costs, so there is an enormous financial advantage to taking proactive actions that prevent contamination.

"Like COVID-19, climate change most affects people who already have low health equity to begin with — those who, for a number of reasons, don't have opportunities to be healthier. Indeed, it's these health inequities that place individuals and communities at the greatest risk for the harmful effects of climate change."

—Nirav D. Shah, Maine Center for Disease Control, Maine Climate Council Member

Clean water is important for public health and economic development. To safeguard public health against water-related climate hazards, Maine should protect drinking water sources and downstream water bodies by: supporting activities that protect watersheds that supply drinking water; encouraging best management practices and low-impact development; separating storm- and sewer-collection systems to prevent future sewage discharges into bays, estuaries, and rivers where contact with humans or shellfish is likely; and identify public water systems in danger of contamination by flood inundation due to climate change.

By 2024, Maine will have convened stakeholder processes to make specific recommendations for changes in state regulations on the following land-use issues.

Land use emerged as an important issue throughout the Climate Planning Process. Maine needs to meet both the imperative to reduce carbon emissions and the duty to protect people and infrastructure from harm. In addition to addressing sea-level rise, there are several topics in the Maine Climate Action Plan that require continued stakeholder processes to address. They include:

- **CLEAN-ENERGY SITING:** Maine should continue to work to achieve its ambitious renewable energy goals while balancing protection of our natural resources, seeking siting that has the least impact on prime agriculture lands, and fishing and marine industries.
- **LAND-USE PRACTICES:** Maine should encourage and incentivize climate-friendly local land-use policies that promote convenient, walkable, and bikeable communities and reduce the need for driving and commuting. Complete streets, mixed use, and housing density in downtowns and village areas are potential considerations for reducing vehicle miles traveled.
- **COMMUNITY FLOOD-RISK REDUCTION:** Maine should develop guidance to support flood risk reductions for communities and state infrastructure. Long-term planning for sea-level rise and riverine flooding should help equitably locate or relocate development in safer areas.
- **ANTICIPATING GROWTH:** Maine should anticipate the potential for growth, development, and economic opportunity as people migrate to Maine seeking refuge from severe climate impacts affecting other parts of the country.

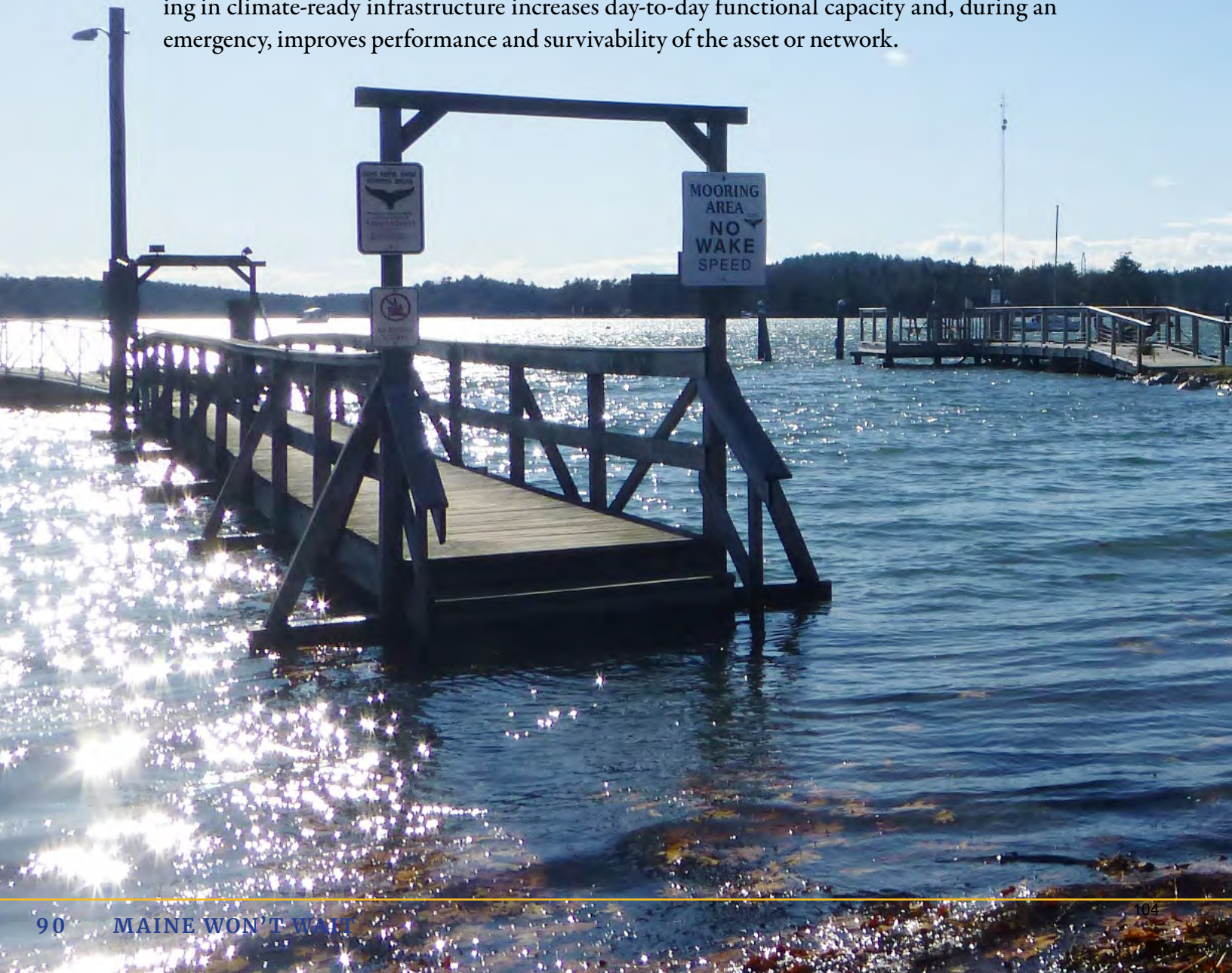
STRATEGY G

INVEST IN CLIMATE-READY INFRASTRUCTURE

Maine must improve the climate readiness and resilience of infrastructure so that it serves Maine better under day-to-day conditions and functions reliably during emergencies.

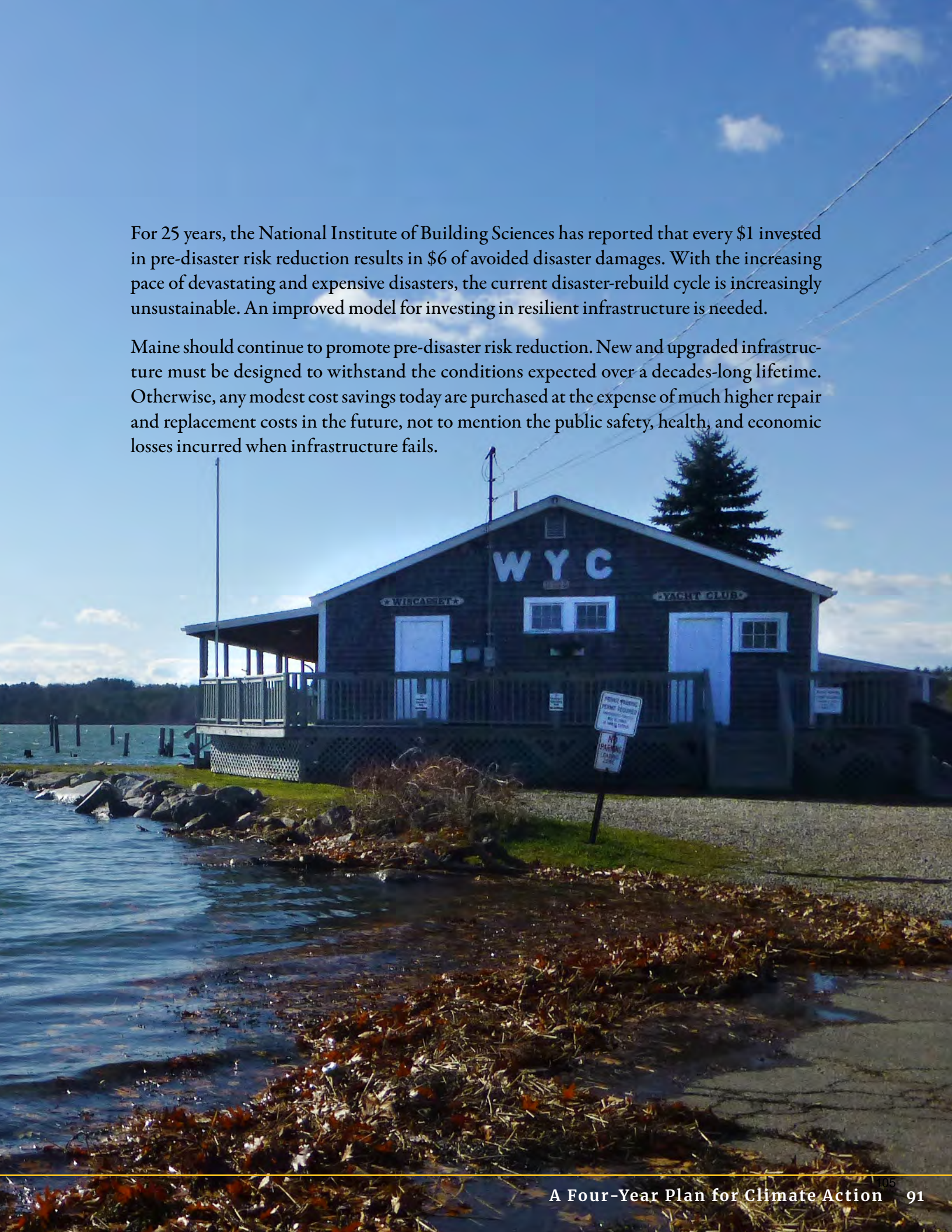
Functioning infrastructure is a basic requirement for public safety and health, thriving state and local economies, and the flow of people, goods, and information. Much of Maine's infrastructure was constructed well before climate change was understood as a threat. It is no surprise, then, that climate change is already having a negative impact on our roadways and bridges, shoreside businesses and working waterfronts, water-treatment facilities, and utilities.

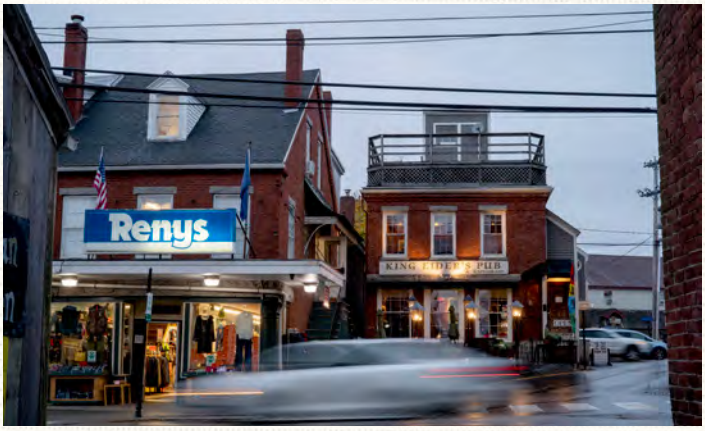
Aging infrastructure represents both a burden on the state as well as an opportunity. Investing in climate-ready infrastructure increases day-to-day functional capacity and, during an emergency, improves performance and survivability of the asset or network.



For 25 years, the National Institute of Building Sciences has reported that every $1 invested in pre-disaster risk reduction results in $6 of avoided disaster damages. With the increasing pace of devastating and expensive disasters, the current disaster-rebuild cycle is increasingly unsustainable. An improved model for investing in resilient infrastructure is needed.

Maine should continue to promote pre-disaster risk reduction. New and upgraded infrastructure must be designed to withstand the conditions expected over a decades-long lifetime. Otherwise, any modest cost savings today are purchased at the expense of much higher repair and replacement costs in the future, not to mention the public safety, health, and economic losses incurred when infrastructure fails.





MATT LUTKUS

Matt Lutkus is Town Manager in Damariscotta. The town is taking action to protect its historic downtown from rising sea levels with a comprehensive waterfront infrastructure project to guard against flooding, replace sewer lines, improve drainage and pedestrian access, and build new public restrooms. This work was funded by a $3 million federal grant and $1.3 million in funds raised locally after being planned for a decade — a timeline the Climate Action Plan wants to accelerate for towns through a State Infrastructure Adaptation Fund.

Was there a "lightbulb moment" for you regarding climate impacts?

In early 2012, the Board of Selectmen first viewed inundation scenarios prepared by the Lincoln County Regional Planning Commission, which identified our downtown village as one of the areas in Lincoln County most vulnerable to coastal flooding.

For years, the downtown parking lot flooded several times a year, but except when first-floor businesses were flooded, it was viewed as a nuisance the community always dealt with. The inundation scenarios, however, showed that flooding was going to get worse — and soon. This got everyone's attention, and shortly after flood resilience was made a top planning priority.

What should towns do to start preparing for climate change?

Use federal, state, and regional data to educate the public on the effects of climate change in their community. Then, work to build a consensus on an action plan. Beyond the first steps, planning, engineering, designing, and having projects "shovel ready" pays off. When construction dollars do become available at the Federal and State levels, decision-makers want to see results within a few years versus a decade. Other than that, I recommend patience and perseverance. Try never to miss an opportunity to tell your story to whomever will listen.

What should the governor or legislature consider for towns when they read this report?

Officials from various State agencies have been extremely helpful to us in our flood resiliency planning activities, and more generally in the Town's efforts to reduce dependence on fossil fuels. Currently, the electric energy for all of the municipal facilities is derived from a solar array, we are in the process of converting all of our street lights to LED, and we are installing a two-unit electric vehicle charging station in our parking lot. I encourage the governor and legislature to continue to encourage these and similar efforts in municipalities and in the private sector.

1

Assess Climate Vulnerability and Provide Climate-Ready Design Guidance

- **Complete a statewide infrastructure-vulnerability assessment by 2023, as well as develop and implement design standards for resilience in infrastructure projects.**

Maine's state agencies, municipalities, tribal governments, and industries need a clear understanding of the risks to infrastructure assets posed by climate change. Not only is this a requirement for responsible planning and investment of taxpayer dollars, but the major credit-rating agencies are beginning to consider how well states, regions, and communities are anticipating climate risks when assigning credit ratings. Failure to understand and incorporate climate risk can increase the borrowing costs for the state and towns, making infrastructure projects even more expensive.

Statewide vulnerability assessments should be conducted for: transportation infrastructure (including roads, bridges, culverts, airports, railroads, ferries, ports and wharfs, maintenance facilities, and public transit systems); water infrastructure (including drinking-water systems, wastewater treatment facilities, and dams and stormwater management assets); energy infrastructure (including electricity generation, storage, and transmission; and fuel supply infrastructure); communications infrastructure (including landline, mobile, and broadband); and community infrastructure (including health systems; public housing; state, tribal, and municipal government buildings; food systems; solid-waste systems, etc.). Several regional-scale and asset-specific assessments (Washington County and culverts, for example) have already been completed and can serve as models for statewide efforts.

Vulnerability assessments should provide an understanding of: 1) the climate hazards to which infrastructure assets are exposed, the likelihood of that hazard occurring, and how the intensity and likelihood of those hazards may change over time; 2) the asset's susceptibility to damage or failure given its location, design, age, condition, and state of repair; and 3) the consequences that impairment or failure of the asset will have on public safety and health, state and local economies, and the environment and natural resources.

The assessments should identify "critical infrastructure" assets that are important for public safety and health. Assessments should also give particular attention to areas of the state where socially vulnerable communities and vulnerable infrastructure overlap. These are communities whose struggle to recover may be improved by reliable and resilient infrastructure.

The vulnerability assessments should inform state and local adaptation strategies and capital-investment plans. A maintenance database should track improvements and climate-hazard impacts.

This stream crossing on Bottle Brook in Kingsbury Plantation is an example of a climate-ready infrastructure project that is also geared to improve habitat connectivity.

Maine should develop resilient design guidance and standards for different infrastructure types. An example is Maine Department of Transportation's Bridge Design Guidelines and Highway Design Guidance.

Agencies, supporting organizations, and the private sector should continue research into construction materials and green infrastructure practices that increase durability and resilience to climate hazards.

Nature-based solutions and green infrastructure should be prioritized where appropriate. Nature-based solutions provide effective and lower-cost protection for climate-change-related challenges while restoring coastal and marine habitats. For example, green infrastructure helps with stormwater management, and "living shorelines" are projects constructed with plants, oyster shells, and other natural materials to protect against coastal erosion.

2

Establish the State Infrastructure Adaptation Fund

- **Launch a State Infrastructure Adaptation Fund and predevelopment assistance program in 2021, designed to leverage federal recovery support in the short term, and in the long term to address the significant and ongoing infrastructure adaptation needs.**

Maine's municipalities, tribal governments, and state agencies all struggle to fund infrastructure projects. Maine currently has a backlog of 1,798 infrastructure-adaptation projects listed across all 16 counties at a proposed cost of $325 million. These projects reduce a community's vulnerability to climate impacts and can also reduce costs to respond and recover when there is a disaster. While there are significant federal resources available, federal grant programs generally require cost-share or "matching" funds from state or local governments.

Maine should establish a new State Infrastructure Adaptation Fund to help local, regional, tribal, and state agencies meet these cost-share requirements, unlocking new federal funds for infrastructure projects. Because the cost-share requirements are frequently 10 to 25% of the total project cost, a relatively modest investment of state funds would result in leveraging four to 10 times more federal funding.

Building a pipeline of infrastructure projects that are shovel-ready for federal support or private investment is important. And this kind of support could be essential when it comes to competing for one-time federal programs designed to support recovery and infrastructure investments.

To make a project shovel-ready, predevelopment assistance is typically needed which includes resilient design, engineering, and permitting; grant writing and grant management; community engagement regarding why the project is important; and, in some cases, matchmaking with investors in public-private partnerships.

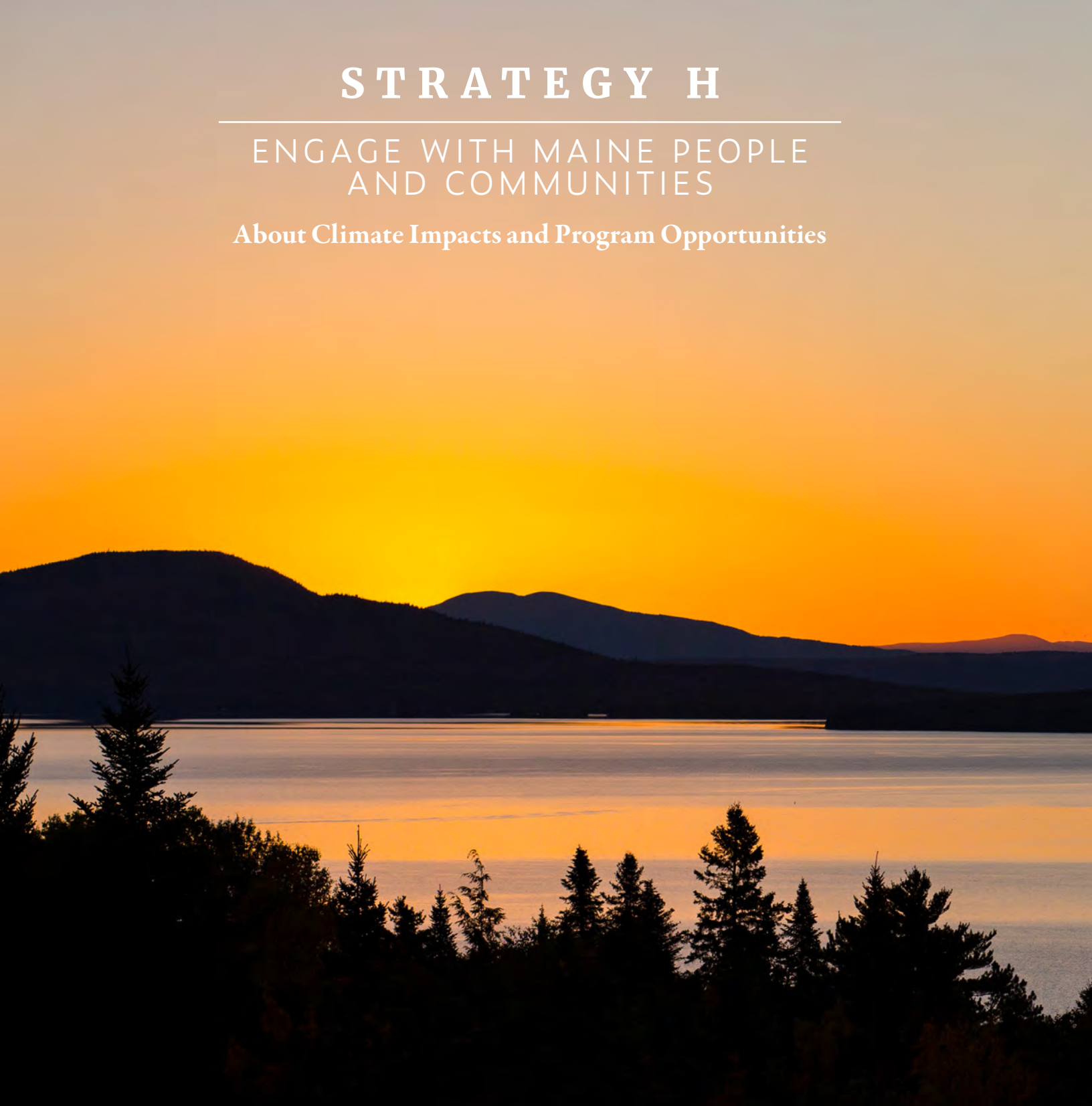
In both funding and predevelopment assistance, attention must be directed toward communities where high social and climate vulnerability overlap with low capacity and limited access to funding. Working-waterfront protection must also be an area of focus, given that it is among Maine's most threatened infrastructure.

It is important to invest up front to reduce vulnerability and avoid post-disaster expenses. However, there will continue to be a need for the state and local cost-share dollars necessary to leverage federal disaster-relief funds. Having state emergency funds at the ready allows us to access federal funds more quickly, supporting local recovery and helping to prevent disaster impacts from reinforcing economic disparity.

STRATEGY H

ENGAGE WITH MAINE PEOPLE AND COMMUNITIES

About Climate Impacts and Program Opportunities



Effective communication about Maine's climate strategies will be critical to the success of the Maine Climate Action Plan. Highlighting leadership and climate innovations can help people better understand the challenges and the opportunities. Maine students should understand the science of Maine's changing natural systems and climate and be prepared with the necessary skills to meet future workforce opportunities.

1

Raise Awareness About Climate-Change Impacts and Opportunities

- **Launch a multifaceted, ongoing communications effort in 2021 based on the Climate Action Plan to raise public awareness and understanding about climate change in Maine, the state's climate-response actions, and climate-related programs and opportunities.**

Regular communication with the public and stakeholders about the impacts of climate change and progress on climate strategies is critical to the implementation of the Maine Climate Action Plan. The state will develop a dashboard for key indicators and regular communications about climate council activities and provide clear, easy access to information about climate policies and programs.

Creative and diverse means of communication should also be employed to promote state climate programs, incentives, and opportunities. Partnerships with business groups, nonprofits, tribal governments, municipalities, and community groups will help spread key messages. Multiple forms of communication, consumer education, and ongoing efforts will be necessary to support the state's goals.

Communications should also include materials translated into multiple languages for diverse audiences, using infographics in addition to text. Additionally, partnerships with community groups and organizations known as trusted resources can help reach vulnerable populations.

2

Increase Public Education Offerings Related to Climate and Energy

- **Develop enhanced educational opportunities for climate science and clean-energy careers in Maine public schools to meet increasing interest from students and educators. Launch a process in 2021 to engage key stakeholders including students, older youth, educators, and state leaders in next steps.**

Many student and teacher groups advocated for expanding PK-12 educational programs about climate during the development of the Climate Action Plan. To address this interest and advance leadership among Maine's youth and students, Maine should consider directions for how schools could develop new offerings in STEAM (science, technology, engineering, arts, and math)-based climate education, and leverage new and existing partnerships with philanthropies, nonprofits, and youth-led organizations. The state should convene stakeholders in 2021 to consider next steps to implement increased climate and career education, including student and youth leaders, educators, and state education and workforce leaders.

In addition to PK-12, Maine should examine how to expand secondary career and technical education (CTE) programs, and higher education programs to connect to existing and emerging workforce pathways in climate- and energy-related careers. Further details about workforce development strategies are included the supporting report, *Strengthening Maine's Clean Energy Economy*. They include:

- **Attract and develop the workforce required for Maine's clean-energy future with the following:**
  - » **Support and promote STEAM, CTE, and Maine community colleges to provide pathways for Maine youth and residents to find fulfilling and quality job opportunities;**
  - » **Promote and encourage training opportunities and industry participation as an avenue for skilled jobs in Maine to benefit participants as well as employers;**
  - » **Prompt industry to provide their own training or associated apprenticeship programs and job opportunities in coordination with existing training programs and needs;**
  - » **Support existing programs and incentives, identify gaps, and develop new programs, as needed, to create opportunities that assist and incentivize Maine workforce in growing the clean-energy sector.**

"Public education on climate change is crucial in addressing and resolving climate-related issues. It is only when citizens are aware of how the global phenomenon is impacting land, communities, and human lives that they'll be prompted to be a part of rectifying the problem."

—Amara Ifeji, Maine Environmental Changemakers Association, Northeastern University Student, and member of the Equity Assessment's Advisory Committee

3

Start the "Maine Climate Corps" for Climate-Related Workforce Development

- **Partner with service-learning organizations and nonprofit organizations to launch a Maine Climate Corps program by 2023.**

With collaboration from existing service-learning organizations (like Volunteer Maine and Americorps), establish a Maine Climate Corps or Clean-Energy Corps to support climate-related actions and engagement from recent college graduates, and utilize these Corps members to engage broad community support and engagement, including older adults, students, and diverse community groups.

The program should be launched with private- and public-sector support, and Corps members could support mitigation, sequestration, and resilience programs. Service members could contribute meaningfully to Maine's climate progress through weatherization actions and education, clean-transportation education, resilience planning, and land-protection efforts.

4

Recognize Climate Leadership by Maine Businesses and Organizations

- **Launch the Governor's Climate Leadership Council in 2021 to increase private-sector commitment toward voluntary climate actions.**

Establish a group of leading Maine businesses, nonprofits, and institutions to highlight organizations taking climate action to reduce greenhouse gas emissions and address climate change while strengthening Maine's economy. The network will recognize innovation and leadership, establish partnerships, and share best practices.

"I started Maine Beer Company with a simple motto, 'Do What's Right.' When it comes to climate change, doing what's right means understanding that small businesses must be a part of the solution, not part of the problem — and this isn't a bad thing. For too long we have been fed the fallacy that a healthy bottom line and a healthy planet are mutually exclusive ideals each in inherent tension with one another. Small businesses, however, can thrive by embracing new opportunities and taking daily steps toward a more sustainable future."

"Breweries don't stand alone in this, and here in Maine we are part of a larger economy and ecosystem, both of which are reliant on each other for success. The farmers in Aroostook, the men and women engaged in fishing and aquaculture in the waters off our coast, those whose living depends on outdoor recreation in our western mountains — can only prosper if we take action now. It is not just the health of our people that depends on us taking action, it is the health of our economy."

—Dan Kleban, Co-founder and Owner of the Maine Beer Company, and Member of the Maine Climate Council

IMPLEMENTING MAINE'S CLIMATE ACTION PLAN

Maine's Climate Action Plan is a blueprint for bold, specific, and immediate action. To implement the plan, government leaders must not only recognize their responsibility in this moment, but also move with urgency to achieve its outcomes. Resources will be needed do this, as will clear and transparent metrics to ensure accountability to the public and convey where progress is occurring.

The responsibility for appropriation and revenues rests with the Governor and Maine State Legislature, with similar processes at the municipal, tribal, regional, and federal levels. This plan seeks to provide a roadmap for actions that will meet the state's goals, urging leaders at all levels of government and society to consider how to prioritize investments toward these actions.

Yet fighting climate change cannot be shouldered by government alone. For this plan to be successful, the support and engagement of Maine people is critical — to mobilize a broad coalition of state, local, regional, and tribal governments, nonprofits, academic institutions, and private interests taking collaborative, decisive action.

Significant and sustained investments, well-financed programs, and properly-capitalized lending entities are needed to implement the Climate Action Plan. Such investments and partnerships will be needed to realize outcomes like a modern electricity grid that delivers clean energy needed to power climate-friendly innovations; transportation infrastructure resilient against rising sea levels and more frequent, intense storms; and enhanced incentive programs that make cleaner vehicles and energy-efficiency improvements within reach of everyone in Maine.

No single funding stream will achieve our climate goals. Climate action requires leveraging a variety of sources — existing and new, private and public, local, state, and federal — and fresh, innovative financing mechanisms to support sector-level transformations and the ability of Maine lenders to make crucial long-term investments in climate-focused projects and initiatives.

This four-year Climate Action Plan, however, is emerging amid unprecedented conditions caused by the global COVID-19 pandemic, which is stretching state revenues and many family budgets without relief in sight, and further exposing inherent inequities within our economy that puts Maine's most vulnerable citizens at risk from even minor disruptions.

This grave situation illustrates the urgent need to prepare our people, communities, and economy for the disruptions that climate change will cause. Investments to create a sustainable economy that is less reliant on global supply chains and imported fossil fuels, while leveraging Maine's abundance to source essential goods, from fresh food to building supplies, will reinforce the bedrock of Maine's economy and enable families to withstand major challenges in the future.

FUNDING & FINANCING OPTIONS

NEAR TERM

USE GENERAL-FUND BONDS FOR ESSENTIAL, FOCUSED CAPITAL INVESTMENT:

Maine should leverage record-low borrowing rates to support critical infrastructure projects that will generate economic activity, create jobs for Maine people, and signal bold action for addressing climate change and implementing this plan. Specific bonding priorities should include:

State infrastructure adaptation fund: Establish this fund to support local and state projects, such as modern transportation investments, urgently needed broadband deployments, and overdue wastewater and drinking-water projects to address risks from climate impacts, while also leveraging federal matching funds to unlock further federal grant support.

Energy innovation, weatherization, and clean transportation: Expand and enhance state research and development programs; recapitalize incentive programs that generate jobs and savings for families, businesses, and communities.

Natural and working lands: Invest to protect at-risk working lands and support business growth of natural-resource-based businesses.

Clean-energy workforce: Support targeted career training programs like CTEs and those within Maine's community colleges and university system to ready Maine people for new and growing well-paying employment opportunities.

Pursue current and new federal grant opportunities: Maine should aggressively support energy, infrastructure, and climate strategies through new federal Land and Water Conservation Funds, emerging climate-focused state funds, federal FEMA hazard-mitigation grants, and ongoing federal transportation, environmental infrastructure, and energy programs. The state should also prioritize providing match dollars when significant federal investments are available.

Maximize one-time funding streams and settlement dollars: These funds, like those received from the Volkswagen emissions settlement, may continue to flow into the state from renewable energy and power projects and should be deployed aggressively to support emissions-mitigation actions.

Enact a Commercial Property Assessed Clean Energy (C-PACE) program: This financing mechanism would support investments by Maine businesses into clean energy and energy-efficiency improvements.

Deploy and retool of existing state resources, staff, and grant programs: The state should review and revise existing state programs and grants to align with climate mitigation and adaptation goals, such as the state drinking-water revolving fund, Tax-Increment Finance programs, or other municipal infrastructure grant and loans programs.

Seek stable budget support for long-term actions: At the time of this report's publication, Maine's general fund budget is under significant strain from revenue reductions associated with the recession and pandemic. But as Maine recovers, state leaders should allocate funding for programs that require ongoing support, such as technical assistance, tax credits and incentives, and monitoring.

Convene: State leaders, stakeholders, and finance experts should convene in 2021 to consider additional creative funding and finance solutions to support Maine's climate strategies, and they should work collaboratively with Maine's federal delegation and federal agencies around emerging climate funding opportunities.

LONG TERM

IDENTIFY REVENUE SOURCES FOR LONG-TERM FUNDING FOR:

Essential transportation infrastructure and clean transportation: Maine needs to fund basic transportation infrastructure needs, including the adaptation work required to make Maine's transportation systems and emergency evacuation routes able to withstand increasing storm events and rising sea levels. In addition, clean transportation programs will also require sustained support for electric vehicles (EVs) and clean-car rebates, public charging infrastructure, pedestrian and bicycle infrastructure, broadband expansion, and clean public transportation options, including buses, school buses, and ferries.

State Infrastructure Adaptation Fund and disaster funds: The proposed State Infrastructure Adaptation Fund supports long-term infrastructure needs for cities and towns, regional units, and state agencies by meeting cost-share requirements to unlock federal funding for infrastructure projects and pre-disaster funds. Pre-development assistance is also much needed to ensure infrastructure projects are made shovel-ready for federal support or private investment. Maine also has two funds that typically support disaster recovery including the State Disaster Recovery Fund and a State Contingency Account. Maine should ensure that they are funded to provide match to towns for federal disaster relief.

Funding for natural and working lands conservation and easements: The Natural and Working Lands Working Group identified the need for a dedicated, sustained funding source, driven by the state's ambitious targets and sequestration needs to support conservation and easements purchases; and supporting agricultural, forestry, fishing, and recreation access and opportunities. Securing Maine's natural lands preserves an essential economic asset and protects the state's special natural places.

Coordinated climate-change monitoring: Maine will need to identify a combination of federal, state, foundation, and private funding sources in order to support a comprehensive climate-change data and monitoring system. Consistent funding over time will help detect changes to land, coastal, and marine ecosystems, avoid data gaps, and support improved and adaptive local decision making.

Enhance supports from visitors: The state should consider funding opportunities that support infrastructure, investments, and natural lands investments drawn from Maine's millions of annual visitors who utilize our transportation systems and contribute emissions in order to experience our iconic landscapes and clean environment.

Revenue bonding: Long-term capital support for long-term state climate infrastructure projects could also be identified through revenue-bonding activities for state and local needs.

Innovation funding: Provide funding that supports innovations, from new vehicle batteries that offer more cost-effective transportation solutions to advances in building material and heating technology. Some of these innovations can grow and emerge in Maine. The state should invest in the most promising sectors

with targeted research and development, commercialization, and business-attraction support. Potential high-value forest products like cross-laminated timber, wood-fiber insulation, biofuels, agriculture production and innovation, and floating offshore wind could help Maine emerge a national leader in climate and energy innovation. A complementary policy framework, ongoing state and federal investments in innovation and workforce, and stable business program supports should be bolstered to encourage their growth as highlighted in the *Clean Energy Economy Plan*.

FINANCING AND POLICY OPTIONS FOR CONSIDERATION:

Maine green bank or green fund: A green bank or fund could leverage significant, low-cost private-sector capital to finance clean-energy projects, climate initiatives, and infrastructure over the long term, based on the successful experience of other states. Options to establish a green bank or fund could include launching a new program through an existing state finance entity or creating a new fund, both of which would require capitalization and staff expertise.

Power-sector transformation: This plan proposes a significant process to investigate structural approaches and make recommendations on required transitions needed for our electricity generation and delivery system to meet projected electrification demands, stable and affordable prices, and reduced infrastructure costs. Some options considered by the Energy Working Group included public financing mechanisms for additional grid or generation capacity; consumer ownership of all or part of Maine's power delivery systems; and examining the viability of a "Maine Power Authority" existing as the primary energy planning and financing authority in the state.

Carbon-market programs: Working groups recommended ongoing consideration of multistate or national carbon-market programs. Carbon pricing is generally viewed by economists as needed to address climate change, but many also consider that these policies are best implemented at the federal level. Maine already prices power-sector carbon emissions through its participation in the Regional Greenhouse Gas Initiative and returns the revenues back to participating states and consumers to invest in energy efficiency. The Transportation Working Group recommended that Maine continue to monitor the Transportation Climate Initiative, a proposed regional initiative in the Northeast to implement a cap, trade, and invest system to reduce transportation emissions and generate revenue for transportation transitions, as well as other options, as transportation-funding solutions.

MEASURING PROGRESS

Clear metrics for Maine's climate goals are critical for informing the public about whether policies are having the intended outcomes and for making evidence-based adjustments, enhancements, or replacements to policies in pursuit of our 2030, 2045, and 2050 targets.

Actions Taken: These indicators will help Maine evaluate progress toward climate mitigation and adaptation goals, such as the number of heat pumps installed or green-industry jobs created, as measures of effort and effectiveness.

Proposed Metrics for Tracking:

- **Progress toward 80% renewable energy by 2050**
- **Energy saved via ongoing efficiency measures**
- **Clean-energy jobs created**
- **Electric Vehicle on the road, Plug-in EVs, total**
- **Heat-pump installations total**
- **Total percentage of Mainers with access to high-speed broadband**
- **Percentage of state lands conserved**
- **Number of towns or regions with resilient community plans**
- **Significant critical adaption infrastructure projects completed**
- **Climate infrastructure and investment funding and leveraged**
- **Federal and private dollars leveraged per state dollar**

Reducing Carbon Emissions - Key Actions

Sector	Metric	2025	2030	2050
Transportation	Number of Light-duty EVs on the Road	41,000	219,000	904,000
	EV Share of New Light-duty Vehicle Sales	28%	85%	100%
	Reduction in Light-duty VMT per Vehicle	10%	20%	20%
	ZEV Share of New Heavy-duty Vehicle Sales	12%	55%	100%
	Reduction in Heavy-duty VMT per Vehicle	2%	4%	4%
Buildings	Number of Households with Retrofit Heat Pumps (installed after 2018) and Legacy Fossil Systems	80,000	130,000	26,000
	Number of Households with Whole-Home Heat-Pump Systems	35,000	116,000	487,000
	Newly Weatherized Householdsm (after 2019)	17,000	35,000	105,000
All	GHG Emissions (MMT)	14.50	11.67	3.72
	Emissions Reduction from 1990 Levels	32%	45%	82%

Measuring Equity: In addition to these measures, the Maine Climate Council Equity Subcommittee will recommend targeted goals and program metrics for key populations and groups, providing additional key equity outcome indicators, along with program suggestions, for Council consideration by September 2021.

The Implementation Chart for the Four-Year Climate Action Plan (available at www.maine.gov/future/initiatives/climate/climate-council) identifies the lead agencies assigned to each of the specific outcomes assigned to the climate strategies. The agencies will work with partner organizations to implement the actions, and progress will be monitored quarterly by the Maine Climate Council and working groups.

Emissions and adaptation impacts achieved: These are indicators that evaluate our collective efforts, as exemplified by the Maine Department of Environmental Protection's Biennial Emissions Report: "Progress Toward Greenhouse Gas Reduction Goals," which charts Maine's sector-based emissions.

New emissions reductions and carbon-neutrality goals outlined in Maine law require the state to include both gross emissions from all sources, including from the combustion of biomass, as well as a carbon sequestration estimate, in the biennial greenhouse gas report submitted to the Legislature, starting in January 2022.

The Maine Department of Environmental Protection (DEP) is also required by law to adopt rules to track and report annual gross and net greenhouse gas emissions by July 2021. The DEP is also developing the methodology for calculating net emissions, in consultation with the Scientific and Technical Subcommittee, and will be working with stakeholders in early 2021 to develop a proposed rule for adoption by the Board of Environmental Protection.

Other examples of possible measures include changes in ocean acidification or reductions in heat-related emergency room visits. Because of the global nature of climate change, some of these indicators are only available on a planetary scale, like atmospheric carbon dioxide concentration, and may respond slowly to the actions that state and country jurisdictions take collectively.

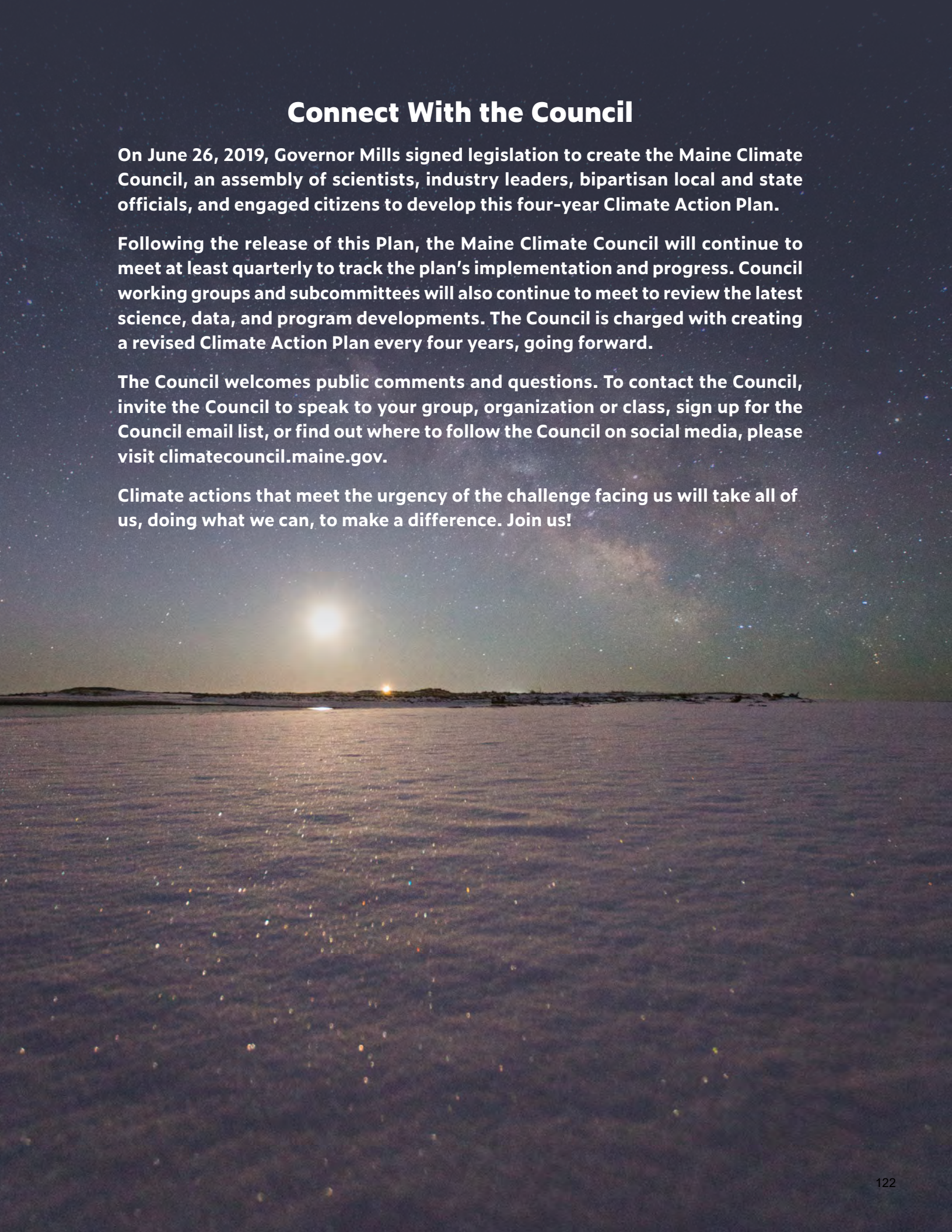
Connect With the Council

On June 26, 2019, Governor Mills signed legislation to create the Maine Climate Council, an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens to develop this four-year Climate Action Plan.

Following the release of this Plan, the Maine Climate Council will continue to meet at least quarterly to track the plan's implementation and progress. Council working groups and subcommittees will also continue to meet to review the latest science, data, and program developments. The Council is charged with creating a revised Climate Action Plan every four years, going forward.

The Council welcomes public comments and questions. To contact the Council, invite the Council to speak to your group, organization or class, sign up for the Council email list, or find out where to follow the Council on social media, please visit climatecouncil.maine.gov.

Climate actions that meet the urgency of the challenge facing us will take all of us, doing what we can, to make a difference. Join us!



DEFINITIONS AND ACRONYMS

Adaptation: An adjustment by nature or a community that reduces the hazardous effects of climate change

Biodiesel: A form of diesel fuel derived from plants or animals

Biofuel: Fuel that is derived from biomass such as plant or algae material, wood, or animal waste

Biomass: Generally in this report, we refer to biomass in relation to wood biomass which is any timber-derived product (softwood or hardwood) capable of being converted to energy through direct combustion or gasification; to solid fuel through pelletizing; or to liquid fuel through myriad processes. Biomass can also be renewable organic material that comes from plants and animals.

Blue Carbon: Carbon that is buried or sequestered away from the atmosphere by coastal ecosystems like salt marshes, seaweeds, and seagrass beds

Carbon Neutral: Emissions are balanced by the uptake of carbon dioxide by forests and other ecosystems

Clean Energy: The production of electricity or heat from renewable or low-carbon resources such as solar, wind, water, biomass, or geothermal. Energy-efficiency measures that improve the output of or reduce energy consumption, and innovative grid technologies such as energy storage, may also be included in the broad definition of clean energy.

CHP: Combined heat and power

Climate: The average weather conditions at a given place over a period of time. For example, meteorologists often make comparisons against a 30-year period, called a climate normal.

Climate Change: A difference in the climate over multiple decades or longer. Long-term changes/shifts in climate can result from both natural and human factors.

DEP: Maine Department of Environmental Protection

DER: Distributed energy resource. Small-scale resources that produce and supply electricity, or controllable loads, that are connected to a local distribution system or installed at a host facility, and may be spread out over a wide area. These resources either provide energy to the electrical grid or allow for greater control of demand for electricity, and are located at various geographic locations across the grid system, sometimes "behind the meter."

EEE: Eastern equine encephalitis is a rare but dangerous infection spread by mosquitoes

EPA: Environmental Protection Agency

EVs: Electric Vehicles

Fossil Fuels: A hydrocarbon fuel (such as coal, oil, or natural gas) formed in the earth from plant or animal remains over millions of years

GEO: Governor's Energy Office

GDP: Gross domestic product, a monetary measure of the market value of all the final goods and services produced in a specific time period

GHG: Greenhouse gases are gases that absorb/act as a blanket, trapping heat in the atmosphere, including but not limited to water vapor, carbon dioxide, methane, nitrous oxide, and ozone

GOPIF: Governor's Office of Policy Innovation and the Future

(Climate) Mitigation: A human intervention intended to reduce the rate of climate change by limiting the emissions of greenhouse gases or by removing greenhouse gases from the atmosphere through natural or technological processes

(Hazard) Mitigation: Any sustained action taken intended to reduce or eliminate the long-term risk to human life and property from natural hazards

HFC: Hydrofluorocarbons, which are greenhouse gases with global-warming potentials of hundreds to thousands of times that of carbon dioxide

HVAC: Heating, ventilation, and air conditioning

HPEV: Hybrid plug-in vehicle

IPCC: Intergovernmental Panel on Climate Change

MPUC: Maine Public Utilities Commission

Particulate Matter: Also known as particle pollution or PM, a complex mixture of extremely small solid particles and liquid droplets found in the air, which can pose a danger to human and animal health

PHEV: Plug-in Hybrid Electric Vehicle

Resilience: The ability of a community, business, or the natural environment to prepare for, withstand, respond to, and recover from a hazardous event

RGGI: Regional Greenhouse Gas Initiative

RFS: Renewable Fuel Standards

RPS: Renewable Portfolio Standard

Sequestration or Carbon Sequestration: The process of capturing carbon dioxide from the atmosphere or industrial processes and storing it for years to centuries, sometimes referred to as "negative emissions." Carbon may be stored in biomass (such as trees, branches, wood products, foliage, and roots), soils, and rocks for varying periods of time, or reused in industrial applications. Research and technological development into direct air capture of carbon dioxide for storage or reuse is ongoing but not yet developed at a large scale.

STS: Scientific and Technical Subcommittee

Weather: Atmospheric conditions at any given time or place, measured from variables such as wind, temperature, humidity, air pressure, cloudiness, and precipitation. Weather can vary from hour to hour, day to day, and week to week.

SCIENTIFIC AND TECHNICAL REPORTS

THE WORK OF THE MAINE CLIMATE COUNCIL IS INFORMED BY SCIENTIFIC AND TECHNICAL ANALYSES INCLUDING:

A summary of the impacts of climate change in Maine by the Maine Climate Council Scientific and Technical Subcommittee (Scientific Assessment of Climate Change and Its Effects in Maine)

An analysis of the costs and benefits of the strategies recommended by the working groups (Assessing the Impacts Climate Change May Have on the State's Economy, Revenues, and Investment Decisions, an analysis by Eastern Research Group and Synapse Energy Economics). The report includes 4 volumes and a Summary report

Volume 1, Vulnerability Mapping: A mapping analysis that identifies vulnerable communities, geographies, and economic sectors.

Volume 2, Cost of Doing Nothing Analysis: Estimates of losses that the State of Maine and its citizens could incur if the State does not take action to prevent or prepare for climate change. The cost of not adapting to a changing climate is large and will accelerate over time, with flooding serving as the largest overall threat.

Volume 3, Maine Emissions Analysis: An energy-use and emissions baseline based on current state and regional policies, as well as an assessment of options for meeting Maine's energy needs (and allowing economic growth) while reducing greenhouse gas emissions.

Volume 4, Economic Analyses of Adaptation and Mitigation Strategies: Economic analyses to provide context for the majority of the adaptation and mitigation strategies developed by the Maine Climate Council.

An Equity Assessment of Working Group Recommendations conducted by the University of Maine's Senator George J. Mitchell Center for Sustainability Solutions

The report, Strengthening Maine's Clean Energy Economy, provides specific strategies to leverage Maine's renewable energy resources and energy efficiency services to recover and grow Maine's economy.

The six working groups of the Climate Council — (1) Transportation; (2) Buildings, Infrastructure, and Housing; (3) Energy; (4) Community Resilience Planning, Emergency Management, and Public Health; (5) Coastal and Marine; and (6) Natural and Working Lands — developed the draft strategies for the Climate Council to consider. The details of the working-group strategies are a resource for policymakers as Maine begins to implement the strategies in the Climate Action Plan.

The working group reports are available at https://www.maine.gov/future/initiatives/climate/climate-council/reports.

ACKNOWLEDGEMENTS

The Maine Climate Council expresses its deepest thanks and appreciation to all the people and organizations who contributed to this Plan.

THE MEMBERS OF THE MAINE CLIMATE COUNCIL ARE:

Co-Chairs:

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Melanie Loyzim, Acting Commissioner of the Department of Environmental Protection

Members of the State Legislature:

Representative Lydia Blume (D)

Representative Richard Campbell (R)

Senator Everett Brownie Carson (D)

Senator David Woodsome (R)

Members of the Executive Branch, or their designees:

Amanda Beal, Commissioner of the Department of Agriculture, Conservation and Forestry

Dan Burgess, Director of the Governor's Energy Office

Judy Camuso, Commissioner of the Department of Inland Fisheries and Wildlife

Major General Doug Farnham, Commissioner of the Department of Defense, Veterans and Emergency Management

Kirsten Figueroa, Commissioner of the Department Administrative and Financial Services

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Laura Fortman, Commissioner of the Department of Labor

Designee: Kim Moore, Director of the Bureau of Employment Services

Heather Johnson, Commissioner of the Department of Economic and Community Development

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The Maine Climate Council includes a Scientific and Technical Subcommittee and six working groups, each composed of diverse stakeholders with expertise and experience in their topic areas. We would like to express appreciation for the incredible work accomplished by the subcommittee and working groups over the last year, and to the many staff who supported their work.

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The six working groups of the Climate Council — (1) Transportation; (2) Buildings, Infrastructure, and Housing; (3) Energy; (4) Community Resilience Planning, Emergency Management, and Public Health; (5) Coastal and Marine; and (6) Natural and Working Lands — developed the draft strategies for the Climate Council to consider.

The details of the working-group strategies are a resource for policymakers as Maine begins to implement the strategies in the Climate Action Plan. The working group reports are available at https://www.maine.gov/future/initiatives/climate/climate-council/reports.

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"Maine cannot wait to make the most of this extraordinary moment in time. This plan against climate change comes in the midst of an unprecedented pandemic which has caused significant economic and social turmoil in Maine, across the country, and around the globe.

"It might be easier to put off climate action until calmer times. But Maine can't wait. Maine shouldn't wait. And Maine won't wait."

—Governor Janet T. Mills

ClimateCouncil.maine.gov

APPENDIX C:

TECHNICAL GUIDANCE FOR UTILITY-SCALE SOLAR INSTALLATION AND DEVELOPMENT ON AGRICULTURAL, FORESTED, AND NATURAL LANDS

(DACF)

TECHNICAL GUIDANCE FOR UTILITY-SCALE SOLAR INSTALLATION AND DEVELOPMENT ON AGRICULTURAL, FORESTED, and NATURAL LANDS

Updated January 8, 2021

PURPOSE AND SCOPE

In 2019 the Maine Legislature enacted solar energy legislation that resulted in significant growth in the development of utility-scale solar projects. Replacing fossil fuels with clean, alternative renewable energy sources that do not contribute to greenhouse gas emissions is a desirable objective for the state. As we work to achieve greater renewable energy generation, it is equally important to ensure that solar development does not negatively impact our state's agricultural and natural resources, including active farmland, productive timberland, rare plant populations, or rare and exemplary natural communities. The Department of Agriculture, Conservation and Forestry (DACF) has developed this technical guidance document regarding the siting of utility-scale solar projects with consideration for valuable agricultural land, forest resources, and rare or unique natural areas.

DACF also recognizes that solar energy production can provide economic benefit to landowners, and that there are ways to maximize compatibility of multiple uses on certain sites. This technical guidance document is intended to provide farmers and forest landowners with practical information to utilize when first considering solar development on their property, as well as planning important preconstruction, construction, and post-construction/ decommissioning activities. It further provides technical information for solar developers to consider when designing, installing, and removing solar projects.

As a general statement of policy, DACF strongly recommends siting of commercial scale solar projects on non-agricultural lands and within areas that do not: contain rare plant populations; provide habitat for rare or exemplary natural communities; contribute to fragmentation of large undeveloped blocks of forestland; or diminish the ability for these natural and working lands to effectively sequester carbon. If impacted by development, these natural areas, productive soils, and prime agricultural lands are finite resources that can take decades to restore, and in some cases, restoration may not even be possible.

Non-agricultural siting locations would include: on top of buildings; in parking lots; on closed landfills; on significantly disturbed sites such as brownfields, where previous development was located or significant grading has taken place; and in regenerating wooded areas that are not comprised primarily of important farmland soils (or similar areas that have little or no commercial farming potential). To determine if a project is located on important farmland soils please, refer to DACF's guide to Determining Prime Farmland Soils and Soils of Statewide Importance here: https://www.maine.gov/dacf/ag/docs/prime-farmland-determination-guidelines.pdf.

If agricultural lands are to be used for solar siting, DACF encourages consideration of dual-use projects. Dual-use, or agrivoltaics, is a mixed land use production system combining the agricultural use of the land with solar energy production. The integrated spacing of solar panels and elevated construction of arrays allows light to penetrate the ground at levels which support the growth of crops, forage grasses, or pollinator habitat while retaining soil moisture. The

meadow and grassland habitats provide meaningful benefits to improving soil health. Solar arrays can also be co-located with grazing for cows, sheep, and goats, apiaries for honey production, and crops. In addition to agricultural production, land leases can provide farmers additional revenue for leasing their land to Solar Developers for 20 to 35-years of the facility's lifespan. With proper planning and installation, the land could be reverted to agricultural or forest production upon decommissioning. For more information on dual-use please see our factsheet here: http://www.maine.gov/dacf/ard/resources/docs/dual-use-factsheet.pdf

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I. Solar Basics

Solar energy or photovoltaic (PV) power is produced by capturing the sun's energy and turning it into electricity. The sun releases packets of energy known as photons. When these photons hit a solar panel (also known as a module), which is made up of multiple solar cells, they knock electrons loose from their atoms. Solar cells are made of silicon, like semiconductors, with a positive and negative layer. These layers create an electric field, like a battery that allows the electrons to travel along the panel in one direction around a circuit. As such, solar modules generate direct current (DC) electricity. DC power is compatible with battery storage but needs conversion to alternating current (AC) before being sent to the electrical grid.

A PV system consists of modules mounted on a racking system, wired together in series along a run. The length of the run will depend on the capacity of the inverter the modules will be connected to. For a residential scale project, an inverter would be connected to an electrical panel and potentially to a battery bank with a charge controller to regulate the battery's charge as well for off-grid or emergency back-up applications. Batteries are not required for grid-tied projects.

In utility-scale applications, electrical wire from inverters is combined and buried in underground conduits or run above ground along the racking and routed to a central equipment pad. Electricity is then fed into batteries and/or a transformer that sends electricity into the grid with above-ground cable. To minimize trenching for electrical conduit, runs can be orientated to terminate at inverters positioned on either side of a centrally located electrical conduit trench.

Solar arrays are a collection of modules mounted on metal racking systems, similar to roof racks on a car. Arrays may be fixed in their tilt and orientation (fixed mount) or may have mechanical parts that allow the array to adjust, tilt, and orient to track the sun to maximize their production (trackers). While trackers may generate more energy than fixed systems, the costs and maintenance associated with them have limited their widespread adoption. Climatic conditions such as temperature, wind and snow load have an impact on the output of the equipment. For this reason it is important to determine if the proposed equipment has a proven track record in the northeast.

Most applications are fixed roof-mounted or ground-mounted arrays. Rooftop racking systems may be clamped to standing seam metal roofs or screwed into roof rafters. The preferred orientation is due south with an angle matching actual latitude. In Maine, that is 45 degrees; however, the sun's angle changes seasonally, from being more overhead in the summer to lower in the sky during the winter, so a range of 30 to 45 works well in most cases. Steeper pitched roofs will help shed snow from the array.

Ground-mounted arrays include a metal racking structure anchored to the ground supporting modules at a determined height above the ground. Applications may include flat roofs on large commercial buildings, parking lots, landfills, agricultural fields and greenfield projects. Wind,

snow load, soil composition, array size, and row spacing are considerations for the height, anchoring, and construction of ground-mounted arrays. The racking structure may be mounted on driven piles, anchor systems, or utilize weighted ballasts. Arrays on commercial roofs have a low profile, and rows consist of single panels positioned in a landscape orientation with a minimal tilt to minimize row shading. These are typically anchored with cement blocks to avoid any roof penetrations.

In open areas, driven beams can be used to support an array. Beams made of steel are driven into the ground to a depth dependent on an impervious layer, and the racking system is affixed to the beams. This is a less costly installation method compared to other foundation methods but is dependent on favorable subterranean conditions.

Other anchoring systems, such as helical piles and ground screws, may be used. These applications can handle vertical loads at relatively shallow depths, do not require concrete, and can be removed and reused after the project has been decommissioned. These installations do not produce significant tailings, which could require grading. Ground screws can be installed with a skid steer avoiding the use of heavier equipment.

At sensitive locations such as landfills and brownfield sites, alternative ballast anchoring systems should be proposed to avoid driven piles with concrete footings and ground penetration. On landfills, precast pavers, or steel baskets filled with rock are used to weigh down the ballasts on top of the landfill cover. These can easily be moved into place with a skid steer.

A geotechnical or soil survey of the ground conditions will help determine which application may be best suited to a particular site. Typically, the most cost-effective installations will not require grading or bringing in additional materials like concrete; as a result, ground screws are becoming more widely used.

Most ground-mounted arrays are installed at the height of three feet (3’) above the ground on the southern end and a height of five feet (5’) or more on the northern end. For dual use systems in particular, these minimal clearances allow for ease of maintenance and livestock foraging. Where crop system integration is applied, arrays may have higher minimum clearances for hand harvesting or to accommodate mechanized harvesting equipment. They might also have gaps between panels along the racking system or utilize smaller panels with single rows in each array to increase solar penetration below the array. For more information on dual-use systems and applications, please refer to our fact sheet.

Utility-scale projects typically have a footprint greater than 40,000 square feet or one acre and is directly tied to the grid, meaning that no energy is consumed onsite but rather that the owner(s) receives a 1:1 kilowatt energy credit or financial credit on their bill. Large-scale commercial projects are between 1 and 30 acres (system size limit is 4.95MWac). They are typically created for residential community solar farms or purchase power agreements. In

contrast, utility-scale projects are greater than 20 acres and usually sell all of the power to a single entity or utility.

II. General Permitting Considerations

Solar developments in Maine will require environmental site permitting, whether through the Maine Department of Environmental Protection (DEP), Land Use Planning Commission (LUPC), Department of Inland Fisheries and Wildlife (IFW), the US Army Corps of Engineers, municipalities, or some combination thereof. Below is a high-level listing of potential permitting that may apply to solar development projects and resources for further information. This overview is not to be interpreted as legal advice. Readers are encouraged to further research permit requirements by consulting relevant agency staff and by obtaining independent legal counsel.

A. >1 acre of disturbance within an organized area of the state:
   1. Subject to Stormwater Management Law (38 M.R.S. 420-D)
   2. Requires a DEP Stormwater Management Law Permit Application found here: https://www.maine.gov/dep/land/stormwater/swapp1.pdf
   3. May be eligible for a Stormwater Permit By Rule

B. > 20 acres of land (total area includes everything inside the fence, an area outside the fence needed for maintenance, roads, collector lines to the point of interconnection, and shade management areas):
   1. Subject to Site Location of Development Act (38 M.R.S. 481)
   2. Requires a DEP Site Law Application found here: https://www.maine.gov/dep/land/sitelaw/application-text-2015.pdf

C. Activities in, on, over, or adjacent to protected natural resources (including rivers, streams, brooks, and wetlands):
   1. Must comply with the Natural Resources Protection Act (38 M.R.S. 480)
   2. Requires a Natural Resources Protection Act (NRPA) permit under its subsequent jurisdiction. For more information please visit:
      a. DEP: https://www.maine.gov/dep/land/nrpa/
      b. LUPC: https://www.maine.gov/dacf/lupc/application_forms/index.shtml
      c. May be eligible for NRPA Permit By Rule

D. DEP Resources:
   1. Site Law Location of Development Act: https://www.maine.gov/dep/land/sitelaw/index.html
   2. Natural Resources Protection Act: https://www.maine.gov/dep/land/nrpa/index.html#form
   3. Stormwater Management Law: https://www.maine.gov/dep/land/stormwater/index.html
   4. Permit By Rule: https://www.maine.gov/dep/land/nrpa/ip-pbr.html
   5. For more information contact: Jim Beyer, Bureau of Land Resources at: jim.r.beyer@maine.gov or 207-446-9026

E. IFW Resources:

1. IFW's Solar Project Guidance: http://maine.gov/dacf/ard/docs/ifw-solar-project-guidance-03052020.pdf
2. For more information contact: Robert Stratton, Wildlife Biologist at Robert.D.Stratton@maine.gov or 207-287-5659 or John Perry, Environmental Review Coordinator at John.Perry@maine.gov or 207-287-5254

F. Municipal Zoning:
1. There are no statewide zoning laws that address solar development. However, some towns have adopted specific solar zoning ordinances. These range from allowing energy generating facilities in commercial and industrial zones, to more nuanced approval in rural and residential areas. On the opposite end of the spectrum, some towns have no zoning requirements allowing for development in any zone. Consult town offices for more information.

G. Municipal Building Permits and Approvals:
1. Many municipal ordinances require solar development plans to be reviewed and approved by the local fire chief, planning board, municipal engineer, and/or code enforcement officials, among others. These requirements may be based on the type of installation (ground-mounted vs. rooftop), if the energy produced will be consumed onsite or sold onto the grid, and the nameplate capacity or the footprint of the system. Consult town offices for more information.

H. Development in areas served by the LUPC, including townships, most plantations, and certain towns (see https://www.maine.gov/dacf/lupc/about/offices/index.shtml for descriptions, maps of service area, and contacts):
1. Grid-scale solar energy generation facilities are defined in the LUPC's rules as facilities that occupy one or more acres, have a nameplate capacity of more than 250 Kilowatts, and are solely intended to generate electricity for commercial sale offsite. These facilities will likely require rezoning to a Commercial Industrial Subdistrict or Resource Dependent Subdistrict and require a development permit. Zoning Petition Application forms and Non-residential Development Permit Application forms can be found here: https://www.maine.gov/dacf/lupc/application_forms/index.shtml
2. Non-grid-scale solar energy generation facilities are generally allowed with a permit or in accordance with standards in most subdistricts. Contact the appropriate regional LUPC office for information on a specific development site.
3. For reference:
   a. LUPC Rules, Chapter 10: https://www.maine.gov/dacf/lupc/laws_rules/rule_chapters/Ch10_ver2019_06_17.pdf
   b. LUPC Statute, 12 M.R.S.: https://www.maine.gov/dacf/lupc/laws_rules/rule_chapters/Statute_2017.pdf

I. Forestry considerations
1. See Section IV - A - 3 below.

J. Rare and exemplary botanical features considerations
1. See Section IV - A - 4 below.

III. Tax, Easement and Mortgage Considerations

A. Tax Considerations

Much of Maine's farmland is enrolled in the state's Farmland Current Use Program, which establishes the valuation of property on its current use, instead of market value. A similar program exists for Tree Growth properties. The enrolled property must meet specific criteria and, as currently designed, any change in the use of the land can disqualify it, resulting in a significant penalty to the property owner.

Before entering into any agreements or leases with a Solar Developer, farmers and forest landowners should contact their municipal assessor to determine the property tax consequences of developing the property into a solar energy generation facility. If the property is enrolled in the Farmland, Open Space, and/or Tree Growth Tax current use taxation programs, a change in use will result in the assessment of withdrawal penalties, landowners may want to contractually pass the payment of any withdrawal penalties onto the Solar Developers.

For more information on the penalties, please consult the following Maine Revenue Services Property Tax Bulletins:

- Maine Tree Growth: https://www.maine.gov/revenue/forms/property/pubs/bull19.pdf
- Maine Farmland: https://www.maine.gov/revenue/forms/property/pubs/bull20.pdf

B. Easement Considerations

If a property is currently or has the potential to be enrolled in conservation or non-development easements, landowners should contact the easement holder (the entity which issued the easement) to discuss the implications of developing solar on the parcel. Based on the terms of the easement, it may not be possible to develop solar installations. Or, conversely, solar development may limit one's ability to enter into such easements in the future.

C. Mortgage Considerations

If landowners have an outstanding mortgage, some solar companies will not entertain a project on the property. This is because the bank would have the first position on the asset. Landowners should discuss this issue with the Solar Developer and contact their lender to determine if solar development would be an option. There is the chance that the mortgagee would be required to pay off the mortgage immediately if they had not consulted with their mortgage lender before entering into a contract.

IV. DACF Solar Siting Best Management Practices

A. Preconstruction Planning for Landowners

1. Soil Sampling
   a. Documenting the soil profile and health will be useful in land restoration after the lifespan of the project, if decommissioning is desirable at that time, especially if heavy soil disturbance is planned. Maintaining this documentation is a good practice, as landowner needs and interest could change over time or shift if there is a change in ownership.
   b. For measuring organic matter and nutrient content, soil test kits may be obtained through the University of Maine Cooperative Extension here: https://umaine.edu/soiltestinglab/home/kit-request/maine-soil-request/
   c. For documenting the soil texture, compaction, structure, consistency, and drainage contact a licensed soil scientist here: https://www.maine.gov/pfr/professionallicensing/professions/geologists/index.html
2. Preconstruction Considerations
   a. Consider the timing of construction and how it may interfere with current activities on the land. Will it impact crop production and harvest activities on adjacent land? Would it create limitations on access to other land or equipment?
   b. Consider the needs of future operations on the site. Plan roads that are appropriate to the immediate and long-term objectives and needs of the solar energy generation facility and adjacent lands. Keep in mind weight limitations, road maintenance, safety considerations, and fire suppression access.
   c. Discuss opportunities to limit subsurface anchoring structures or foundations where possible. Refer to the Department's Fact Sheet on Foundation and Installation Types for more information: http://www.maine.gov/dacf/ard/resources/docs/solar-installation-applications-factsheet.pdf
   d. Prior to beginning work, determine boundary lines, harvest objectives, and post-construction conditions with the Solar Developer and any subcontractors.
   e. Walk the property with the Solar Developer, their subcontractors, and other pertinent professionals (such as foresters, wetland scientists, engineers, municipal and state officials) to identify important features of the site, such as seasonally wet areas, steep slopes, invasive plants, poorly drained soils. Determine what Best Management Practices (BMPs) are needed for stream crossings, roads, landings, and for protecting water bodies during construction and closeout. For the development of solar installations, follow Maine DEP BMPs for Erosion & Sedimentation Control, found here: https://www.maine.gov/dep/land/erosion/escbmps/index.html. For more information on BMPs for forestry, please consult: Maine Forest Service Best Management Practices for Forestry: Protecting Maine's Water Quality – Third Edition (MFS BMP Manual) here: https://digitalmaine.com/cgi/viewcontent.cgi?article=1052&context=for_docs

f. If the area is heavily infested with long-lived invasive plants, merely removing the above-ground vegetation is unlikely to kill the invasive plants as they can re-grow from their roots. It is advisable to take steps to address any significant infestations of invasive plants before construction or harvesting. Invasive plants are diverse, and there is no "one size fits all" removal plan; effective approaches vary by plant species, infestation size, and whether seeds are present. Use the principles of Integrated Pest Management (IPM) to determine the best treatment, or combination of treatment methods, to address the infestation. If the landowner is Certified Organic, additional consultation with the certifying agent is strongly advised if any herbicide use is contemplated. Disposal of invasive plant material should be done with care so as not to spread seeds or viable plant fragments.

g. Review the operations and maintenance agreement with the solar developer to understand who is responsible for what activities during and after construction.

3. Clearing Forested Land

a. Under Maine Forest Service rules, clearing land which produces forest products (i.e., the trees, or products made from the trees, are sold) for a non-forested use (such as a solar project) requires landowners to submit a Forest Operations Notification (FON) (Chapter 26 Rules). The FON must accurately identify the intended Change of Use. Please refer to Chapter 26 Rules found here: https://www.maine.gov/dacf/mfs/publications/rules_and_regs/chap_26_rules.pdf

b. The change of use must be completed by the end of the second full calendar year following the year of the timber harvest. If the change of use is not completed within two calendar years, timber harvesting must have complied with Maine Forest Service Forest Regeneration and Clearcutting Standards (Chapter 20 Rules): https://www.maine.gov/dacf/mfs/publications/rules_and_regs/chap_20_rules_05012014.pdf. If there is any uncertainty about whether the solar project will come to fruition on time, err on the side of caution and abide by Chapter 20 Rules.

c. Other Maine Forest Service rules which may apply to timber harvesting include Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas (Chapter 21 Rules), https://www.maine.gov/dacf/mfs/publications/rules_and_regs/chap_21_rules_effective_01012016.pdf and Standards for Timber Harvesting and Timber Harvesting Related Activities within Unorganized and Deorganized Areas of the State (Chapter 27 Rules): https://www.maine.gov/dacf/mfs/publications/rules_and_regs/chap_27_rules.pdf

d. All timber harvesting activities must comply with all other applicable federal, state, or municipal legal requirements. For more information on state timber

harvesting rules, please consult: The Forestry Rules of Maine 2017: A Practical Guide for Foresters, Loggers and Woodlot Owners, found here: https://digitalmaine.com/for_docs/52/

e. Before conducting any timber harvest, contact the Maine Forest Service for assistance at www.maineforestservice.gov, forestinfo@maine.gov, or 207-287-2791. The Maine Forest Service recommends that woodland owners work with a licensed forester when making decisions or undertaking management activities in their woods. For more information: https://www.maine.gov/dacf/mfs/policy_management/working_w_a_forester.html
If the harvest is located in a Development Subdistrict in an area served by the LUPC, contact the regional LUPC Office for information on permitting requirements. LUPC Regional Offices can be found at: https://www.maine.gov/dacf/lupc/about/offices/index.shtml

f. In summary, developing solar on forested land is a change of land use, which must comply with change of use standards. This means that the solar facility must be developed within two (2) years of clearing the trees. Otherwise, the landowner may be in violation of clearcutting standards. A scoping or option agreement does not guarantee the land will be developed. See section IV- A-3-C above.

4. Considerations for Rare Plants and Rare or Exemplary Natural Communities and Ecosystems
   a. During the project design or pre-application phase of a solar project, the Solar Developer (or consultant working on their behalf) is strongly encouraged to contact the Maine Natural Areas Program (MNAP) to inquire whether any rare plants or rare/exemplary natural communities or ecosystems have been documented on the property. Inquiries may be sent to maine.nap@maine.gov.
   b. Under some circumstances, several MNAP-defined natural communities and rare plant populations are protected when projects trigger a Natural Resources Protection Act (NRPA) or Site Law permit as defined by DEP. In those cases, avoidance and set back measures apply. Pre-identification of these natural features through MNAP and/or field surveys will significantly help with project planning.

B. During Construction – Recommendations for Solar Developers

Construction activities that may result in soil disturbance, including excavation, grading, cutting, or clearing of trees, stumping, and use of heavy mechanized equipment, should be limited to the extent practicable. Because all solar farm construction projects result in some degree of soil disturbance, consider the following before and during construction:

1. Anticipating Site Conditions

a. Minimize rutting and compaction of wet or saturated soil during timber harvesting. Harvest during the winter on the frozen and snow-covered ground, in the driest summer months, or with the use of slash to provide support for harvesting equipment.
b. Timber harvesting in spring and fall when streams are high, and soils are saturated is strongly discouraged. If the installation of a permanent stream crossing is to occur between October 2nd through July 14th, an applicant must contact IFW to obtain and submit a Request for Approval of Activity form. Using this form, IFW will conduct a site visit to approve or deny the request. Find your regional office here: https://www.maine.gov/ifw/about/contact/department-directory.html
c. Monitor and adjust BMPs as needed under seasonal or weather-related changes.

2. Site Compaction
   a. Use tracked vehicles when possible in order to reduce the pounds per square inch of pressure on soils.
   b. The use of timber mats or similar measures can provide bearing strength when soils are soft.
   c. When possible, limit vehicles or equipment axle loads over 12,000 pounds when soils experience higher than average rainfall for a trailing 30-day period, based on local rainfall data.
3. Clearing Forested Land
   a. See Clearing Forested Lands and Considerations for Rare Plants and Rare or Exemplary Natural Communities and Ecosystems in the Preconstruction in section (A3, A4) above.
4. Regrading
   a. When possible, avoid stumping, grubbing, and removal of sod. Leaving stumps and sod in place will provide soil stability, bearing strength, and prevent erosion.
   b. Excess stripped topsoil shall not be utilized for onsite fill. Where excess topsoil has been removed from permanently impacted areas (e.g., roads), it should be stockpiled to reclaim the area from which it came or spread on other areas of the project site with insufficient topsoil.
   c. Stockpile excess subsoil for reuse in excavated areas to recreate soil conditions before alteration.
   d. Remove rock excavated during construction from areas intended to return to agricultural use.
   e. Divert runoff from roads into undisturbed vegetation using effective conveyance structures such as water bars, turnouts, or other best management practices.
   f. Minimize impacts to wetlands by using slash, corduroy, or other effective BMPs to increase bearing capacity and allow for the natural movement of water.
5. Road Creation and Water Diversion
   a. Follow Maine BMPs for erosion, sedimentation control, and road construction as outlined in the DEP BMP Manual: https://www.maine.gov/dep/land/erosion/escbmps/index.html

b. Follow Stream Smart Design practices for any new stream crossings. For more information, see https://www.maine.gov/dacf/mfs/policy_management/water_resources/stream_smart_crossings.html
c. In addition:
    i. Ensure road design is appropriate for its intended use.
    ii. On agricultural land, ensure access roads are constructed so they do not shed water onto active agricultural fields, and that the finished grade does not interfere with normal drainage patterns. This may require the installation of waterbars or culverts.
    iii. On forested land, divert runoff from access roads to stable, vegetated areas using appropriate diversion structures. Culverts or other water conveyance structures should be used to allow for normal drainage patterns of wetlands.
    iv. Determine appropriate weed control strategies for the access road.
    v. Temporary access roads may be constructed of erosion control mulch, the thickness depending on how wet the soils are (6 inches for dry soils and 12 inches for wet soil areas).

6. Erosion Controls
    a. Stormwater from the drip edge of solar panels can cause soil erosion, particularly when the soil below it has been disturbed and is bare. To prevent soil erosion under the drip edge of solar panels, install controls such as erosion control blankets, hay mulch, or other appropriate measures to prevent erosion until ground cover conditions are permanently stabilized.
    b. Employ measures to maintain runoff as sheet flow from the solar panels onto and across vegetated areas. If concentrated flows are necessary, proper design, construction, and maintenance techniques of swales, berms, level spreaders, etc. may be needed.
7. Trenching Considerations
    a. Construction techniques that eliminate or minimize soil disturbance, such as directional drilling, are preferred over excavating and trenching.
    b. If excavation activities occur, stockpile the soil in like horizon types and placed back in the order in which they were removed to restore the soil to as closet to its original conditions.
8. Utility Connection
    a. For overhead powerlines and utility power pole installation, ensure that pole placement and the height of the wire will not interfere with the ability to access the land with harvest equipment.
9. Buried Utilities
    a. The National Electrical Code sets the standards for buried electrical lines, which are dependent on the voltage and length of the run. Code allows for direct buried lines, although they are typically installed in PVC conduits for solar projects to avoid damage. The Code requires anywhere from 18 to 30 inches of

minimum coverage, whereas a minimum of 30 inches is typical for solar installations.

b. The amount of buried conduit will be minimal because much of the electrical wire is connected above-ground along the underside of the modules. For buried conduit, 30 inches or more of soil cover is recommended to allow for adequate root growth for desired agricultural use or ground cover.

10. Concrete
    a. Do not bury excess concrete or leave on site.
11. Stockpiling Soil
    a. Avoid stockpiling soil on slopes greater than 15%.
    b. Create stockpiles by soil horizons: topsoil in one pile, horizons above the "C" horizon in another, and the "C" (unweathered parent material) horizon soils in a third. When used to restore a farm field after decommissioning, the piles should be placed back in the ground in the order in which they were removed.
    c. Seed agricultural stockpiled soils with a conservation or perennial mix and mulch with straw for long term storage.
    d. Utilize silt fencing, hay bales, or erosion control mulch to prevent sediment from leaving the stockpile site until stabilized with vegetation.

C. Post Construction – Recommendations for Developers & Landowners

1. Site Cleanup
    a. Take all best efforts to remove all construction debris (wire, bolts, metals, plastics) to avoid mixing with soil or being consumed by grazing livestock.
    b. Remove all excess concrete from the site.
2. Drainage Structure Repair
    a. Any surface or subsurface drainage structures to be left in place should be in good working order and should maintain or improve pre-existing conditions.
3. Any surface or subsurface drainage structures to be left in place should be in good working order and should maintain or improve pre-existing conditions.
4. Revegetation
    a. Select a seed mix that meets the maintenance agreement, which may include pollinator habitat, livestock grazing pasture, cover crops, row crops, or grass.
    b. Prepare the seedbed by removing debris, regrading the topsoil, and scarifying the soil surface.
    c. Amend the soil as recommended, based on soil tests, crops needs, and recommendations of the seed supplier.
    d. Apply the seed mix immediately after preparing the bed at the supplier's recommended rate. If the site cannot be seeded shortly after the seedbed has been prepared, use temporary erosion control measures until seeding takes place. On areas subject to erosion, use erosion control blankets, hydro-seed, or tack the mulch down.
    e. If restoration efforts take place during the summer, mulch with enough straw to completely cover the soil to prevent erosion, keep the seed moist, and prevent

weed establishment. Typically, 90 lbs. of mulch will cover 1,000 sq. ft. (or two square bales for a 30 foot x 30 foot area). Hydro-seeding is another option.

f. If restoration efforts take place after October 1st, use winter seeding rates and re-seed any bare areas in the spring. Use temporary measures to divert surface water runoff away from the newly seeded area(s) until they are permanently stabilized.

D. Monitoring, Remediation and Maintenance Considerations

Solar Developers should provide landowners entering a solar contract with an operations and maintenance plan. They should ensure that all monitoring, remediation, and maintenance work be listed as the sole responsibility of the Solar Developer unless there are site conditions and/or potential damage attributable to any agricultural land use practices undertaken by the landowner. At a minimum, the plan should address the following:

1. Revegetation Monitoring
   a. In the two years following project completion, revegetation efforts should be monitored three times during the growing season (Spring, Summer, and Fall). They should also be monitored whenever new soil is brought in and applied to the site.
      i. Observations should include but are not limited to: erosion, bare soil, soil compaction, tree growth, and invasive plants.
2. Rehabilitation of Disturbed Soils
   a. Avoid using areas affected by livestock compaction until vegetation is re-established. Where fill is required use native excess topsoil from the property or imported topsoil free of invasive species consistent with the quality of the existing site conditions.
   b. Reseed disturbed areas lacking desired vegetation with non-invasive plants.
   c. Rehabilitation efforts should restore the natural soils and hydrology to the extent practicable.
3. Removal of Invasive Plants
   a. Remove those invasive plants that are detected within the project area during the monitoring phase. Monitor the area for invasive plant regrowth for at least one full growing season after removal/treatment.
   b. Invasive plants are diverse, and there is no “one size fits all” removal plan; effective approaches vary by plant species, infestation size, and whether seeds are present. The Solar Developer should use the principles of Integrated Pest Management (IPM) and follow all applicable rules and regulations when considering manual, mechanical, and herbicide treatments. If the landowner is certified organic, additional consultation with the certifying agent is strongly advised if any herbicide use is contemplated.
   c. Dispose of invasive plant material with care so as not to spread seeds or viable plant fragments.
   d. If the area treated is extensive and bare soil is present, reseed with non-invasive plant species.

4. Maintenance
    a. Maintain vegetative growth within the project area throughout the growing season.
    b. Mechanical methods
        i. To avoid rutting and compaction, do not undertake maintenance of groundcover using mechanical methods such as lawnmowing, bush hogging, and weed whacking when soils are saturated.
        ii. Clippings may be left in place as mulch or removed from the site.
5. Infrastructure Checks
    a. Inspect project area fencing and gates on a seasonal basis and repair as needed.
    b. Secure any exposed electrical wires to the solar equipment and protect against damage from grazing animals and other wildlife with meshing or other pest guards. This equipment must be repaired as necessary.

E. Reporting Practices for Solar Developers

1. Ongoing Reporting
    a. Upon seasonal inspections, the Solar Developer should immediately report to the landowner the need for any remediation work identified and determine with the landowner what remediation actions to undertake prior to work commencing, unless otherwise agreed.
2. Annual Report
    a. The Solar Developer should consolidate their annual observations about the project area into an annual report for the landowner.
    b. The report should include images of any adverse impacts to the land and document the remediation process and results.
    c. The report should also identify any long-term projects or changes in maintenance going forward and what additional permits or approvals may be needed.

F. Decommissioning Considerations for Developers & Landowners

Decommissioning plans are required currently as part of DEP's Site Location of Development permitted solar projects (larger than 20 acres). However, regardless of size, the Solar Developer should provide for all projects a decommissioning plan that includes restoration measures to restore the property to its original status as part of the solar contract. The plan should identify when a project is considered abandoned and a timeframe for completion of decommissioning activities, which is typically 120 days. Examples include decommissioning after a specified amount of time construction has not been undertaken, or the system has not been operational, a land lease has expired, or with prior written notification. The decommissioning plan should also identify who is responsible for the costs of decommissioning and how this work will be funded (e.g., trusts, escrow accounts, surety bonds, or letters of credit). Decommissioning and restoration work should be the sole responsibility of the Solar Developer. The Solar Developer should notify the landowner prior to undertaking any decommissioning steps or of any need to update the decommissioning plan.

At a minimum, the decommissioning plan should address the following:

1. Above-ground Structure Removal and Disposal
    a. Including, but not limited to, removal and appropriate offsite disposal of panels, racking system, signage, fencing, equipment pads, and storage buildings.
2. Below-grade Equipment
    a. Remove any equipment buried less than 48 inches deep and dispose of offsite. This includes but is not limited to underground utilities, concrete piers, footers, and electrical conduit.
    b. Any equipment buried deeper than 48 inches may be left in place. Any abandoned conduit should be sealed or capped to avoid the potential of unwanted drainage onto adjacent property.
3. Access Roads
    a. Unless otherwise specified by the landowner, remove access roads and restore this land back to its predeveloped grade and soil conditions.
4. Regrading
    a. Establish contours that support the natural hydrology of the area and its next intended use. Where fill is required, use native excess topsoil stockpiled from the property or imported topsoil free of invasive species consistent with the quality of the existing site conditions.
5. Drainage Structure Repair
    a. Repair or replace any surface or subsurface drainage structures to remain.
6. Restorative Work on Adjacent Lands
    a. Where land outside of the project area has been disturbed by project activities (e.g., access road creation, culvert work, etc.), restorative practices should occur under favorable conditions when the land is workable and relatively dry using BMPs.
7. Revegetation
    a. See Revegetation in Post Construction section above.
8. Property Owner Notification
    a. Verify whether or not a decommissioning plan can be recorded with the Registry of Deeds.
    b. Before the final electrical inspection, the Solar Developer should provide the landowner evidence that the decommissioning plan was recorded with the Register of Deeds.

APPENDIX D:

FINAL REPORT OF THE AGRICULTURAL SOLAR STAKEHOLDER GROUP

Final Report of the Agricultural Solar Stakeholder Group

Credit: Longroad Energy

January 2022

Table of Contents

List of acronyms and terms

Unless noted or context indicates otherwise, the following acronyms and terms have these meanings when used in this report:

Term	Meaning
AAFM	Vermont Agency of Agriculture, Food and Markets
ADA	New Jersey agriculture development area
Agencies	DACF and GEO jointly
DACF	Maine Department of Agriculture, Conservation and Forestry
DEP	Maine Department of Environmental Protection
GEO	Maine Governor's Energy Office
kW	Kilowatts
LUPC	Land Use Planning Commission
MW	Megawatts
NEB	Net energy billing
NRPA	Natural Resources Protection Act
PBR	Permit-by-rule
PUC	Public Utilities Commission
REC	Renewable energy credit
REGMA	Maine Renewable Energy Goals Market Assessment
Resolve	L.D. 820 – Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays
RPS	Renewable portfolio standard
Site Law	Site Location of Development Law
SLODA	Site Location of Development Law
Stakeholder Group	Agricultural Solar Stakeholder Group
USDA	United States Department of Agriculture

Executive Summary

Prime farmland, and soils of statewide importance that are used or could be used as farmland in the future, are finite and critical natural resources for Maine's agricultural productivity, biodiversity, and food security. At the same time, solar energy development is key to achieving Maine's renewable energy goals, reducing greenhouse gas emissions, and growing Maine's clean energy sector. As the state continues to make progress towards both increasing the vitality of the agricultural sector and advancing the growth of the renewable energy economy, the nexus of solar development and agricultural lands becomes an increasingly important conversation.

This report is the product of the Agricultural Solar Stakeholder Group, a diverse group of stakeholders convened by the Department of Agriculture, Conservation and Forestry and the Governor's Energy Office to discuss, review, and consider potential avenues that may adequately protect important agricultural land while helping to reach solar generation goals. The subject matter of this report is complex and multi-faceted. Over the course of seven months, the Stakeholder Group strove to hear all opinions, consider varying viewpoints, and work to gain consensus where possible on important recommendations. It is the intention of the Stakeholder Group that this report catalyze action by providing recommendations the Group views as important steps to build on existing progress, advancing opportunities for protecting prime farmland and soils of statewide importance while also supporting solar development, and providing information and resources to inform practitioners and decisionmakers on the ground. While this report focuses specifically on the intersection of solar development and agricultural lands, the Stakeholder Group regularly noted that not all solar will be developed on agricultural lands and substantial opportunity exists for solar development in other areas, including the built environment and on various contaminated or previously-developed areas, although the direct costs of developing these areas may in many cases be higher. Further, solar is not the only form of development that has and will continue to impact agricultural, natural, and working lands, such as commercial or residential development.

Based on its research and discussions, and additional input received from the public, the Stakeholder Group advances seven consensus recommendations to the Department of Agriculture, Conservation and Forestry and the Governor's Energy Office. The Stakeholder Group also developed relevant definitions and a matrix of siting considerations for practitioners. Recommendations are numbered for reference only, and not to indicate prioritization of one recommendation over another.

- Recommendation 1: Creation of a centralized clearinghouse of information
- Recommendation 2: Dual-use pilot program
- Recommendation 3: Consideration of current use taxation
- Recommendation 4: Consideration of standards for dual-use and co-location in permit-by-rule review
- Recommendation 5: Development of hosting capacity maps
- Recommendation 6: Increased support for municipal planning capacity
- Recommendation 7: Consideration of program preference based on agricultural site characteristics

Stakeholder Group Purpose

Prime farmland, and soils of statewide importance[1] that are used or could be used as farmland in the future, are finite and critical natural resources for Maine's agricultural productivity, biodiversity, and food security. At the same time, solar energy development is key to achieving Maine's renewable energy goals, reducing greenhouse gas emissions, and growing Maine's clean energy sector.

To ensure responsible siting of solar energy on agricultural lands, the Governor's Energy Office (GEO) and the Maine Department of Agriculture, Conservation and Forestry (DACF) (jointly "the Agencies") convened the Agricultural Solar Stakeholder Group (the "Stakeholder Group") to make policy recommendations to balance the need to protect Maine's current and future farmland with the need to develop sources of renewable solar energy. The Stakeholder Group focused its research and recommendations on the intersection of agricultural lands and solar, informed in part by L.D. 820, while occasional discussion of other land uses and characteristics occurred incidentally. In addition, while much of Maine's prime and statewide important agricultural soils are currently occupied by forests, the Stakeholder Group did not focus on working forests in its deliberations or in this report. The Stakeholder Group's research included learning about existing requirements for solar project design and decommissioning enforced by the Department of Environmental Protection (DEP) and Land Use Planning Commission (LUPC) and acknowledged the existence of additional standards established at the municipal level, but did not extend to considering additional agriculture-specific standards beyond those already in law (see Appendix B).

Maine Won't Wait

The Agricultural Solar Stakeholder Group was recommended by *Maine Won't Wait*, Maine's four-year climate action plan from the Maine Climate Council, in recognition that both agricultural production and the opportunity to expand renewable energy generation are valued, and that thoughtful consideration of land use decisions and incentives should be explored more thoroughly.[2] *Maine Won't Wait*, released in December 2020, identifies data-driven strategies and recommendations to reduce Maine's greenhouse gas emissions, as required by law, to 45% below 1990 levels by 2030 and 80% by 2050.

Strategy E from *Maine Won't Wait* is to "protect Maine's environment and working lands and waters." As part of this strategy, the plan calls for "develop[ing] policies by 2022 to ensure renewable energy project siting is streamlined and transparent while seeking to minimize impacts on natural and working lands and engaging key stakeholders," as well as "increas[ing] by 2030 the total acreage of conserved lands in the state to 30% through voluntary, focused purchases of land and working forest or farm conservation easements." Strategy D from *Maine Won't Wait* is to "grow Maine's clean-energy economy

[1] "Prime farmland" and "soils of statewide importance" (or "statewide important farmland") are defined pursuant to Maine Instruction 430-380 – Prime, Statewide, Unique and Locally Important Designation (May 2020). Soils meeting these definitions possess desirable attributes for agricultural production including gradient, water table, rock material, and water holding capacity. Working definitions of these terms used by the Stakeholder Group are included in this report on page 14. The complete instruction is available here: https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1585016&ext=pdf

[2] For the full text of *Maine Won't Wait*, see https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf

and protect our natural-resource industries," including by "increas[ing] the amount of food consumed in Maine from state food producers from 10% to 20% by 2025 and 30% by 2030 through local food system development." Finally, Strategy C from *Maine Won't Wait* is to "reduce carbon emissions in Maine's energy and industrial sectors through clean-energy innovation," including by "achiev[ing] by 2030 an electricity grid where 80% of Maine's usage comes from renewable generation."

Consistent with these recommendations and acknowledging the rapid growth of solar energy taking place in the wake of other recent policy changes, the Stakeholder Group is specifically focused on minimizing the potential impact of solar development on Maine's prime farmland and soils of statewide importance.

L.D. 820

The 130th Maine Legislature passed L.D. 820 – Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays (the "Resolve") on June 8, 2021. The Resolve directs DACF to "convene a working group of stakeholders to develop plans and consider ways to discourage the use of land of higher agricultural value and encourage the use of more marginal agricultural lands when siting a solar array." DACF is further directed to "submit its report and recommendations, including any suggested legislation, to the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources no later than January 14, 2022." The full text of the resolve is included in Appendix A of this report.

Purpose of this report

This report summarizes information provided to the Stakeholder Group and discussed at the group's meetings. It outlines conclusions made by the Stakeholder Group based on that information as well as on the expertise and experience of group members and information provided through comments from interested members of the public. Finally, based on the conclusions, this report advances recommendations made by the Stakeholder Group to the Department of Agriculture, Conservation and Forestry and the Governor's Energy Office some of which are relevant to LD 820.

Photo credit: ReVision Energy

Stakeholder Group Membership

The following members of the Agricultural Solar Stakeholder Group were appointed jointly by the Department of Agriculture, Conservation and Forestry and the Governor's Energy Office. The co-chairs on behalf of their agencies wish to express sincere gratitude for the time, energy, expertise, and thoughtful engagement contributed by every member of the group, as well as numerous members of the public who attended meetings, participated in public comment sessions, offered written and verbal feedback on the Group's report, and provided their input through other channels.

Co-Chairs

Celina Cunningham, Governor's Energy Office
Nancy McBrady, Department of Agriculture, Conservation and Forestry

Stakeholders

Nick Armentrout, Spring Creek Farm
Emily Cole, American Farmland Trust
Heather Donahue, Balfour Farm
Ellen Griswold, Maine Farmland Trust
Eliza Donoghue, Maine Audubon
Kaitlin Hollinger, BlueWave Solar
Matt Kearns, Longroad Energy
Fortunat Mueller, ReVision Energy
George O'Keefe, Town of Rumford
Jeremy Payne, Maine Renewable Energy Association
Andy Smith, The Milkhouse
Julie Ann Smith, Maine Farm Bureau
Patrick Wynne, City of Hallowell

Staff

Tom Gordon, Department of Agriculture, Conservation and Forestry
Yvette Meunier, Department of Agriculture, Conservation and Forestry
Ethan Tremblay, Governor's Energy Office

Facilitator

Jo D. Saffeir

Photo credit: Terra Firma Farm

Stakeholder Group Process

Meetings

The Stakeholder Group met eight times from its formation in June 2021 through December 2021: June 3 and 24, July 22, August 24, September 23, October 21, November 18, and December 16. Agendas, materials for discussion, and summaries of the immediate prior meeting were provided a week in advance to the Stakeholder Group members as well as a list of interested parties maintained by the agencies. Due to the ongoing COVID-19 pandemic, all meetings were conducted using the Zoom virtual meeting platform and were recorded.[3]

At several points during the Stakeholder Group's work, some members of the Stakeholder Group volunteered to form ad-hoc sub-groups to focus on specific topics of interest. Of particular note are the sub-groups that formed to conduct additional information-gathering and draft discussion materials related to the group's definitions of "dual-use" and "co-location," the group's discussion of a matrix of solar siting considerations, and the group's formulation of a set of policy options for consideration.

Consensus

The Stakeholder Group was presented with and agreed to the following ground rules for all of its meetings:

1. Meetings start and end on time.
2. Come prepared, having read all meeting materials in advance.
3. Be present and engaged.
4. Strive for equal air time, enabling everyone to participate fully.
5. Listen with curiosity and an openness to learning and understanding.
6. Adopt a creative problem-solving orientation.
7. Commit to working toward consensus.
8. Meetings and materials are public, and comments are on the record.
9. Humor is welcome; it's OK to laugh while addressing a serious topic.

Decision-making: Decisions by the Stakeholder Group are advisory and represent recommendations to the Department of Agriculture, Conservation and Forestry and the Governor's Energy Office. The Stakeholder Group sought to make decisions by consensus through a facilitated, discussion-based process, and did not hold votes on any specific decisions.

Public engagement

Meetings of the Stakeholder Group were open to attendance by the public. Each meeting reserved time on the agenda for the public to comment on any aspect of the Stakeholder Group's work. In addition, written comments were provided periodically through the Stakeholder Group staff and facilitator. This report was provided in draft form to the Stakeholder Group and interested parties as well as posted

[3] All meeting recordings are available on YouTube here: https://www.youtube.com/playlist?list=PLHmFAUsYQIxbA6L0Dr0XaEbVezxsTzDi0
All meeting materials, including presentations, are available here: https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/agricultural-solar-stakeholder-group/past-meetings

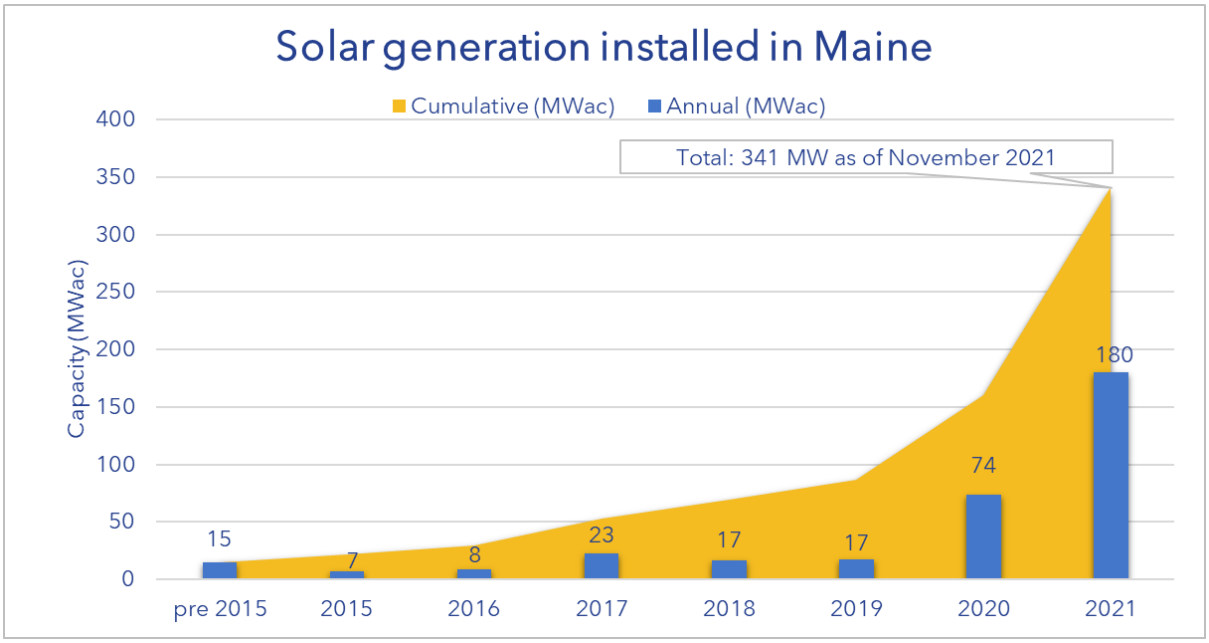
publicly by the agencies on November 12 for public comment. All comments received were summarized and provided to the Stakeholder Group to inform the final version of the report.

Photo credit: Longroad Energy

Overview of Maine solar energy policy and industry landscape

Solar electricity is a clean and renewable resource that can provide a variety of benefits to the electrical grid. Solar installed behind-the-meter, such as on a homeowner's rooftop, lowers load on the distribution system and can offset the building's energy bill, while larger utility-scale solar projects provide clean power to the grid throughout the course of the day. When paired with energy storage, solar can continue to provide clean, renewable power even after the sun sets.

Solar photovoltaic (PV) panels can be installed in arrays ranging from small, residential rooftop installations that power a home to an array covering many acres[4] that can power entire towns – thousands of homes, businesses, schools, and other buildings. Maine has established in law a specific goal of "ensuring that solar electricity generation, along with electricity generation from other renewable energy technologies, meaningfully contributes to the generation capacity of the State."[5] Recent policy changes have accelerated the deployment of solar in the state; as illustrated in the figure below, less than 30 MW of solar was operational in 2016 – an amount that has since increased more than tenfold.



Source: Governor's Energy Office

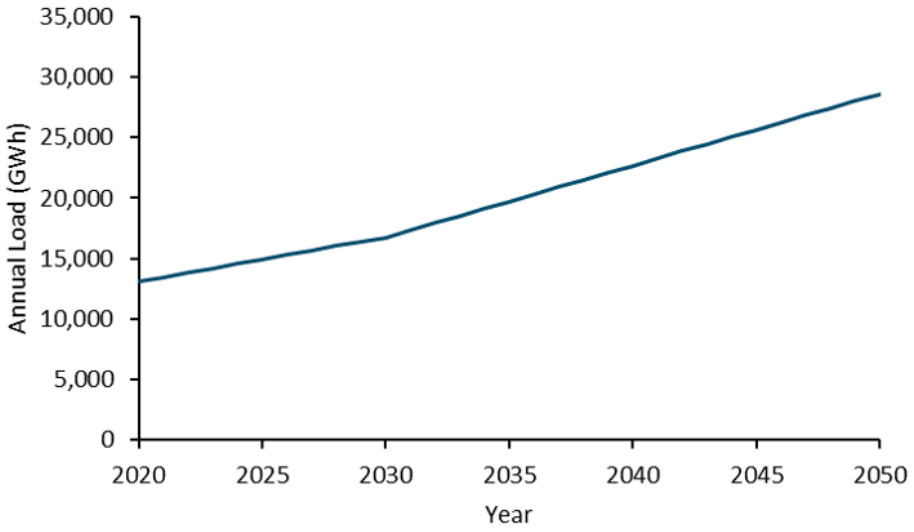
Maine energy policy context

Many of the strategies and actions identified in *Maine Won't Wait* to achieve Maine's ambitious economy-wide decarbonization objectives rely on two energy-related pillars: rapid electrification of emitting sectors of the economy, including transportation, buildings, industry, and power, often referred

[4] The Stakeholder Group was informed that on average one MW of ground-mounted solar requires approximately five acres of land, although multiple factors including site design, supporting infrastructure, topography and other technological and environmental characteristics may influence specific outcomes.

[5] Title 35-A MRS § 3474

to as “beneficial electrification;” and rapid transition to low-carbon emitting power generation, including solar. Achieving the beneficial electrification actions identified by *Maine Won’t Wait* is expected to put Maine on a path to nearly double the amount of electricity needed in Maine by 2050, as illustrated in the figure below.[6]



Renewable portfolio standard

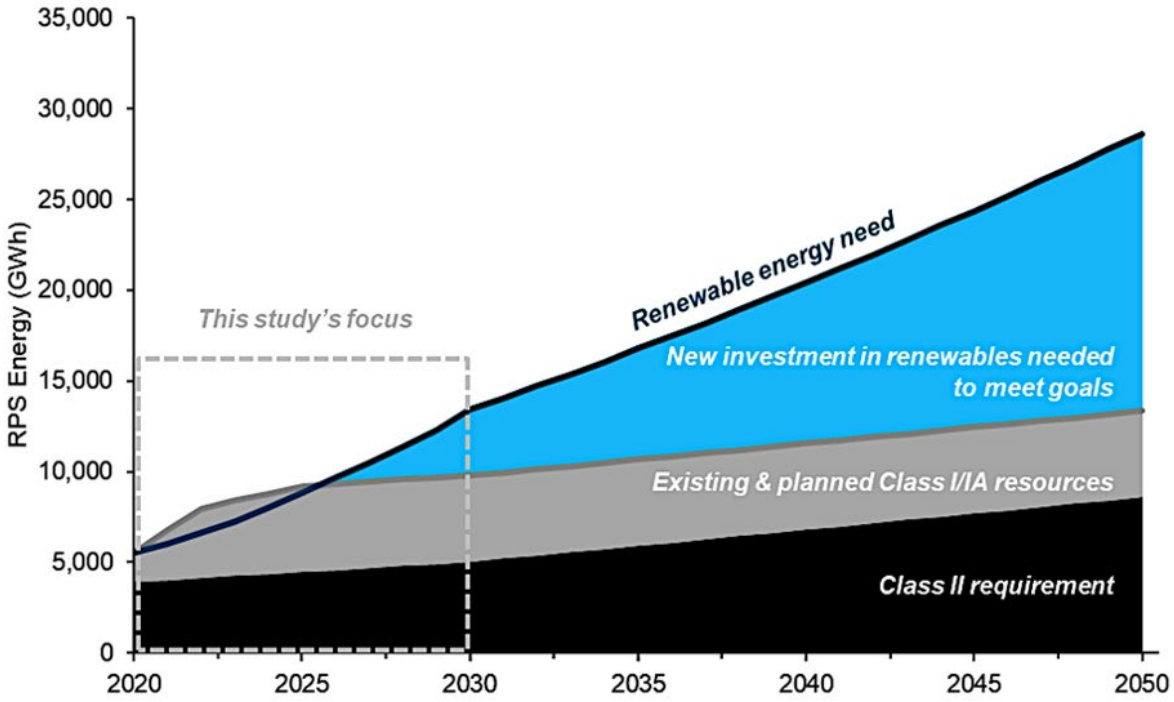
Maine’s renewable portfolio standard (RPS) establishes the portion of electricity sold in the state that must be supplied by renewable energy resources. In June 2019, Governor Mills signed legislation that increased Maine’s renewable portfolio standard (RPS) to 80% by 2030 and set a goal of 100% by 2050. In addition, the bill required the Maine Public Utilities Commission (PUC) to procure long-term contracts for new clean energy generation. In order to ensure this procurement created significant economic benefits for Maine, the procurement weighed bids with a 70% consideration towards benefits to ratepayers (i.e. price) and 30% towards proven benefits to the economy. Through two rounds of procurement announced in September 2020 and July 2021, the PUC selected a mix of qualified renewable resources including solar, wind, and biomass equivalent to 14% of the state’s retail electric load in 2018. Solar resources made up the largest share of the procurement results, with term sheets awarded to twenty projects totaling 773 MW.

The same legislation also directed the GEO to conduct a renewable energy goals market assessment (REGMA) to assess options for how to meet the renewable transition in Maine over the next decade. The REGMA study was completed with stakeholder input and released in February 2021.[7] The REGMA analyzed six future scenarios to explore plausible renewable portfolios that would enable Maine to meet its 2030 RPS requirement. One key finding from the REGMA was that, based on existing and planned

[6] For details about the assumptions included in this load forecast, see Maine Renewable Energy Goals Market Assessment, section 3.3.1.1. https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/renewable-energy-market-assessment

[7] https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/renewable-energy-market-assessment

renewable resources assumed in the study (including approximately 1,200 MW of solar assumed to be built by 2026), Maine is on track to meet its RPS until 2026, but new resources will be needed to meet increasing goals thereafter. This increasing need is illustrated in the figure below, which compares the output of qualifying categories of existing and expected renewable resources to the overall renewable energy need, given both the increased share of renewable energy required by the RPS as well as expected load growth due to beneficial electrification primarily in the transportation and buildings sectors. ("This study's focus" refers to the ten-year time horizon that was the focus of the REGMA analysis.)



Net energy billing

Net energy billing (NEB) provides bill credits for excess generation from solar and other distributed renewable resources that is not consumed on site, but instead provided to the grid. "Distributed" resources are defined by statute as renewable energy generation facilities less than 5 MW in size.[8] NEB programs are available for residential, commercial, and industrial customers. These programs can provide energy savings by lowering overall utility bills and offer the opportunity to support renewable energy generation at a local level.

NEB participants may enroll solar generation they own themselves, such as rooftop panels, or may choose to join a solar array shared with other customers and located elsewhere in their utility's service territory. This arrangement is commonly referred to as "community solar." The NEB programs have stimulated substantial investment in distributed solar development, with 114 MW of solar already

[8] 35-A MRS §3481 (5).

operational as of October 2021 and more than 1,500 MW under development, although not all projects in development are expected to ultimately reach commercial operation.

In 2021 the Legislature enacted P.L. 2021 ch. 390, which established a goal of 750 megawatts (MW) of distributed generation under the NEB programs. The bill also set a limit on distributed generation resources between 2 and 5 MW eligible for enrollment in NEB and concludes the program for these resources on December 31, 2024. The law also directed the GEO to convene a stakeholder group to, in part, consider various distributed generation project programs to be implemented between 2024 and 2028.

Overview of Maine agriculture and solar development potential

Maine agriculture is a diverse industry with a $3.6 billion impact on the state's economy.[9] Maine is the largest producer of brown eggs and wild blueberries in the world. It ranks eighth in the country in production of potatoes and second for maple syrup. It ranks second in New England in milk and livestock production. The small, diversified farms across Maine supply markets with locally-grown fresh and frozen produce and meat, value-added products, and fiber products.

MAINE ECONOMIC IMPACTS

SECTOR	DIRECT SALES	ECONOMIC IMPACT	EMPLOYMENT
AGRICULTURAL PRODUCTION	$ Million	$ Million	Jobs
Grain and Oilseed Farming	26.3	50.6	579
Vegetable Farming	231.9	438.8	5,552
Fruit Farming	63.9	125.1	3,075
Greenhouse, Nursery and Floriculture Production	72.3	125.2	1,731
Other Crop Farming	42.0	80.7	2,253
Cattle Production	23.5	35.0	849
Dairy Cattle and Milk Production	154.5	265.1	2,063
Poultry and Egg Production	15.4	25.8	258
Other Livestock Production	16.5	24.6	666
PROCESSING			
Grain and Oilseed Processing	89.8	151.2	450
Frozen and Canned Food Manufacturing	635.6	1,027.3	4,409
Milk, Yogurt, Butter and Cheese Manufacturing	336.4	640.5	2,473
Other Dairy Processing	56.4	86.2	296
Animal Slaughtering and Processing	262.7	381.7	1,904
Wineries	22.8	37.9	196
Ag Input Manufacturing	65.4	106.2	309
TOTAL FOR AG INDUSTRY	2,115.4	3,601.9	27,063

Farm Credit East, "Northeast Economic Engine," 2020.

Maine agriculture serves a variety of markets. Larger farms provide crops to commodity markets and act as anchors for agricultural inputs, equipment, and services that impact and benefit all farms in the state. Products from these farms are often processed and sold out of state. The majority of Maine farms are small family farms that enhance community food security and provide open space which defines Maine's rural character.

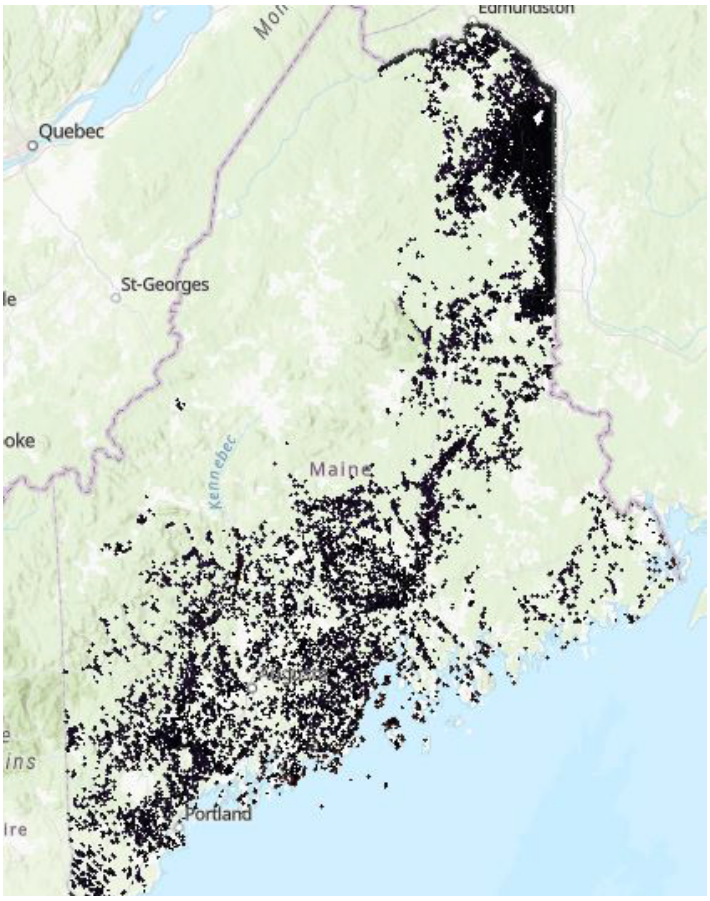
USDA-ERS Farm Classification System	ANNUAL FARM SALES	NUMBER OF FARMS	PERCENT OF FARMS	2017 MARKET VALUE	PERCENT OF SALES
Small family farms	**$ 0 - $ 99,999**	**6,884**	**90.6%**	**$ 71,031,000**	**10.5%**
Intermediate family farms	**$ 100,000 – $ 249,999**	**299**	**3.9%**	**$ 47,376,000**	**7.0%**

[9] Farm Credit East, Northeast Economic Engine, 2020

Large family farms	**$ 250,000 – $ 499,999**	**177**	**2.3%**	**$ 61,866,000**	**9.2%**
Very large family farms and nonfamily farms	**$ 500,000 – $ 5,000,000+**	**240**	**3.2%**	**$495,635,000**	**73.3%**

USDA-NASS, 2017 Census of Agriculture, Table 2 (2019)

Maine farmers are the stewards of 1,307,566 acres (~6%) of the state. This includes 472,508 acres of cropland, 685,529 acres of woodland, 62,369 acres of pasturelands, and 87,207 acres of other agricultural land[10] (). While the Stakeholder Group was specifically focused on solar development on active agricultural lands (and not forests or developed areas), woodlands are a significant component of most farms and may be impacted by solar projects on farms.



USDA-NRCS, Map of Prime Farmland and Statewide Significant Soils

In addition to active farming, the land provides the public benefits of open space, recreation, wildlife habitat, and natural resource preservation. Maine's "Current Use" taxation policy can provide tax relief to landowners for some of these public benefits which otherwise do not typically produce direct economic value to the landowner.

In 2017, 1,870 farm operations (25%) utilized leased lands involving 261,448 acres (20%).[11] Farmers on leased lands often cannot afford to purchase these lands and as a result are subject to land use decisions made by the property owners. Competition from development, including solar, is likely to reduce the availability and increase the cost of leased lands for agricultural use.

[10] USDA-NASS, 2017 State Profile, and 2017 Census of Agriculture, Table 8, 2019

[11] USDA-NASS, 2017 Census of Agriculture, Table 76, 2019

Soils data from the USDA Natural Resource Conservation Service indicate that 2,929,881 acres (14%) of Maine's land area are classified as prime farmland soils[12] (794,320 acres) or soils of statewide importance[13] (2,106,549 acres).

US Geological Survey Land Cover Database data indicate 2.5% (730,005 acres) of crop and pasture land is in active production. 73% of crops and pasture (529,241 ac) are grown on prime soils or soils of statewide importance.

More than half of Maine's prime farmland or statewide important soils are not currently being used for agricultural production. However, agricultural land use is dynamic and may shift to meet growing demand for local products and new market opportunities. Reclaiming reverted fields or woodlands can be cost-prohibitive for new or existing farming ventures.

Between 2012 and 2017, the number of reported farms in Maine declined by 7% and the total land ownership reported by agricultural producers decreased by 146,491 acres (10%).

	1997	2002	2007	2012	2017
Farms	**7,404**	**7,196**	**8,136**	**8,173**	**7,600**
Acres	**1,313,066**	**1,369,768**	**1,347,566**	**1,454,104**	**1,307,613**

USDA-NASS, 2017 Census of Agriculture, Table 1 (2019)

According to American Farmland Trust, Maine was one of the top five states with declines in farmland between 2012 and 2017. American Farmland Trust has estimated that approximately 1,200 acres of Maine farmland were lost to highly developed or low-density residential use each year from 2001 to 2016[14]. *Maine Won't Wait*, Maine's four-year climate action plan from the Maine Climate Council, calls for an increase in the amount of food consumed in Maine from state food producers from 10% to 30% by 2030 through local food system development, and an increase in the total acreage of conserved lands in the state to 30%.

Solar development is a potential means for income diversification and stability for farms, as well as increased economic viability for local communities. The Stakeholder Group heard from a Monmouth landowner that solar development on a portion of the family farm would allow for the long-term conservation of the larger overall farm property for agricultural production.

Many Maine farmers have been contacted about potential solar project development on their lands. DACF and Maine Audubon Society have been developing materials to assist agricultural landowners, communities, and developers with decisions about solar project opportunities, design, and best

[12] The National Soil Survey Handbook and 7 CFR 657 Prime and Unique Farmlands, defines Prime Farmland as follows: 'Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and is also available for these uses (the land could be in cropland, pastureland, rangeland, forest land or other lands, but not urban built-up land or water). It has the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.'

[13] According to 7 CFR 657, Prime and Unique Farmlands is defined as follows: 'Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. General additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.'

[14] American Farmland Trust, Farms Under Threat, 2016

practices. The Department's Technical Guidance for Utility Scale Solar Installations and Development on Agricultural, Forested, and Natural Lands and its Guidance to Determining Prime Farmland Soils and Soils of Statewide Importance for Solar Projects may be found here: https://www.maine.gov/dacf/ard/resources/solar.shtml. Maine Audubon's Renewable Energy Siting Tool, its Model Site Plan Regulations and Conditional Use Permits, and other useful guidance can be found here: https://maineaudubon.org/advocacy/solar/.

Primary areas of Stakeholder Group research

Other states' solar and siting practices

Massachusetts

Photo credit: BlueWave Solar

Emily Cole, New England Deputy Director of American Farmland Trust, presented to the Stakeholder Group on June 24, 2021, regarding the Solar Massachusetts Renewable Target (SMART) program. In spring of 2017 the program announced an initial competitive procurement of 1,600 MW of solar. Proposed and completed projects from that initial procurement included significant solar development on farmland. As a result, changes were made to the land-use policies requiring any future solar projects proposed on farmland be dual-use. The changes also included a requirement that the value of agricultural production be documented with the University of Massachusetts Cooperative Extension. While the group saw merits in aspects of the SMART program that may be replicated in Maine, including the possibility of an increased payment for the energy from dual-use projects (an "adder") and the dual-use design guidelines, there was also a recognition that Maine is different from Massachusetts in a number of ways, including the ability to bear higher electricity costs, that should be considered if pursuing a similar program. For instance, solely allowing dual-use on farmland, as the SMART program does, would require significant study and stakeholder discussion to determine if this would work for Maine farmers and ratepayers. However, setting aside a specific MW of capacity within each procurement as a carve-out specifically for dual-use is something the State may want to review. Overall, there are program characteristics and lessons learned from the MA SMART program that can help inform solar discussions in Maine.

New Jersey

Ethan Winter, Northeast Solar Specialist for American Farmland Trust, presented to the Stakeholder Group on July 22, 2021, regarding New Jersey's landscape of farmland protection in relation to the state's solar legislation. Like Maine, New Jersey is facing farmland loss for a number of reasons; both states lost approximately 10% since the last ag census. However, in comparison, Maine is four times the size of New Jersey. New Jersey's solar market is much larger and more mature than Maine's and is set to grow substantially in the coming years. New Jersey's solar development goals are 5.2 GW by 2025, 17 GW by 2035 and 32 GW by 2050. Of New Jersey's 779,000 agricultural acres, all but 101,000 acres would be protected given their soil quality, farmland protection status or recognition at the county level as an agriculture development area (ADA).

New Jersey has created a 3-year Dual-Use Pilot Program to develop 200 MW of solar with projects not to exceed 50 acres. Projects must be sited on unprotected farmland, continue to be actively devoted to agricultural production and vetted through the NJ Department of Agriculture. The only installations allowed for dual-use on prime farmland soil are for research purposes with any public university in New Jersey. Enrolled land is permitted to be eligible for farmland assessment. This program can be extended and is authorized to become a permanent program with standards for dual-use including capacity limits, continued agricultural/horticultural use and decommissioning bonds. Details about the dual-use pilot program are currently being drafted through a stakeholder process, after which dual-use projects up to 10 MW can be built.

In addition, a utility scale solar bill was passed which codified the development of 3.75 GW of solar by 2026. These installations would include community solar projects, net metered projects, and procurement solicitations. The statute also establishes a limit of up to 8,000 acres of utility scale development on ADA land. Additional development on ADA sites beyond this acreage would require a waiver from the NJ Department of Agriculture. Details of these policies are currently being drafted through a stakeholder process, keeping solar development on pause for dual-use projects until more information is available.

Vermont

Genevieve Byrne, assistant professor and staff attorney at the Farm and Energy Initiative at the Vermont Law School, presented to the Stakeholder Group on July 22, 2021 and gave an overview of Vermont's Certificate of Public Good (CPG) regulatory process for solar projects. Vermont's Public Utilities Commission (PUC) issues Certificates of Public Good for roof-mounted arrays up to 500 kW and ground-mounted arrays up to 2.2 MW. Certification criteria and application complexity increase with array capacity. All roof-mounted systems up to 500 kW and smaller ground-mounted systems up to 15 kW are fast-tracked though a registration process. An application for ground-mounted systems up to 50 kW must be submitted with accompanying evidence of meeting compliance criteria. Anything above 50 kW undergoes a formal petition process with the PUC, which can allow for fast-tracking if projects are within size and scope limitations.

In relation to agricultural resources, the PUC must consider impacts to prime agricultural soils for all ground-mounted projects over 15 kW. For projects over 50 kW, Vermont's Agency of Food and Markets (AAFM) receives notification of the proposed project. AAFM has the right to appear at PUC hearings and is required to appear for systems over 500 kW that are located on agricultural soils. Conditions for the protection of agricultural soils may be included in the project's CPG.

The policy includes siting adjustors and rate adjustors. Siting adjustors initially included adders for the construction of smaller arrays under 16 kW and/or on preferred sites such as parking lots, brownfields, and landfills. Moving forward the program will continue with the existing subtractors which are applied only to projects 15 kW and larger not located on preferred sites.

Subtractors will be increasing to 5 cents/kwh for projects between 15-150 kW and 4 cents/kwh for larger projects. Rate adders for projects whose renewable energy credits (RECs) would be applied to

Vermont's renewable energy portfolio will no longer be continued. However, the subtractor for projects which keep their RECs will increase to 4 cents/kwh. Changes in the policy were a result of a variety of factors, including declining costs of solar technology and concerns about the compensation structure of net metering. Professor Byrne noted that Vermont's renewable energy requirements are largely achieved through imported hydroelectric generation and that there are concerns among some stakeholders in Vermont about the viability of that state's renewable energy goals due to difficulty accessing in-state energy or regional non-hydro energy sources.

Taxation laws in Vermont allow farms in the open space current use taxation program to have solar installations of 50 kw or less and up to 500 kW if they are deemed as a farm improvement, where 50% of the energy is used on the farm.

Maine's solar programs and results

Perspective and data from Maine Audubon

On June 3, 2021, Sarah Haggerty, Conservation Biologist and GIS Manager for Maine Audubon presented the Maine Renewable Energy Siting Tool. The GIS-tool aggregates Maine's mapped natural resources, developed/previously impacted land (such as landfills and Brownfields), as well as solar siting constraints (such as proximity to transmission lines) to aid in identifying areas with lower wildlife and habitat impacts.

Using this tool, Maine Audubon has mapped all 180 solar projects submitted to DEP for review, noting that there are many smaller projects not triggering a DEP review and that not all projects reviewed will be built. Of the 180 projects: 43% overlap at least in part high value plant and animal habitat and 49% overlap at least in part with large forest blocks. Fifty-eight percent overlap at least in part with large agricultural land (five acres of continuous crop land or 10 acres of pasture) and 89% overlap at least in part with high value agricultural blocks. More information was requested about the intersection of prime agricultural land versus agricultural land of statewide significance. Only 6% of the projects overlap at least in part with gravel pits and 3% with capped landfills. The utilization of these sites tend to be limited by the lack of transmission lines nearby.

Perspective from Maine Municipal Association

Rebecca Graham, Legislative Advocate with Maine Municipal Association (MMA), presented to the Stakeholder Group on August 24, 2021, covering multiple policy areas including agriculture, conservation, and forestry, and gave a presentation covering interests and concerns of solar development for municipalities. In Maine, most of the services municipalities provide are paid through property tax revenue. The current use tax programs utilized for agricultural production offer no state reimbursement to municipalities for the loss of tax revenues for sheltering this land use. Allowing agricultural land that has been altered by solar development to remain in these programs is of concern for municipal revenue streams. It is MMA's perspective that farmland developed for solar should be removed from current use tax programs.

Recent changes to energy laws have rapidly increased solar development in Maine. As a result, municipalities have had to vet a new industry and have often responded by creating ordinances and

assurances for decommissioning projects. Such work has fallen to volunteer boards that often lack the appropriate expertise and has caused concern for comprehensive land use planning. Further, many projects being proposed are just under the 20-acre threshold which eliminates the requirement of Site Law review by the State, although other oversight including stormwater permitting and Natural Resource Protection Act provisions may apply.

To support municipalities' desire for more solar, MMA suggests these measures: incentivize development in marginal and contaminated or unusable spaces first (such as PFAS-contaminated soils); incentivize more structurally challenging, built environment-focused projects (e.g., brownfields, gravel pits); fully fund the municipal reimbursement portion of the "current use" program; strengthen local planning capacity with solar-specific technical assistance; provide PUC, DEP and DACF with enforcement powers, and adequate staffing resources to oversee projects, reducing the burden on code enforcement; close loopholes that may allow land in one current use program to roll to another with no penalties for the purpose of solar farms; create a list of trusted development partners for any co-location project by establishing a robust licensing or certification program like shoreland zone-certified contractors; and revisit the farmland current use program with an eye towards greater accountability/penalties for productivity.

A discussion of the future obsolescence of projects brought up the value of project locations near grid infrastructure as being a driver to keep a site in future power production. Further, the lack of solar panel recycling facilities in Maine was noted, although some companies utilize recycling facilities in neighboring states. The Stakeholder Group ultimately arrived at a different conclusion than MMA with regard to the current use taxation program, as noted in Recommendation 3 on page 32.

Perspective from Nexamp

Palmer Moore, Vice President of Business Development at Nexamp, presented to the Stakeholder Group on August 24, 2021 with an overview of Nexamp's experience developing solar in states across the country and how policy has influenced its work. Nexamp is a solar development company based in Massachusetts with over 300 MW installed across ten states from Maine to California. While utilities nationwide are using new tools, equipment, and safety protocols to better manage interconnections, tracking interconnection is difficult as the roster of proposed projects lined up for interconnection is constantly changing. With so many projects in flux, interconnection costs that may include significant upgrades can swing from $5,000 to $5 million making development costs unpredictable. Local ordinances or moratoria can add to this uncertainty. Given the interest in solar development, land leases are becoming more competitive, further increasing project costs.

Nexamp has been exposed to a variety of policies focused on balancing the impact of solar development on agricultural land. In New York, the Department of Agriculture and Markets created a notice of intent process which incorporates a mitigation fee. The fee is determined by a calculation that incorporates a value to agricultural soil. These polices put the onus on the developers to verify the quality of the soil through site evaluation. According to Palmer, when such a policy is implemented, this approach is welcomed by developers as spatial soil data is lacking. Several other states have implemented the use of pollinator scorecards (see Siting Scorecards section below). In many cases these are voluntary, while in

others a minimum score is required to develop a project. Alternatively, an analysis as to why the location for the development was chosen by the farmer and developer may be presented to the permitting authority. Nexamp typically installs pollinator habitat as a best practice, implementing the National Wildlife Federation certification for habitat and ecological diversity. It also installs livestock fencing instead of chain link fences to create less industrial looking sites and to allow wildlife to pass through sites.

Perspective from BlueWave

Drew Pierson, Senior Director of Sustainability at BlueWave Solar discussed dual-use solar projects which focus on ecosystem services and holistic community development with the Stakeholder Group on October 21, 2021. He noted that Maine was unlikely to provide a rate-based incentive but could demonstrate how to have an effective voluntary market for dual-use projects. Planning dual-use requires convening all interest sectors, defining shared goals, and creating shared value. BlueWave's siting process involves farmland preservation, soil vitality, and flexibility in maintaining ongoing farming activities. The Massachusetts SMART Program is demonstrating that agrivoltaics can minimally impact soil and moderate microclimate to improve farm resilience. BlueWave's Rockport, Maine project is sited on wild blueberry fields and involves five years of crop trials by the University of Maine. BlueWave is developing an agrivoltaic project in Benton, Maine which will involve grazing sheep and providing five acres of land for fruit and vegetable crop trials. The group discussed current use taxation policy as an incentive for agrivoltaic projects.

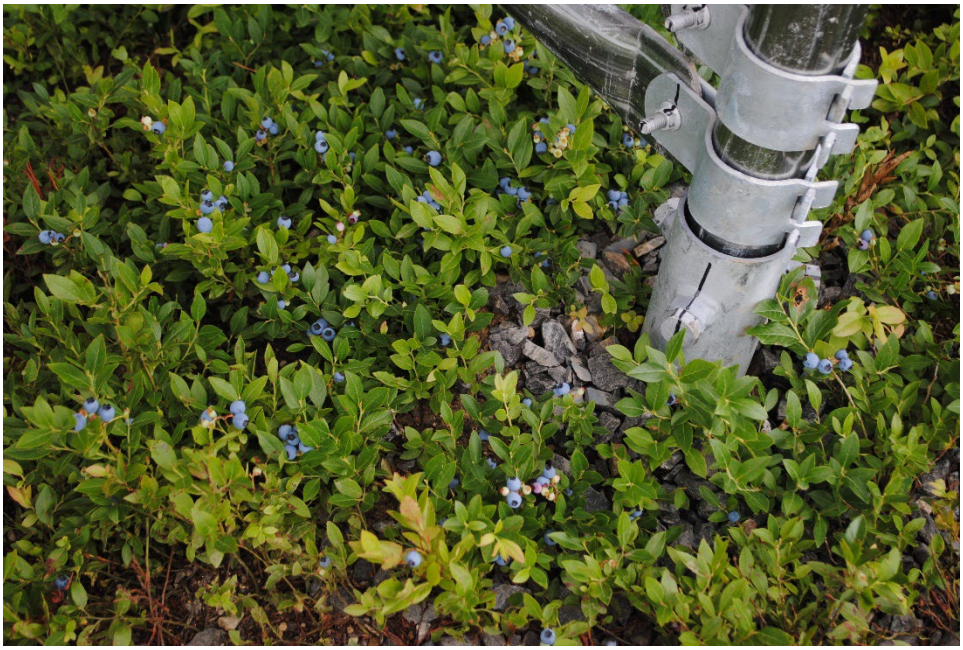


Photo credit: BlueWave Solar

Perspective from Clemedow Farm

Rick Dyer, a fourth-generation owner of Clemedow Farm in Monmouth, discussed the farm's consideration of solar energy development of some of its farm acreage as a means of conserving additional agricultural land use with the Stakeholder Group at its October 21, 2021, meeting. The project will utilize 45 acres of orchard, cornfield and forest out of the farm's 1,000 acres (the project sited at Clemedow Farm is shown on the cover page of this report). Local permitting has been challenging. He commented that most farmers might not have the time to analyze legal protections and tax implications

of solar projects on their land. The group discussed the decommissioning bonds required by state and local permitting authorities.

Other topics

Maine Department of Environmental Protection land use regulations

Nick Livesay and Jim Beyer from the Maine DEP presented to the Stakeholder Group on the statutory and regulatory programs that apply to solar projects on June 24, 2021. These include: Site Location of Development (SLODA, or Site Law),[15] the Natural Resource Protection Act (NRPA),[16] Stormwater Management Law,[17] and Decommissioning.[18]

Projects that occupy more than 20 acres trigger Site Law review. DEP is undertaking rulemaking to allow projects up to 50 acres in size that meet certain citing criteria to obtain a Permit by Rule (PBR), as opposed to going through the traditional permitting process. Through June 2021, DEP has seen between 20-30 projects in the 20-50 acre range. The goal of the PBR process is to make the permitting process more efficient and incentivize siting projects in areas with minimal potential environmental impact.

All projects one acre or greater fall under Stormwater Management Law. Maine has jurisdiction in this area of law where many other states rely on federal oversight. DEP is working with solar developers to pilot solar grazing at solar sites as a means for vegetative management. Those projects must follow best management practices that have been developed by DACF, Cooperative Extension, and USDA Natural Resource Conservation Service (NRCS) for solar grazing, which includes guidance on rotational grazing plans, soil considerations, and seed mixes. A new law on decommissioning will require projects three acres or larger to provide DEP a decommissioning plan and financial assurance for decommissioning.[19] The law offers additional protections for agricultural land requiring removal of inground components to depths of 48 inches.

Maine Revenue Services tax considerations

Peter Lacy, Director of the Property Tax Division of Maine Revenue Services, presented to the Stakeholder Group on July 22, 2021. In Maine property tax is assessed at its best and highest value use of the property. Land used for agriculture generally is not determined to be its best and highest value use, for example in most of Maine, land is more valuable as housing. To remedy this, the Farmland Tax Program exists to protect farmland from being converted into a higher value use.[20] However, fair market value can differ across Maine – for example, an acre of potato field in Aroostook County may be more valuable as farmland than as a one-acre home lot. This leads to geographic differences in farmland tax program enrollment across the state.

[15] https://www.maine.gov/dep/land/sitelaw/index.html
[16] https://www.maine.gov/dep/land/nrpa/index.html
[17] https://www.maine.gov/dep/land/stormwater/index.html
[18] https://www.maine.gov/dep/land/solar-decommissioning/index.html
[19] The new law, P.L. 2021 ch. 151 (LD 802), is included in Appendix B.
[20] https://www.maine.gov/revenue/taxes/tax-relief-credits-programs/property-tax-relief-programs/land-use-programs

Farmland value has been established for six different types of farmland. However, municipal assessors have discretion when applying these values. Currently there are 134,000 acres enrolled in the program which requires farm income verification and minimum acreage requirements.

If land is converted to another use, like solar energy generation, the land is removed from the program and a tax penalty is assessed. Solar projects sited on farmland, including dual-use projects that ensure the land is continuously being used for agricultural purposes, trigger the land's removal from the farmland tax program, and the landowner is responsible for paying five years of back taxes.

Additionally, in 2019 the Legislature passed LD 1430, which creates an exemption for solar equipment if all energy generated is either used on the site where the project is located or is used to provide bill credits to utility customers (for example, through a community solar project). In this case the solar equipment would be tax exempt, and the town would be reimbursed by the state for 50% of the taxes lost on the equipment (but not the land).

Additional policy discussions

Pollinator Scorecard

The Stakeholder Group reviewed a compilation of pollinator scorecards from five states at its meeting September 23, 2021. Maine Audubon is working on Maine-specific guidance on native planting and vegetation management practices that support pollinators and other wildlife. This guidance could help inform a permit-by-rule process, a tariff concept, or other policy that encourages particular management or siting practices. The Stakeholder Group generally saw value in the scorecard concept, but did not pursue continued discussion in favor of other topics also under discussion at that time.[21]

Photo credit: ReVision Energy

In-lieu fee

The Stakeholder Group considered a range of policy options, many of which led to specific conclusions and/or recommendations summarized later in this report. Other policy tools that the group discussed but did not reach conclusions or decide to issue recommendations for included creation of a mitigation program or in-lieu fee model through which solar development would trigger compensation when it occurred on agricultural soils or other areas of interest. New York is currently developing an in-lieu fee program relative to solar development but the nascency of the effort did not provide particular guidance to the Stakeholder Group at this time. There was some interest in monitoring other examples, such as the program under

[21] Solar siting scorecard information and examples reviewed by the Stakeholder Group are available on pages 18-31 here: https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/ASSG%20092321%20briefing%20materials.pdf

development in New York, for potential future exploration and analysis. However, there was also concern about this concept regarding potentially restrictive treatment of solar relative to other forms of development.

Conclusions and Recommendations

Conclusions

Definitions of dual-use and co-location

The group discussed and agreed to the following definitions for the terms "dual-use" and "co-location." These definitions distinguish between two related but separate concepts that the Stakeholder Group discussed extensively. These definitions could serve as a conceptual starting point for more refined definitions as needed to implement the Stakeholder Group's recommendations.

"Dual-use" projects involve the installation of solar photovoltaic panels on farmland in such a manner that primary agricultural activities (such as animal grazing and crop/vegetable production) are maintained simultaneously on the farmland. Dual-use array designs may (but are not required to) include increased panel height or expanded panel row spacing to improve compatibility with farming operations and crop production. To qualify as dual-use, the solar installation must:

1. retain or enhance the land's agricultural productivity, both short term and long term,
2. be built, maintained, and have provisions for decommissioning to protect the land's agricultural resources and utility, and
3. support the viability of a farming operation.

Photo credit: Crescent Run Farm

In contrast, "co-location" generally involves conventional ground-mounted solar installations (designs that have not been modified to increase flexibility and compatibility for agricultural use) that either host non-agricultural plantings with additional environmental benefits or involve siting a more conventional solar installation on a portion of farmland, while retaining other farmland for agricultural use.

Matrix of Agricultural Siting Considerations

Purpose

Maine agriculture is diverse, reflecting the variety of Maine's landscapes and the economic opportunities that they may present. Site planning for agricultural activities and solar development must reflect the unique circumstances of each location in terms of soils, topography, microclimate, and the goals of the landowner. Any rubric for approaching siting considerations should be understood as general guidance only. The ultimate planning and design for specific projects and activities should be based on the site-specific evaluation of environmental conditions and economic goals of the landowner.

The Stakeholder Group's goals were to identify potential solar site attributes, with as much specificity as possible. The below matrix enumerates siting and array options for consideration on agricultural lands, including options that allow farmland to remain in production.

The Stakeholder Group discussed solar array siting and farmland classifications to develop siting options that may be used to encourage maintenance of on-site agricultural production if a solar project is to be sited on that type of land. For example, when considering siting solar on actively farmed land or prime soils, dual-use solar is encouraged as an option for consideration but is not being proposed as the only option.

Photo credit: ReVision Energy

The following table is advisory to site owners and developers only and does not represent policy or rulemaking for use by regulators. It should not be interpreted as prohibitive of siting locations or mandating components of any regulatory agency's permitting decisions without further analysis and stakeholder input. However, this matrix may currently be used to inform decisions during project development, providing additional array options and siting locations of solar projects for consideration.

Parcel	**Farmland** **Meets definition of farmland established in Title 36, section 1102 subsection 41 and/or affidavit from farmer**			
	Actively farmed	*Other farmland*	*Inactive farmland*	*Woodlot on farms*
Prime soils Pursuant to Maine Instruction 430-3803	Encourage/incentivize dual-use Encourage/incentivize non-dual-use siting elsewhere	Encourage development	Encourage/incentivize dual-use	Encourage co-location
Soils of Statewide Importance Pursuant to Maine Instruction 430-3804	Encourage/incentivize dual-use Encourage/incentivize non-dual-use siting elsewhere	Encourage development	Encourage/incentivize dual-use	Encourage co-location
Marginal farmland Areas within farmland parcel not classified in the preceding categories	Encourage development	Encourage development	Encourage development	Encourage development
Non-agricultural land Encourage development on landfills, brownfields, rooftops, carports, gravel pits, mining sites, and other previously developed parcels.				

Definitions

For the purposes of this evaluation tool, definitions were derived from Maine law and the USDA National Agricultural Statistical Service's Census of Agriculture.

Actively farmed: land that generates a gross income of at least $2,000 per year from the sale of agricultural products in one of two or three of five previous calendar years.[22] This may include the following:

> **Harvested cropland:** This category includes land from which crops were harvested and hay was cut, land used to grow short rotation woody crops, Christmas trees, and land in orchards, groves, vineyards, berries, nurseries, and greenhouses.[23]
>
> **Permanent pasture and rangeland**, other than cropland and woodland pastured: This land use category encompasses grazable land that does not qualify as woodland pasture or cropland pasture. It may be irrigated or dry land.[24]

Inactive farmland: land that can include the following:

> **Other cropland:** land that includes all cropland other than harvested cropland or other pasture and grazing land that could have been used for crops without additional improvements. It includes cropland idle or used for cover crops or soil improvement, cropland on which all crops failed or were abandoned, and cropland in summer fallow.[25]
>
> **Other pasture and grazing land:** land that could have been used for crops without additional improvements. This category includes land used only for pasture or grazing that could have been used for crops without additional improvement.[26]

Other farmland: land that does not otherwise fall into the above farmland categories. This category includes land in house lots, barn lots, ponds, roads, ditches, wasteland, etc. It includes those acres in the farm operation not classified as cropland, pastureland, or woodland.[27]

Woodlot on farms: woodland that is part of a farm producer's total operation or woodland used for pasture or grazing.

Dual-use and co-location are defined earlier in this section.

[22] Definition from Maine Title 36: http://legislature.maine.gov/statutes/36/title36sec1102.html
[23] Definition from the USDA Agricultural Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxb.pdf
[24] Definition from the USDA Agricultural Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxb.pdf
[25] Definition from the USDA Agricultural Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxb.pdf
[26] Definition from the USDA Agricultural Census: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxb.pdf
[27] Farm Credit East: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxb.pdf

Recommendations

Based on its research, discussions, and additional input received from the public, the Stakeholder Group advances the following recommendations. Recommendations are numbered for reference only, and not to indicate prioritization of any given recommendation over any other.

Recommendation 1: Creation of a centralized clearinghouse of information

The Stakeholder Group recommends the creation of a publicly-accessible database of key characteristics, including spatial data, related to approved and constructed renewable energy project, including solar projects. The data should be submitted in a format and on a schedule determined by GEO by all interconnecting solar projects upon final site decision-making following approval of state and local permitting agencies. Where applicable, this information should be made publicly available in an appropriate format by GEO. This information can be used by DACF, other natural resource agencies, and the public, as needed, to identify potential trends. GEO may need additional resources or staff support to implement this recommendation.

Recommendation 2: Dual-use pilot program

The Stakeholder Group recommends establishment of a robust pilot program to support the growth of dual-use projects in Maine. The pilot would allow DACF to work with GEO, the PUC and other agencies to further explore the potential for dual-use in Maine. Projects meeting dual-use criteria should be supported with a financial incentive, location-based waiver, or other benefit as determined by the program. The pilot should also provide opportunities to conduct necessary research on compatible crops and other dual-use systems to determine best practices for dual-use within a defined timeframe or capacity limit. The Stakeholder Group recommends that the DACF and GEO develop the pilot program in collaboration with other state agencies and research institutions. The pilot program design should include innovation and data collection as priorities, encompass at least 20 MW of dual-use development, and outline the financial mechanisms necessary to appropriately support the pilot program and participants. The group recommends that this pilot program development be completed by October 2022 in time for potential enabling legislation and funding support in 2023.

Photo credit: ReVision Energy

Recommendation 3: Consideration of current use taxation

The Stakeholder Group recommends further consideration of treatment of land enrolled in the farmland current use taxation program when such land is housing a dual-use project. For example, such land could be treated as not subject to the withdrawal penalty if the farming operations continue to meet the farmland current use taxation requirements. Notwithstanding further consideration around current use taxation, the Stakeholder Group further recommends solar equipment located on land enrolled in the farmland current use taxation program that primarily serves the farm's electrical load be classified as agricultural infrastructure or equipment. The Stakeholder Group recommends that the Legislature consider advancing this recommendation as expeditiously as possible through coordinated efforts of the Legislature's Joint Standing Committee on Agriculture, Conservation and Forestry and Joint Standing Committee on Taxation.

Recommendation 4: Consideration of standards for dual-use and co-location in permit-by-rule review

The Stakeholder Group recommends that dual-use and/or co-location standards be considered for inclusion as permitting criteria in future development of permit-by-rule processes by the Department of Environmental Protection and other relevant permitting agencies.

Recommendation 5: Development of hosting capacity maps

The Stakeholder Group recommends development of detailed hosting capacity maps that include analysis from the utility perspective and that can help developers become more efficient at targeted site selection for all sizes of solar projects. Comprehensive data that indicates which areas of the grid have capacity for additional interconnections can minimize land use stress, including agricultural lands, in any one location. Comprehensively mapping and updating the grid could increase reliability, resiliency, and support bringing three-phase power to rural locations. The Stakeholder Group views the Distributed Generation Stakeholder Group established in 2021 by LD 936 and convened by GEO to be the appropriate venue for consideration of this recommendation.

Recommendation 6: Increased support for municipal planning capacity

The Stakeholder Group recommends more robust technical assistance capacity and/or financial support for planning be provided by natural resource agencies directly to municipalities, councils of governments, or other networks to help municipalities balance solar development. The Stakeholder Group views DACF and GEO as well-suited to provide such assistance and requests that the Legislature consider providing sufficient funding to establish and maintain new programmatic staff positions for this purpose in both DACF and GEO.

Recommendation 7: Consideration of program preference based on agricultural site characteristics

The Stakeholder Group recommends that future state-sponsored programs to support the development of solar resources through long-term contracts or other compensation mechanisms include consideration of agricultural siting characteristics consistent with the program's design. For example, if the Public Utilities Commission were directed to procure solar resources, evaluation and scoring of proposed projects' agricultural and natural resource impacts (with support from natural resource agencies) when selecting projects could be incorporated. Alternatively, if a tariff program were

developed, including an adder could be a significant market-based financial incentive to site dual-use solar.

The Stakeholder Group views the Distributed Generation Stakeholder Group established in 2021 by LD 936 and convened by the GEO as an appropriate venue for consideration of this recommendation, given its direction to consider mechanisms to limit siting impacts. The Agricultural Solar Stakeholder Group recommends that the Distributed Generation Stakeholder Group invite members of the Agricultural Solar Stakeholder Group to be a part of conversations specific to siting distributed generation projects, so that the Distributed Generation Stakeholder Group may benefit from the careful consideration already given to this topic.

Credit: ReVision Energy

Appendix A – LD 820 – Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays

APPROVED
JUNE 8, 2021
BY GOVERNOR

CHAPTER
26
RESOLVES

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-ONE

S.P. 206 - L.D. 820

Resolve, To Convene a Working Group To Develop Plans To Protect Maine's Agricultural Lands When Siting Solar Arrays

Sec. 1. Department of Agriculture, Conservation and Forestry to convene working group. Resolved: That the Department of Agriculture, Conservation and Forestry shall convene a working group of stakeholders to develop plans and consider ways to discourage the use of land of higher agricultural value and encourage the use of more marginal agricultural lands when siting a solar array. The department shall submit its report and recommendations, including any suggested legislation, to the Joint Standing Committee on Agriculture, Conservation and Forestry; the Joint Standing Committee on Energy, Utilities and Technology; and the Joint Standing Committee on Environment and Natural Resources no later than January 14, 2022.

Appendix B – LD 802 – An Act To Ensure Decommissioning of Solar Energy Developments

APPROVED
JUNE 10, 2021
BY GOVERNOR

CHAPTER
151
PUBLIC LAW

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-ONE

S.P. 113 - L.D. 802

An Act To Ensure Decommissioning of Solar Energy Developments

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 35-A MRSA c. 34-D is enacted to read:

CHAPTER 34-D

SOLAR ENERGY DEVELOPMENT DECOMMISSIONING

§3491. Definitions

As used in this chapter, unless the context otherwise indicates, the following terms have the following meanings.

1. Decommissioning. "Decommissioning" means the physical removal of all components of a solar energy development, including but not limited to solar panels and associated anchoring systems and foundations to a depth of at least 24 inches or to the depth of bedrock, whichever is less, and other structures, buildings, roads, fences, cables, electrical components or associated facilities and foundations to a depth of at least 24 inches or to the depth of bedrock, whichever is less, to the extent the components of the development are not otherwise in or proposed to be placed in productive use or otherwise authorized to remain in place by the environmental permitting entity.

For any portion of a solar energy development located on land classified as farmland any time within 5 years preceding the start of construction of the development, "decommissioning" means the physical removal of all such components of the development to a depth of at least 48 inches or to the depth of bedrock, whichever is less, to the extent such components are not otherwise in or proposed to be placed in productive use or otherwise authorized to remain in place by the environmental permitting entity.

"Decommissioning" includes the grading to postconstruction grade and revegetation of all earth disturbed during construction and decommissioning, except for areas already restored.

2. Environmental permitting entity. "Environmental permitting entity" means:

A. The Department of Environmental Protection in the case of a solar energy development:

(1) Located wholly or partly outside of the unorganized and deorganized areas; or

(2) Subject to the department's jurisdiction pursuant to Title 38, chapter 3, subchapter 1, article 6; or

B. The Maine Land Use Planning Commission in the case of a solar energy development located wholly in the unorganized and deorganized areas and not subject to the jurisdiction of the Department of Environmental Protection pursuant to Title 38, chapter 3, subchapter 1, article 6.

3. Farmland. "Farmland" has the same meaning as in Title 36, section 1102, subsection 4.

4. Transfer of ownership. "Transfer of ownership" means a change in the legal entity that owns or operates a solar energy development. A sale or exchange of stock or membership interests or a merger is not a transfer of ownership as long as the legal entity that owns or operates the solar energy development remains the same.

5. Unorganized and deorganized areas. "Unorganized and deorganized areas" has the same meaning as in Title 12, section 682, subsection 1.

§3492. Prohibition

A person may not construct, cause to be constructed or operate a solar energy development with ground-mounted solar panels occupying 3 or more acres without first obtaining approval of a decommissioning plan from the environmental permitting entity under section 3495.

§3493. Transfer of ownership

Upon a transfer of ownership of a solar energy development subject to a decommissioning plan approved under section 3495, a person that transfers ownership of the development remains jointly and severally liable for implementation of the plan until the environmental permitting entity approves transfer of the decommissioning plan to the new owner or operator.

§3494. Decommissioning plan

A decommissioning plan must:

1. Decommissioning. Provide for the decommissioning of a solar energy development. For any portion of the development located on land classified as farmland any time within 5 years preceding the start of construction of the development, the plan must provide for the restoration of that farmland upon decommissioning sufficient to support resumption of farming or agricultural activities;

2. Grading and revegetation of earth. Provide for the grading and revegetation of all earth disturbed during construction and decommissioning, except for areas already restored; and

3. Financial capacity. Include demonstration of current and future financial capacity, which must be unaffected by the owner's or operator's future financial condition, to fully fund decommissioning in accordance with an approved decommissioning plan under this chapter.

§3495. Standards

An environmental permitting entity shall approve a decommissioning plan whenever it finds the following:

1. Successful decommissioning. The plan, if implemented, will result in successful decommissioning of the solar energy development, including the restoration of farmland sufficient to support resumption of farming or agricultural activities;

2. Financial assurance. The person identified in the plan as responsible for decommissioning demonstrates financial assurance, in the form of a performance bond, surety bond, irrevocable letter of credit or other form of financial assurance acceptable to the environmental permitting entity, for the total cost of decommissioning; and

3. Update. The plan requires the financial assurance be updated 15 years after approval of the plan and no less frequently than every 5 years thereafter. Updates to financial assurance required under this subsection must be submitted to the environmental permitting entity on or before December 31st of the year in which such updates are required.

§3496. Administration and enforcement; rulemaking

The Department of Environmental Protection shall administer and enforce this chapter with respect to the decommissioning of solar energy developments for which it is the environmental permitting entity, subject to the same powers and authorities granted to it pursuant to Title 38, chapter 2, including but not limited to the adoption of rules and the establishment of reasonable fees. The Maine Land Use Planning Commission shall administer and enforce this chapter with respect to the decommissioning of solar energy developments for which it is the environmental permitting entity, subject to the same powers and authorities granted to it pursuant to Title 12, chapter 206-A, including but not limited to the adoption of rules and the establishment of reasonable fees.

Rules adopted by the Department of Environmental Protection or by the Maine Land Use Planning Commission pursuant to this section are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

Sec. 2. Application. This Act applies to a solar energy development on which construction begins on or after October 1, 2021 and to any other solar energy development that undergoes a transfer of ownership on or after October 1, 2021.