Maine Climate Council - Energy Working Group
Co-Chair Cover Letter
June 5, 2020

Members of the Maine Climate Council:

As Co-Chairs of the Energy Working Group of the Maine Climate Council (MCC), we respectfully submit this cover letter to accompany our recommendations. We are extremely grateful for the active and insightful participation of those on our Working Group and the members of the general public who engaged in the process. The challenges of meeting Maine's clean energy and climate goals are real but are matched by even greater opportunity for the state. It is our hope that this process and these recommendations represent the start of a fruitful examination and execution of opportunities necessary to meet our objectives that will be improved by technology and policy changes with each four-year MCC Climate Plan iteration.

Overview of Process and Recommendations

The Energy Working Group (EWG) is comprised of thirty individual members reflecting broad representation of Maine's energy sector. The EWG met as full group for ten meetings, four of which were in-person and the remaining utilizing the Zoom platform, in addition to approximately ten subgroup meetings. Information for each of these meetings was posted on the EWG webpage and all meetings were open to the public with time available at the end of each meeting for public input. Additionally, members of the public could submit comments through the MCC webpage anytime throughout the process; and comments and suggestions received through that portal were passed along to EWG members and posted on the webpage.

The meetings began with a number of level-setting, informative presentations on key topics including the regional grid and energy markets, analysis of a possible pathway to a zero-carbon economy, technology trends and unique opportunities for Maine, natural gas, power-to-gas, and biomass. As the group progressed beyond the information-gathering stage, EWG members submitted ideas for specific strategies and recommendations, which were consolidated into five broad categories. EWG members then formed subgroups focused on each category, from which emerged four broad recommendations after recognizing areas of overlap. These broad recommendations focus on clean energy supply, proactive grid planning and flexible demand, renewable fuels and combined heat and power (CHP), and financing for clean energy. The progression of the spreadsheets that these subgroups developed can be found within the meeting materials on the Energy Working Group webpage. The four subgroups then presented their conclusions to the full EWG. Out of its subsequent discussions, five recommendations evolved for the EWG to forward to the MCC for its consideration. These recommendations are listed below in no particular order.

1. **Ensure adequate affordable clean energy supply to meet Maine's 100% RPS goal and any increased load through the development of centralized generating resources, distributed energy resources, and other measures.**

2. **Initiate a Power Sector Transformation Stakeholder Process managed by the Governor's Energy Office (GEO) in coordination with the Maine Public Utilities Commission (MPUC) to examine and provide recommendations regarding transformation and planning of Maine's electric sector to address and facilitate the recommendations of the Maine Climate Council (MCC) and achieve Maine's greenhouse gas reduction requirements.**
3. **Encourage the utilization of MPUC's long-term contracting authority to include highly efficient combined heat and power (CHP) production facilities.**
4. **Institute a Renewable Fuel Standard for all heating fuels, with incentives sufficient to drive rapid reductions in emissions from heating and process fuels (e.g., for industrial processes) used in Maine.**
5. **Develop and implement new financing options necessary to meet Maine's clean energy and emission reduction targets.**

Detailed descriptions of these five recommendations can be found in the MCC templates provided.

Our discussions were mindful of the fact that significant increases in the electrification of Maine's transportation and buildings sectors will directly impact the electricity sector and the state will need to grapple with how best to deliver the needed electricity reliably and cost-effectively. Estimates suggest that electrification could double or triple Maine's electrical load, with the potential for peak loads to grow as well. Continued attention to energy efficiency, and the use of load flexibility as the power sector transforms technologically, will be central to maximizing existing systems and resources; but more will also need to be done as this progresses, including further work on the potential for innovative renewable fuels as well as efficient wood systems to help meet the state's objectives. The MCC should anticipate additional analysis – and policy implementation – to address this need, and the opportunity for other innovative technologies, in its future work.

It is important to note that the EWG's goal was not to reach consensus on every detail of each of the five recommendations. Instead, our focus was to incorporate as much participation and input as possible in developing a set of recommendations that will move Maine's energy sector toward accomplishment of the state's energy and emission-related goals and targets. Upon the EWG's final review of its recommendations, no EWG member voiced major concerns with the overall package of recommendations. That does not mean, however, that all EWG members agree with every aspect of each recommendation. Indeed, the EWG templates include several instances where disagreements and divergent paths are directly noted.

In addition to an ambitious timeline overall, it should also be noted that the MCC's switch to entirely virtual meetings half-way through the process due to COVID-19, while handled efficiently and effectively by MCC staff, did affect the progress of the working group slightly.

<u>Overarching Considerations</u>

While considering and pursuing the recommendations of the EWG and the Maine Climate Council as a whole, the EWG members urge consideration of a number of additional elements, reflecting their importance and significance across sectors. It may also be advisable to create appropriate entities to monitor, review, and implement these additional considerations as needed.

Clean Energy Economy

Supporting the growth of clean energy resources and technologies presents a significant opportunity for economic growth in Maine and is required to be considered per the legislation that created the MCC. This opportunity embraces all aspects of the supply chain including research and development, manufacturing, commercialization, operation and maintenance, etc. There are further opportunities to benefit Maine's economy as the state supports the New England and Northeast regions in accomplishing larger climate and clean energy goals. The MCC should consider ways to include such co-benefits to Maine's economy in its deliberations, especially as the state identifies opportunities to recover from the current pandemic.

Workforce and Just-Transition

Transitioning to a low-carbon future provides an opportunity for substantial job creation in Maine. New job creation should strive to provide a living wage and benefits, with an aim at creating sustainable career opportunities in the sector. The implementation of the EWG's recommendations should also include ways to avoid negative impacts to Maine's workforce, and to provide transition assistance where this is not possible. This assistance could include utilizing and expanding existing workforce programs, such as internships, apprenticeships, and job training programs, while also identifying additional gaps that may exist.

Equity

Though perhaps implicit in considerations of a clean energy economy and just-transition, it is vital to understand and address areas of potential inequities. While the State of Maine can be united in its efforts to accomplish carbon reduction and clean energy goals, the effects of that pursuit may not impact all Mainers equally. Transitioning away from fossil fuels provides a number of benefits including particulate and emission reductions that will improve public health, avoiding revenues lost to out-of-state fossil fuel suppliers, and protecting our planet for future generations. However, accomplishing these goals may have further equity implications that need to be addressed. Consideration should be given to potential impacts to communities as they transition to a low-carbon future, particularly more vulnerable populations such as rural and low-income communities. Existing programs focused on supporting rural and low-to-moderate income households, such as those offered through Efficiency Maine Trust, should continue to be made available and expanded as needed. Establishing a clear understanding of potential equity impacts, ameliorating negative impacts when possible, and providing assistance when it is not are essential components to creating a just, low-carbon future for Maine's citizens.

Promoting and Advancing Innovation

Resource-rich Maine has uncommon opportunity to embrace innovation to meet the state's energy goals and drive economic growth. The state has taken steps to support floating offshore wind, energy storage, renewable fuels, and other technologies. The state should continue these efforts and encourage studies and pilot projects and/or procurements to assess whether these technologies could advance the state's objectives, including the renewable portfolio standard. Federal funding should also be pursued for energy innovation and initiatives, especially as any federal stimulus funds become available. Additionally, Maine should promote existing resources – and seek out new ones – to support

energy innovation and associated industries. The energy sector is never stagnant, and technologies are constantly being developed and improved. Therefore, it is vital for the state to encourage and support Maine's entrepreneurial spirit as the industry creates new solutions to energy, climate, and cost challenges.

Modeling Results

Given the ambitious timeline of the MCC and its working groups, our modeling consultants were required to provide results quickly. The EWG pursued its process of generating recommendations in parallel to the modeling work, thus developing its recommendations without the insight provided by the final energy system modeling. In addition, the modeling generally reflected traditional energy supply and cost approaches and assumptions. The energy sector is evolving rapidly however, so we expect transformational approaches already underway, including advancements in distributed energy resources, storage, offshore wind, and the management of electricity demand (also known as "load flexibility") – to play a more prominent role in the future, the cost for each of which is declining dramatically. Given these realities, the recommendations do not include specifics drawn from the modeling results but offer broader recommendations instead. In several instances, the EWG recommends future processes to generate the data and insights needed to develop more specific and detailed energy system recommendations. Further energy modeling by the MCC may also be beneficial as the Climate Plan is developed.

Conclusion

The EWG co-chairs recognize that this is the beginning of a long-term climate effort and believe that the proposed recommendations, in addition to diligent work in the Legislature over the past two years, provide a firm foundation for significant growth of clean energy resources to help accomplish the goals and objectives of the MCC and the state.

Examples of statutory programs already working to accomplish these goals and objectives, creating benefits for Maine's economy, having implications for Maine's electricity grid, and providing more detailed information for future policy planning include Public Law 2019, Chapter 478 (*LD 1711: An Act To Promote Solar Energy Projects and Distributed Generation Resources in Maine)* and Public Law 2019, Chapter 477 *(An Act To Reform Maine's Renewable Portfolio Standard)*. These pieces of legislation will spur significant growth in Maine's distributed energy resources and utility-scale clean energy generation. As of June 2020, there are ongoing procurement processes for both DERs and utility-scale resources, which upon completion will provide a clearer picture of the existing sector and grid structure to inform energy sector planning and policies. This is in addition to improved net energy billing policy which is growing the market for distributed energy resources.

The EWG emphasizes that planning processes in future years should include consideration of all the proposed recommendations – even those not currently highlighted by the EWG – as additional time, procurements, and other information help inform policy deliberations. While the EWG generally desired to provide more detailed recommendations with higher specificity, without knowing the outcome of current programs and procurements, and without additional analysis and modeling, it would be inappropriate to establish specific technology targets. Available on the EWG webpage[1] are the

[1] Maine Climate Council. Energy Working Group. https://www.maine.gov/future/initiatives/climate/climate-council/energy

documents related to the work of this group including spreadshes outlining all recommendations considered by the EWG, much of the original recommendation language proposed by the EWG members, and additional resources on a number of the topics explored.

Thank You to Energy Working Group Members

We would like to extend our sincere appreciation to the members of the EWG, as well as agency staff, for the extraordinary time and expertise they offered throughout this process. Even despite a transition to virtual meetings and significant global disruptions, EWG members stayed focused and driven to accomplish the tasks of moving Maine closer to a cleaner energy future. The members of the EWG engaged and contributed with a sense of mission and were models of what civil discourse can be throughout a fast and challenging process. We thank you all for your participation.

Sincerely,

Dan Burgess, Co-Chair of Energy Working Group
Director of the Governor's Energy Office

Ken Colburn, Co-Chair of the Energy Working Group
Climate and Energy Expert

Energy Working Group Members:

Maine Climate Council Energy Working Group Membership List		
Name	**Organization**	**Role**
Dan Burgess	Governor's Energy Office	Co-chair of the Working Group
Ken Colburn	Energy and Climate Expert	Co-chair of the Working Group
Kurt Adams	Summit Utilities	Working Group Member
Beth Ahearn	Maine Conservation Voters	Working Group Member
Phil Bartlett	Maine Public Utilities Commission	Working Group Member
Matt Beck	IBEW 1837	Working Group Member
Representative Seth Berry	Maine State Legislature	Working Group Member, representing Maine State Legislature
Tony Buxton	Preti Flaherty	Working Group Member
Steve Clemmer	Union of Concerned Scientists	Working Group Member
Greg Cunningham	Conservation Law Foundation	Working Group Member
Senator Paul Davis	Maine State Legislature	Working Group Member, representing Maine State Legislature
Evelyn deFrees	Maine Department of Labor	Working Group and Maine Climate Council Member
Carrie Gilbert	Daymark Energy Advisors	Working Group Member
Ben Gilman	Maine State Chamber of Commerce	Working Group Member
Marty Grohman	E2Tech	Working Group Member
Abigayle Hargreaves	University of Maine	Working Group Member and Youth Representative
Barry Hobbins	Office of the Public Advocate	Working Group Member
Andy Lubershane	Energy Impact Partners	Working Group Member
Katryn Mitchell	SEARCH	Working Group Member
Jeremy Payne	Maine Renewable Energy Association	Working Group Member
Julie Rosenbach	City of South Portland	Working Group Member
Jeff Saucier	McCain Foods USA, Inc.	Working Group and Maine Climate Council Member
Rich Silkman	Competitive Energy Services, LLC	Working Group Member
Eric N. Stinneford	Central Maine Power Company	Working Group Member
Michael Stoddard	Efficiency Maine Trust	Working Group and Maine Climate Council Member
Robert Stoddard	Power Market Economics, LLC	Working Group Member
Jeff Thaler	University of Maine	Working Group Member
Sarah Tracy	Pierce Atwood LLP	Working Group Member
Jake Ward	University of Maine	Working Group Member
Tom Welch	Energy Policy Expert	Working Group Member

Energy Working Group Recommendations

RECOMMENDATION: Ensure adequate affordable clean energy supply to meet Maine's 100% RPS goal and any increased load through the development of centralized generating resources, distributed energy resources, and other measures.

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**
    a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**
    b. **List any site-specific geographies where the strategy would be applied.**

Ensure adequate affordable clean energy supply to meet Maine's 100% RPS goal and any increased load through the development of centralized generating resources, distributed energy resources, and other measures.

Maine's Renewable Portfolio Standard (RPS) of 80% by 2030 and 100% by 2050, one of the most ambitious standards in the country, will require disciplined acquisition, attention to cost, and coordination with electricity demand growth. The Energy Working Group (EWG) urges Maine to stay the course on the RPS, especially as demand grows with future beneficial electrification. The Energy Working Group suggests specific actions and considerations outlined in this template related to: procurements; energy storage; ocean energy; distributed generation; and improved siting processes.

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**
    a. **For mitigation strategies:**
        i. **What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?**
        ii. **What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?**

    See modeling from Synapse and future analysis from ERG.

    b. **Are outcomes measurable with current monitoring systems?**

Yes, the outcomes of the strategies described in this template can be measured, including Maine's emissions from the electric sector as well as emissions from imported energy.

3. **What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?**

    1. Maine's unique renewable energy resources, strategic location and low-cost of development should influence state and regional policy decisions. Policy makers should structure policy to ensure highest benefits to Maine, to complement regional markets, and to ensure additional generation is developed in parallel to grid infrastructure. Where prudent, Maine should work with regional partners to advance Maine's strategic and policy objectives; particularly in promoting coordinated procurements for generation and/or transmission development.

a. Power Purchase Agreements ("PPAs") will be necessary for virtually all foreseeable new large-scale renewable generation development. Maine has two existing RPS-related procurements that provide twenty-year PPAs. Maine will require additional scheduled procurements to drive further development and create cost-focused financing terms, and the legislature should require initiation of an additional procurement(s) for renewable generation in 2022 with amounts and requirements (bundled energy and RECs, etc.) based on the outcome of the GEO RPS study required by Public Law 2019, Chapter 477 and consistent with the MCC consultant's modeling data to match up load growth with necessary clean energy supply.

2. New resources should be prioritized to ensure economic benefits to the state and should include technologies such as offshore wind, distributed generation and energy storage. The GEO should update or develop targets for resources in line with renewable energy and greenhouse gas reduction requirements and recommend the programs and policies needed to advance these targets.

    a. Energy Storage: The Commission to Study the Economic, Environmental and Energy Benefits of Energy Storage to the Maine Electricity Industry, a legislative commission, published a report in December 2019 that provided seven recommendations and actions to advance energy storage in Maine. These included setting a state target for development, encouraging energy storage to be paired with distributed generation, allowing Efficiency Maine Trust to advance energy storage, addressing rate design, clarifying utility ownership of storage, advocating for regional wholesale market inclusion and conducting a future study of energy storage costs, benefits and opportunities. These recommendations are sensible and should be pursued. The EWG does not opine on what the specific target of storage should be but feels additional study should inform future policy. Equity considerations should also be incorporated into these recommendations to help reduce air pollution, demand charges and outages by deploying storage in low-income and disadvantaged communities.

    b. Ocean Energy: *An Act To Implement the Recommendations of the Governor's Ocean Energy Task Force (PL 2010, Ch. 615)*, often referred to as Maine's Ocean Energy Act, sets various goals and objectives for Maine's offshore wind industry, including the goal of 5,000 MW of offshore wind capacity installed by 2030. The Ocean Energy Act also notes potential opportunities for other ocean energy resources, such as hydrokinetic energy from tidal, ocean or river currents, but recognizes that with current technologies the greatest resource potential is offshore wind. While accomplishing this goal may be less viable today than when it was established, the GEO should lead the state's offshore wind strategy, with all deliberate speed, initiate deliberate steps and subsequent plans to develop offshore wind in the Gulf of Maine for Maine's benefit. This should include: encouraging more pilots and demonstration projects; outlining the sequence of steps for projects to commercialize; proactively considering Maine's role in regional development of offshore wind; exploring and ensuring economic benefits for Maine from development of projects; and coordinating offshore wind with necessary transmission planning.

c. Distributed Generation: Maine has lagged behind other states when it comes to the development of distributed generation, especially solar. There is less than 100 MW of solar installed in the state, though recent policy changes are driving considerable development with more than 500 MW likely to be installed prior to the update of the next Climate Action Plan. The Energy Working Group recommends that distributed generation programs continue to be developed in a way that prioritizes considerations of cost and equity. As development moves forward through 2020, policymakers should continue to identify opportunities for growth, and the Governor's Energy Office should set obtainable targets for distributed energy resources and their cohesive integration into the grid.

3. Maine must plan and build additional infrastructure to meet its renewable energy and emissions reduction goals. Careful prospective consideration must be given to the siting of transmission, distribution, and generation assets so that expansion can be efficient, timely and least-cost. Existing assets should be maximized to the greatest extent possible. The Energy Working Group perceives the permitting, financing, and construction of the substantial renewable generation, grid expansion and other energy infrastructure necessary for Maine to reach its zero carbon by 2050 goal to require more efficient permitting and other regulatory paradigms. For onshore development, Maine should align programs that incentivize renewable growth with state land use and conservation goals. Maine should consider best siting practices from other states and work closely with stakeholders and municipal partners in any future policies. In the short-term, to ensure an adequate timeline for energy resources to develop, there should be coordination among natural resource agencies for permitting review to maintain thorough analysis while streamlining the siting and permitting processes. In order to ensure there are adequate resources for permitting review, additional funding should be provided to the Maine Department of Environmental Protection to meet the increased demand associated with growth in the clean energy sector.

   For offshore development, consistent with the historic Ocean Energy Act, Maine should engage traditional maritime users early in the process and seek to minimize impacts on Maine's commercial fishing, maritime industries and habitat, as well as effectively promote Maine's strategic interests in the Gulf of Maine.

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X			
To realize outcomes		X	X	

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	Continued development of clean energy resources to meet the State's RPS, clean energy and climate goals creates prime opportunity for growth of a clean energy economy, including significant full-time job creation. Additionally, as the State transitions away from fossil

	fuel generation, existing job training programs can be utilized, and new programs created as needed, to aid in any workforce transition needed to develop a clean energy future.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?	Additional clean electricity generation is a vital component of moving towards beneficial electrification in the heating and transportation sectors, Maine's two highest carbon emitting sectors. As carbon emissions and particulates are reduced during this transition, that reduction provides significant health benefits as well as cost savings. There are numerous studies and examples from those jurisdictions that have pursued additional clean energy, with benefits including economic growth and improved public health. Improving siting practices and review can help to ensure minimized prime land, environmental, and ecological impacts.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	Initial costs for additional energy development would likely be borne by ratepayers, with the benefits accruing to these ratepayers as well. The GEO is required to undertake a study of Maine's Renewable Portfolio Standard, per LD 1494, that will assist in identifying the market opportunities and challenges related to many of these recommendations. The EWG has also identified multiple opportunities for financing opportunities in a different recommendation that could be considered.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	Considerations should be made to any potential impacts to communities as they transition to a low-carbon future, particularly more vulnerable populations such as rural and low-income communities. Existing programs focused on supporting rural and low-to-moderate income households, such as those offered through Efficiency Maine Trust, should continue to be made available and expanded as needed. The Union of Concerned Scientists specifically highlights their equity in energy storage report - https://www.ucsusa.org/resources/principles-equitable-policy-design-energy-storage
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	**RPS and PPAs:** Yes, several jurisdictions are advancing procurements to meet their RPS, including Maine, New York, Massachusetts and others. **Storage:** Variety of implementation across New England and the United States, with California, New York and Massachusetts leading. Technology is advancing and costs are declining. Barriers include market design as well as policy development.

	DG: Variety of implementation across New England and the United States. Technology is mature and improving and costs are declining. Barriers include policy design (i.e.: compensation for value of DG resource), distribution system, interconnection, and land use issues. **Ocean Energy:** Offshore wind has predominately been fixed bottom platforms, with rapid development taking place along the east coast and already in Europe. Floating platforms will be needed in Maine and that technology is advancing across the world and costs are declining. Hydrokinetic energy has been developed in Maine and is being commercialized in the United States and around the world. **Siting:** There are myriad examples of siting best practices available for Maine consideration such as New York's streamlining of clean energy permitting process as well as Maine's hydropower regulatory process.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	This varies by sub-recommendation, however several of the policies would require statutory changes: - 2022 power purchase agreements - Storage recommendations - Offshore energy pilots/expansion - Future distributed generation program - Funding for DEP staff - Minimizing agency overlaps in review of proposed clean energy projects

Energy Working Group Recommendations

RECOMMENDATION: Initiate a Power Sector Transformation Stakeholder Process managed by the Governor's Energy Office (GEO) in coordination with the Maine Public Utilities Commission (MPUC) to examine and provide recommendations regarding transformation and planning of Maine's electric sector to address and facilitate the recommendations of the Maine Climate Council (MCC) and achieve Maine's greenhouse gas reduction requirements.

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**
    a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**
    b. **List any site-specific geographies where the strategy would be applied.**

Involved Entities:

- Governor's Energy Office
- Maine Public Utilities Commission
- Office of the Public Advocate
- Efficiency Maine Trust
- Electric Utilities
- Generators
- Consumers/Ratepayers
- Other Relevant Stakeholders

Initiate a Power Sector Transformation Stakeholder Process managed by the Governor's Energy Office (GEO) in coordination with the Maine Public Utilities Commission (MPUC). This will include informal stakeholder engagement and may involve formal PUC proceedings (including potential inquiries and rulemakings, as needed). This process will examine and provide recommendations regarding transformation and planning of Maine's electric sector to address and facilitate the recommendations of the Maine Climate Council (MCC), including beneficial electrification in heating and transportation, which may require significant expansion and investment in the electric grid, and achieve Maine's greenhouse gas reduction requirements.

In preparation for the process, the GEO and PUC shall initiate an integrated resource plan (IRP) for the short, intermediate, and long (30 year) term periods for meeting the electrical needs of the State and achieving Maine's greenhouse gas reduction requirements consistent with the goals and recommendations of the MCC. The GEO and PUC should request the electric distribution utilities to provide reasonably representative studies (i.e. feeder analysis capturing time-sensitive impacts) of capacity for new EV and heating load and distributed energy resources on the distribution system within the State of Maine in order to help inform the integrated resource planning effort.

The Power Sector Transformation Stakeholder Process should include an initial evaluation as well as periodic reexaminations. Areas for analysis through this process should include:

- Utility Structure
    - What functions should the future electric utility perform to facilitate the achievement of the recommendations of the MCC and results of the integrated resource plan, and how should the utilities be compensated for those services?
    - Should Maine establish an independent, public or non-profit entity to conduct comprehensive energy grid planning – independent from utility T&D ownership – undertaken in a way that uses competitive markets to harness innovation and cost savings and considers both utility and consumer needs?
- Load Management
    - What is the extent to which load flexibility can increase the efficient and optimal use of clean energy generation, reduce carbon emissions, reduce system costs (including T&D costs), and minimize peak load?
    - What means are available to achieve useful and effective load management goals? Should the retail competition model be revised to remove the "price flattening" impacts of the current Standard Offer?
- Data/Information Access
    - What enhancements in the production and dissemination of information are needed to facilitate access to energy usage data to assist in the deployment of market-based load management mechanisms?
    - What enhancements in the production and dissemination of information are needed to facilitate the development of clean energy generation in Maine to accomplish climate-related goals?
- Non-wires alternatives (NWA) & Distributed Energy Resources
    - How should non-wires alternatives (NWA) and DERs, including storage, be incorporated into integrated resource planning and other investment decisions to meet the objectives and recommendations of the MCC and other state policy?
- Efficient and Equitable Cost Allocation
    - What is the efficient and equitable allocation of costs associated with achievement of the objectives and recommendations of the MCC and the integrated resource plan?
    - What are the implications for electric rate design of moving towards the MCC and integrated resource plan objectives with respect to economic efficiency, equity, and proper market incentives?
    - What rate design tools would be useful to influence consumer behavior to achieve MCC objectives and recommendations and improve the efficient and equitable cost recovery, while minimizing negative impacts on marginalized communities?
- Regional Collaboration
    - What are the opportunities for and barriers to regional collaboration in the achievement of MCC objectives and recommendations, as well as the development of the integrated resource plan?
- Changes in Law and Regulation
    - What modifications to existing statutes and regulations are required to achieve the objectives and recommendations of the MCC, the implementation of the integrated resource plan, and the recommendations arising out of the Transformation Stakeholder Process?

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**
    a. **For mitigation strategies:**
        i. **What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?**
        ii. **What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?**
    b. **Are outcomes measurable with current monitoring systems?**

This recommendation, on its own, does not specifically offer carbon emission reductions. However, the intention of this process is to examine and provide recommendations regarding Maine's electric sector that will facilitate implementation of the recommendations of the Maine Climate Council to achieve Maine's greenhouse gas reduction requirements. This process is essential in ensuring effective implementation of changes to Maine's electric sector needed to adopt recommendations of the MCC, including those related to beneficial electrification, in a way that examines greatest benefits to the state and Maine's ratepayers.

3. **What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?**

While legislation is not required to begin the process, it may be needed to secure adequate funding for executing the process and related studies. Additionally, one of the questions that will be examined through the stakeholder process is what modifications to existing statutes and regulations are required to achieve the objectives and recommendations of the MCC, the implementation of the integrated resource plan, and the recommendations arising out of the Transformation Stakeholder Process. This will help to identify potential future legislative or regulatory changes necessary to accomplish the goals of the MCC and state policy.

The GEO will initiate and manage the process in coordination with the PUC, and with the engagement of the Office of the Public Advocate, Efficiency Maine Trust, electric utilities, generators, consumers, and other relevant stakeholders.

It is likely to be useful to complete the IRP (which should include input from and review by the Office of the Public Advocate, Efficiency Maine Trust, electric utilities, generators, consumers and other relevant stakeholders) before pursuing the Power Sector Transformation Stakeholder Process, and include in that IRP economic analysis of various pathways to achieving the objectives of Maine's Climate Act and the Maine Climate Council. The IRP should be completed by the end of 2021. Studies that could begin coincident with the IRP process include: examinations of how to improve access to data and information, and equitable and efficient cost allocation.

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X			
To realize outcomes	X			

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	The IRP and Stakeholder Process itself will not have an impact on workforce, though the outcomes of this process may have workforce related impacts.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?	Potential benefits of this process could include: improved utility structure, effective load management strategies that result in beneficial impacts on the grid and ratepayers, lower electricity rates, lower costs of generation, better data and information sharing, beneficial incorporation of DERs, and efficient and equitable cost allocation to achieve objectives and recommendations of the MCC and IRP.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	There would be costs associated with execution of this process, including necessary staff resources of the GEO and PUC. Pursuing a thorough IRP effort would require outside consulting and, thus, the associated costs of hiring a consultant to assist with the work. The Power Sector Transformation Stakeholder Process would have costs associated with administration of the Process by the GEO and PUC, as well as consulting costs depending on the outcome of the various stakeholder groups and PUC proceedings.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	The GEO and PUC should ensure transparency and adequate opportunities for public engagement in addition to ensuring relevant stakeholders have an opportunity to participate. Additionally, equity impacts should be taken into account while exploring the various strategies and considerations outlined in the process.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What	Modellable Integrated Resource Planning (IRP) processes have taken place in Massachusetts and Connecticut.

barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	Massachusetts: 2050 Roadmap: Building Solutions to Address Climate Change in the Commonwealth (https://www.mass.gov/doc/3272020-slide-deck-from-public-webinar/download) Connecticut: 2018 Integrated Resources Plan including a Clean Energy Pathways Analysis (https://portal.ct.gov/DEEP/Energy/Integrated-Resource-Planning/Integrated-Resource-Planning) Modellable Power Sector Transformation Process: Power Sector Transformation Initiation in Rhode Island (http://www.ripuc.ri.gov/utilityinfo/electric/PST_home.html)
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	No new legal authority would be required for the initiation of this process, however, statutory authority may be required to obtain the necessary funding to pursue this thorough analysis and process.

6. Rationale/Background Information

The Energy Working Group members presented a number of strategies related to power sector transformation, all available in the working group spreadsheet on the EWG webpage. However, without answers to the questions outlined in the Power Sector Transformation Stakeholder Process, the members generally did not feel comfortable recommending any one specific strategy without in-depth analysis and greater stakeholder engagement. The EWG greatly emphasizes that while this process does not, in and of itself, result in carbon emission reductions or related benefits, the process is essential to ensure that beneficial electrification and other clean energy and climate goals are accomplished in the most efficient and effective way. Additionally, this process is needed to better understand the statutory and regulatory requirements and changes that may be needed to implement the recommendations of the Maine Climate Council.

Energy Working Group Recommendations

RECOMMENDATION: Encourage the utilization of the Maine Public Utilities Commission's (MPUC) long-term contracting authority to include highly efficient combined heat and power (CHP) production facilities.

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**
    a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**

Encourage the utilization of Maine Public Utilities Commission's (MPUC) long-term contracting authority to include highly efficient combined heat and power (CHP) production facilities.

CHP is the utilization of energy efficient technology that captures heat from the generation of electricity to provide useful thermal energy, such as steam or hot water. This heat would otherwise be wasted and instead can be utilized for space heating, water heating, cooling, and industrial processes.

    b. **List any site-specific geographies where the strategy would be applied.**

CHP is typically located at facilities where there is a need for both electricity and thermal energy, though can also be used for a district energy or utility resource. CHP both reduces energy loss and reduces the need for additional energy generation to accomplish heating and industrial processes.

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**
    c. **For mitigation strategies:**
        i. **What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?**
        ii. **What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?**

    Reduction in greenhouse gas (GHG) emissions from heating and industrial processes. The exact reduction in emissions will depend on the CHP unit as well as the system it is replacing, which will also impact the cost effectiveness of the reductions. It is strongly recommended that only highly efficient CHP units are allowed for long-term contracts to ensure greatest reduction in emissions.

    d. **Are outcomes measurable with current monitoring systems?**

The state's overall emissions are currently measurable and monitored. For each individual CHP project, calculations could be made to estimate carbon emission reductions compared to the current system, but precise monitoring at any particular project may be challenging.

3. **What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?**

Maine PUC, through statute and potential regulatory changes, should be encouraged to pursue long-term contracts that include highly efficient combined heat and power production facilities. In addition, parameters need to be established to define exactly which highly efficient systems would meet approval of the long-term contracts. The group did not agree exactly on the language to define highly efficient, though there was agreement that the parameters adopted should ensure only the most efficient systems are approved in order to maximize benefits and reduce emissions. Two suggested options for defining highly efficient are available below:

- Highly efficient means that the CHP unit has a minimum of 70% combined electric and thermal efficiency with fuel input being expressed on a higher heating value basis. In order to provide incentives for higher efficiency CHPs, units with higher efficiency ratings would be better compensated in CHP procurements.
- Highly efficient means that the CHP unit produces fewer GHG emissions from electric, heating and process load at the host than would have been produced by the hosts "replaced" system, including electricity sourced from the grid, over the first 10 years of operation.

If the CHP unit provides electricity system benefits (i.e. synchronous generation) that can facilitate more rapid development of generation consistent with the EWG's broader goals, than those benefits may be considered as additive to the CHP unit's efficiency.

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X			
To realize outcomes	X			

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	The installation of CHP can provide both direct and indirect job creation. Direct job creation is provided by the manufacturing, installation, and ongoing operations of the facility, in addition to the indirect jobs associated with the supply chain for the development of a CHP facility. As the entities utilizing the CHP facility increase productivity and efficiencies, their cost savings allow them to operate more competitively and potentially increase their employment opportunities.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk,	CHP units reduce the amount of energy wasted at any given facility and prevents the need for additional energy consumption, while increasing efficiency, as waste heat from electricity generation is utilized for heating/cooling/process needs. The entities utilizing highly efficient CHP units will experience significant cost-savings for their operations, in addition to the carbon reduction benefits. In addition to benefits at the facility, CHP can provide community benefits by increasing industrial productivity and increased economic activity and

increased recreation, avoided damage)?	tax revenue. CHP facilities can also offer enhanced energy reliability in times of grid disturbances CHP can provide grid benefits (synchronous generation) to enable greater penetration of renewable energy.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	Energy procurements at the PUC are paid for by all ratepayers. Therefore, as with all procurements, it is important to ensure that competitive procurements elicit least-cost prices from potential suppliers of efficient and well-located CHP facilities.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	There is likely an equitable benefit to all Mainers in providing the opportunity for additional CHP projects that can provide benefits to Maine businesses and the grid. The investments can help to stabilize Maine's economic fabric.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	California's PUC has a Quality Facilities and Combined Heat and Power Program (QF/CHP Program) including procurements for long-term contracts. In order for a CHP facility to qualify they must receive certification as an eligible CHP facility from the California Energy Commission (CEC). (https://www.cpuc.ca.gov/General.aspx?id=5131) The U.S. Department of Energy provides a Combined Heat and Power Technology Fact Sheet Series, which outlines specific examples of cost savings, increased facility productivity, job creation, and community benefits of CHP facilities throughout the U.S. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/CHP%20Economic%20Success%20Stories%20Fact%20Sheet%20-%20Final.pdf
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	New statutory and regulatory authority may be needed to encourage the PUC to procure long-term contracts for CHP units.

6. Rationale/Background Information

As long as CHP units are proven to be highly efficient, they can offer significant benefits to the facilities where they are located, as well as overall benefits to the grid. CHP both reduces energy loss and reduces the need for additional energy to accomplish heating and industrial processes. The state should continue to support the growth of CHP units and should do so through a procurement and issuance of long-term contracts.

Energy Working Group Recommendations

RECOMMENDATION: Institute a Renewable Fuel Standard for all heating fuels, with incentives sufficient to drive rapid reductions in emissions from heating and process fuels (e.g., for industrial processes) used in Maine.

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**
    a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**
    b. **List any site-specific geographies where the strategy would be applied.**

Institute a Renewable Fuel Standard (RFS) for all heating fuels. An RFS for the heating sector requires that a certain percentage of renewable fuels are included in the heating fuel sector in order to replace or reduce the quantity of CO2 emitting heating fuels. An RFS should be instituted with incentives sufficient to drive rapid reductions in emissions from heating and process fuels used in Maine. In addition, pilot programs should be created to explore the potential long-term role and efficacy in Maine of renewable natural gas and power-to-gas (hydrogen).

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**

Net greenhouse gas (GHG) reductions from the switch from fossil-fuels to more carbon-friendly fuel sources.

    e. **For mitigation strategies:**
        i. **What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?**
        ii. **What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?**

    The estimated CO2e savings depends on the tiers of the RFS and the fuel they are displacing. In developing the RFS tiers, renewable fuels with the highest GHG emission reductions should be prioritized.

    f. **Are outcomes measurable with current monitoring systems?**

    Emissions are currently measurable. Estimated emission reduction calculations could be done for RFS based on the type and amount of renewable fuels in relation to the fuels that are being displaced.

3. **What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?**

The Governor's Energy Office (GEO), advised by stakeholders, should determine the exact categories of fuels for the various tiers within the RFS, as well as the starting percentages required for compliance. Below is an example of what this tiering could look like. While there is general agreement that the tiers

should prioritize fuels based on GHG impact, highlighting GHG negative fuels first, and that the tiers should evolve with the development of technology, the specifics of each tier should be developed more fully by the GEO and stakeholders. The Energy Working Group members did not agree on the exact specific examples for each of the tiers.

The RFS would be applicable to all heating fuels and would have requirements to increase the compliance percentage, creating a graduated standard increasing over 10 years.

RFS EXAMPLE:

- Tier 1: GHG Negative
  - Example: 'new' anerobic digestors deriving their fuel from GHG emitting waste and avoiding the use of traditional fuels in the heating sector (i.e. dairy digesters)
- Tier 2: Carbon-Neutral
  - Example: 'new' capped landfill or wastewater treatment facilities
- Tier 3: Low-Carbon
  - Example: biofuels
- New Technology: New technologies should be incorporated in the appropriate tier as they are determined to be technically and commercially viable (renewable power-to-gas).

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X			
To realize outcomes	X			

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	Instituting an RFS encourages the development of renewable fuels in Maine, leading to the creation of construction and other full-time employment. An RFS would support Maine-based dairy and agricultural sectors. An RFS may provide additional economic opportunity for existing industries in Maine, such as wood products and biofuels, allowing the expansion of existing workforce.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?	An RFS will provide opportunity for development of new projects needed to meet the standard, driving economic activity in the area of development. As the State transitions away from foreign fossil-fuels and develops markets for domestic renewable fuels, there will be an opportunity for increased economic activity. An RFS spurs the development of additional new technologies needed to meet the objectives, allowing Maine to be at the forefront and leader in the industry.

	Transitioning away from certain farming practices to generating renewable fuels also has potential public health benefits through the reduction of groundwater pollutants.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	Modeling may be able to provide additional cost details
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	Projects developed to meet the objectives of the RFS, particularly those utilizing existing methane sources, will likely be located in rural communities. This presents the opportunity to provide economic and tax benefits to that community.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	Massachusetts has an Alternative Energy Portfolio Standard (APS) [https://www.mass.gov/alternative-energy-portfolio-standard] California currently has a Low Carbon Fuel Standard [https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard] Hydrogen for Power-To-Gas is being produced commercially in Europe (Germany/Switzerland/Netherlands) National Renewable Energy Laboratory in the United States is currently researching and piloting hydrogen power-to-gas projects, as well as a few other pilots in the U.S. [https://www.nrel.gov/esif/renewable-fuels-grid-integration.html]
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	Instituting an RFS would require statutory changes to implement for all heating fuels. LDCs could pursue this without statute, though they would still require approval from the PUC

6. Rationale/Background Information

Maine is currently the most heating-oil dependent state for home heating in the country. As a result, a significant amount of the state's emissions come from the residential heating sector. In order to meet Maine's carbon emission reduction goals, this must be addressed. An RFS provides carbon reductions, including to the industrial sector, and should be pursued in addition to beneficial electrification of the heating sector to obtain greatest carbon benefits.

Energy Working Group Recommendations

RECOMMENDATION: Develop and implement new financing options necessary to meet Maine's clean energy and emission reduction targets.

1. Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.

BROAD RECOMMENDATION: Develop and implement new financing options necessary to meet Maine's clean energy and emission reduction targets.

SPECIFIC RECOMMENDATIONS: EWG Small Group #4 identified several possible mechanisms that Maine could apply. These fell into categories reflecting how readily they could be implemented versus whether they required further development. The EWG Small Group #4's recommendation reflects these categories:

a. Create the mechanisms or entities necessary to finance Maine's energy system effectively, through and including energy end-uses, and authorize their initial capitalization.

(1) Maine Green Bank: Create a Maine Green Bank, based on the successful experience in other states and building on existing clean energy financing programs in Maine. A green bank would leverage significant, low cost private sector capital to finance clean energy projects and infrastructure. Programs could be targeted at populations and sectors that have limited access to capital such as homeowners and renters, small businesses, institutions, and local governments. They could also address equity issues by providing grants and low or zero-interest loans to low- and moderate-income households. More details on this option are included in the accompanying MCC template.

(2) Increased Revenue Bonding: Enable and encourage state and local revenue bonding to compete for any and all energy infrastructure investments that have a material impact on reducing carbon dioxide emissions. Remove legal impediments to the use of this low-cost, tax-exempt capital, enabling existing state and local entities to accelerate the pace and reduce the cost of new clean energy investments. Encourage municipal leaders and boards of state or quasi-governmental entities to utilize their full ability to invest.

b. Pursue further investigation of structural approaches to reducing clean energy infrastructure costs in Maine, including but not limited to:

(1) Consumer ownership and control of all, or the greater portion of, Maine's power delivery systems (e.g., as explored in 2019 LD 1646) to enable less-costly financing of related infrastructure, as well as to refocus planning and investment priorities; and

(2) Establishment of a "Maine Power Authority "as a quasi-independent governmental entity to serve as the primary energy planning and financing authority in the state. This might take a form similar to the New York Power Authority, the Illinois Power Agency, the Maine Electrical Generation Authority proposed by Dr. Silkman, or something in between.

c. Investigate the potential of multistate or national carbon pricing beyond the electric power sector. Economists generally believe that carbon pricing will be needed to address climate

change; many also suggest that carbon prices need to increase over time and be accompanied by other complementary policies and measures. Maine already prices power sector carbon emissions through its participation in the Regional Greenhouse Gas Initiative (RGGI) and returns the revenues back to participating states and consumers to invest in energy efficiency and for other state purposes. Carbon revenues can also be returned directly to consumers in the form of dividends. This carbon-price-and-dividend or investment approach could be expanded at the state or regional level to include other sectors and fuels sold and combusted in Maine, which could provide an important source of low-cost capital for financing clean energy. Carbon revenues should also be used to address any regressive distributional impacts to ensure that Maine's transition to clean energy is equitable. The institution of a carbon price in Maine alone could negatively impact the state's competitive advantage, so it may be necessary to condition the implementation of a carbon pricing policy on the adoption of a multi-state agreement, echoing the approach taken with power sector emissions (i.e., RGGI).[2]

REMAINDER OF THIS RECOMMENDATION:

The elements of the EWG's broad Financing recommendation are stated above in Section 1. The elements embodied in Section 1.b and 1.c require further development. Those included in Section 1.a – a Maine Green Bank and Increased Revenue Bonding – can be adopted comparatively expeditiously. The remainder of this document addresses the template questions for each of these two elements separately, before returning to a common closing in Section 6 applicable to both elements.

Template Questions for 1.a.1 – Maine Green Bank

2. What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?

a. For mitigation strategies:

i. What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?

The amount of CO2e reductions depend on size and scope established for the program. A 2016 Union of Concerned Scientists (UCS) study found that implementing a green bank in Maine with a modest initial capitalization of $14 million could leverage a $300 million investment in renewable energy and energy efficiency over 15 years that would reduce CO2 emissions by nearly 176,000 tons, equivalent to taking 33,600 cars off the road.

ii. What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?

The cost effectiveness of CO2e reductions depend on size and scope established for the program. The 2016 UCS analysis mentioned above concluded that homes and businesses would save $33 million per year on electricity bills by investing in energy efficiency.

[2] Initial polling of the EWG members indicated interest in carbon pricing as a mitigation policy. As the process progressed some members suggested pursuing carbon pricing, while other members expressed concern about this approach, particularly if implemented as a single-state initiative rather than as part of a multi-state approach.

b. Are outcomes measurable with current monitoring systems?

Specific metrics depend on the final scope established for the bank, but they could include:

- Dollars invested and number of loans in different technologies and market segments, including low- and moderate-income (LMI) households;
- Public-private leverage ratio (green bank programs in NY and CT, for example, are leveraging about $5 in private sector investments for every $1 of public sector funding);
- Job impacts;
- CO2 and other emission reductions;
- MW and MWh of renewable energy generation and energy efficiency savings;
- Number of technologies (e.g., heat pumps, EVs, etc.) installed; and
- Energy bill savings.

Many such metrics are already being tracked by Efficiency Maine, the state energy office, and other entities in implementing related programs. A green bank in Maine could greatly expand and supplement this tracking. It could also assist in evaluating and replicating other monitoring approaches being used successfully by other states' green banks.

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

c. The establishment of a Maine Green Bank would likely require new legislation such as LD 1634 (2019 committee amendment).

d. A Maine Green Bank would require initial capitalization.

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X			
To realize outcomes	X	X	X	X

a. A green bank could be implemented relatively quickly after enabling legislation is passed and additional funding is secured by building off of existing programs and institutions like Efficiency Maine Trust (EMT), the Finance Authority of Maine (FAME), the Small Business Development Center (SBDC)/Coastal Enterprises Inc. (CEI), and Maine Technology Institute (MTI).

b. If Maine builds off of existing programs and institutions, outcomes should be evident within just a few years.

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	By facilitating additional investments in clean energy technologies and related infrastructure, a green bank would create new jobs, income, and tax revenues for the state and local communities.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage, etc.)?	● New investment in state and local economies. ● Additional tax revenue for state/local communities. ● By reducing fossil fuel use, a green bank would also reduce criteria pollutants, providing important public health benefits. ● More of Maine citizens' energy dollars would stay in-state rather than be "exported" to fossil-fuel producing states and countries.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	The only costs would be the green bank's initial capitalization and a modest number of additional staff to administer and implement its programs. The initial capitalization could build off existing funding sources such as CO2 allowance revenues from RGGI, system benefits charges, federal grants from the US Department of Energy and other agencies, and/or other sources. However, funding from these sources would likely need to be supplemented with additional funding from such sources as state bonding, tariffed on-bill financing, additional system benefits charges, RPS alternative compliance payments, institutional investors (e.g., ME PERS), FHA energy efficiency mortgages and solar loans, public employee payroll deductions, and/or a fee on CO2 emissions from fossil fuels.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	Many state green banks have efficiency and renewable energy programs that provide grants, low- or zero-interest loans, and credit enhancements to low- and moderate-income (LMI) households and owners of multi-family and public housing. Some states like RI provide a broader array of loans and programs that can provide additional environmental, public health, and resilience benefits to LMI and disadvantaged communities, such as financing to remediate contaminated brownfield sites, reduce water pollution, improve drinking water, and replace septic systems.

Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	Green banks have been successfully and effectively implemented in a number of states. Some resources include: ● Clemmer, S., K. Wright, and R. Cook. 2016. *Green Banks: Transforming Clean Energy Financing in Maine.* Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/sites/default/files/attach/2016/12/maine-clean-energy-finance.pdf ● Vermont Energy Investment Corporation (VEIC). 2019. *Advancing Clean Energy Investment in Northern New England*. Prepared for The Nature Conservancy and Coastal Enterprises, Inc. https://www.ceimaine.org/wp-content/uploads/2019/02/VEIC-Clean-Energy-Investment-Report-January-2019-for-Distribution.pdf ● Also see these links: – New York Green Bank - https://greenbank.ny.gov/ – Connecticut Green Bank - https://ctgreenbank.com/ – Rhode Island Infrastructure Bank - https://www.riib.org/ ● For examples of other state and national green bank programs, see the Coalition for Green Capital website: http://coalitionforgreencapital.com/
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	● The establishment of a Maine Green Bank would likely require new legislation such as LD 1634 (2019 committee amendment). ● A Maine Green Bank would require initial capitalization.

Template Questions for 1.a.2 – Increased Revenue Bonding

2. What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?

a. For mitigation strategies:

i. What is the estimated CO2e savings (metric tons) by 2025, 2030, 2050?

Historically, the total cost of revenue bonds is on the order of 40%-50% less than that of private investment. As a result, revenue bonding would enable Maine to meet its emission reduction targets at a much lower cost.

To the extent that the increased availability of lower-cost capital leads to a more accelerated and sustained pace of clean energy investments, CO2e savings can be directly inferred. To the extent that it increases affordability rather than more rapid investment, it is also possible to assume the potential for faster

consumer adoption heat pumps, EVs and other beneficial electrification, due to the improved economics.

ii. What is the cost effectiveness of those reductions (cost per ton of CO2e reduced) and the total cost?

All else being equal, the cost per ton of CO2e reduced using revenue bonds can be approximated at 40%-50% less than a traditional mix of equity and debt. For example, on a 30-year bond for $1 million, the annual costs at 3% interest are ~$51,000 while the costs at 8% interest are ~$89,000.

This is why the widespread use of lower-cost revenue bonding by existing Maine entities could increase the pace of both investment and adoption.

For this reason, we recommend that Synapse construct a sensitivity analysis for all MCC recommendations that require public and/or private capital investment, estimating the costs, benefits, and pace of each recommended CO2e reduction strategy using a reasonable range of possible capital costs (e.g., 3% to 8%).

b. Are outcomes measurable with current monitoring systems?

Yes, with minor additions. Annual reporting from entities making clean energy capital investments, the cost of capital included, and expected or inferred CO2e reductions could be collected through the Public Utilities Commission (PUC) and EMT. The Synapse/ERG modeling recommended above could also help establish sound methodologies.

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

a. Many entities can already issue revenue bonds but may need additional authorization or direction to invest in clean energy. The Governor and the Legislature, or their designees, should encourage the use of revenue bonding by soliciting examples of successful experiences and strategies, and by identifying and removing obstacles impeding greater access to this source of lower cost capital. Consultations should include municipal leaders and representatives of FAME, EMT, the Office of Public Advocate (OPA), CEI, MTI, PUC, utilities, energy developers, and the Maine Municipal Bond Bank, among others, and if warranted, the state should convene a Clean Energy Revenue Bonding Task Force to make additional recommendations expeditiously.

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	X	X		
To realize outcomes	X	X	X	X

a. Increased use of revenue bonding could be implemented relatively quickly, accelerating enabling legislation. Issuers of such bonds to finance clean energy infrastructure could include municipalities, EMT, FAME, existing or new consumer-owned utilities, the Maine Turnpike Authority, the Maine Municipal Bond Bank, and others.

b. If Maine builds off of existing programs and institutions, outcomes should be evident within just a few years.

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?	By facilitating additional investments in clean energy technologies and related infrastructure, increased use of revenue bonding would create many new jobs.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage, etc.)?	● New investment in state and local economies with related economic activity. ● Revenue bonding can also be used by public entities for fiberoptic cable or similar applications, to lease capacity in order to increase connectivity and telework. This technology relies on the same poles and public rights-of-way as electricity. ● Increased use of revenue bonding to accelerate the transition would also reduce criteria pollutants, providing important public health benefits. ● More of Maine people's energy dollars would stay in-state rather than be "exported" to fossil-fuel producing states and countries.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?	Encouraging the use of tax-exempt revenue bonding by state and local entities would require minimal administrative cost to the state and local entities issuing the bonds. Entities such as FAME, CEI, MTI and the Maine Municipal Bond Bank could assist. Tax-exempt revenue bonding by state and local entities can be significantly less expensive than the use of private capital, and does not require the use of tax dollars.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?	By cutting costs of capital, increased use of revenue bonding can make the transition more attainable for those most impacted by high energy costs, from low-income Mainers to those workers and businesses most sensitive to electricity costs. Financing a portion of new energy infrastructure using revenue bonding would expose ratepayers to reduced risk by creating a more diverse set of funding streams and introducing competition and a source of capital typically half as expensive.

	Importantly, as we look ahead to a period of very scarce state and local resources, revenue bonds do not require the use of tax dollars, so will not compete for funding with critically needed health, education and human service needs.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?	Revenue bonds are a common tool used across state and local government as well as other public entities in various sectors. These include turnpikes, water and sewer utilities, the state liquor contract, and many others. Thirty percent of America's utilities rely almost exclusively on revenue bonds.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?	Minor amendments to existing laws could enable greater access to this financial tool, but many entities are already able to invest in this way.

6. Rationale/Background Information

BACKGROUND: Achieving Maine's clean energy and climate goals will require additional capital to finance clean energy projects and to fund energy-related programs (e.g., clean energy supply resources, energy efficiency and weatherization, transportation and other beneficial electrification, etc.). This requirement will likely be met through a variety of existing and new funding sources, both private and public, and mechanisms (e.g., policy incentives, financial incentives, regulatory mandates, public education, codes and standards, etc.). Every effort should be made to ensure that any public and ratepayer resources used are secured as inexpensively, and employed as effectively and efficiently, as possible while maximizing public benefits.

Although characterized in this template as mitigation strategies, the recommended strategies to enhance investment in clean energy infrastructure provide significant adaptation benefits as well. Specifically, such investments can improve the reliability and resilience of the electrical grid, and they are vital to the adoption of EVs, heat pumps, telehealth/telework, and other climate solutions. Maine's outages are already some of the most frequent and long-lasting in the nation, and accelerating extreme weather events can be expected to magnify this problem. Our challenge is due at least in part to Maine's rural character, rocky soils, tree cover, and peninsular wind exposure. Investments needed likely include some grid hardening and related infrastructure improvements, as well as wider use of distributed energy resources, energy storage, and microgrid solutions like those being explored on Isle au Haut, Mount Desert Island, and elsewhere in the state. The more affordable these reliability and resiliency investments are, the more cost effective and robust Maine's transition to a clean energy economy will be.