Senators and Legislators, I would like to express my opposition to LD 1708 “An act to Create the Pine Tree Power Company, a non-profit Utility, To Deliver Lower Rates and Maine Energy Independence”.

I am Kay Aikin, CEO of Introspective Systems of Portland Maine, we provide grid modernization controls under the brand Dynamic Grid for both utilities and renewable energy developers. You may have seen press on the Isle au Haut microgrid that we helped design/optimize. I am also very heavily involved in the regulatory and grid modernization field locally and nationally with my contributions to the Maine Climate Council, the Maine Utility Regulatory Reform and Decarbonization Initiative (MURRDI) convened by the Maine Nature Conservancy and the Great Plains Institute, but most importantly, I am one of 13 members of the Grid Wise Architecture Council (GWAC) that is the lead Department of Energy sponsored advisory group for grid modernization across the United States.

While I not opposed to the intent of LD 1708 of making a better grid, I won’t debate the merits of corporate or public control. Being deeply involved in modernizing the grid so we may meet our decarbonization goals, I want to submit that we can better spend our limited time on modernizing the grid, using current, although stronger, Public Utility Commission authorities to make the utilities function better to public benefit. The MURRDI report (attached) that was developed by roughly 35 community stakeholders from a broad range of perspectives is a road map current legislation. Members of MURRDI included utilities, energy developers, technology companies, government officials, advocacy groups and trade groups. We all worked together to make a strong group of recommendations that could be implemented quickly and start us on the path to a decarbonized and well-functioning electrical grid. I urge the committee members to read this report and start the process of implementing these recommendations and I stand ready to help answer any questions that may arise.

I pledge to work with you to focus on a suite of grid architecture, grid modernization technology and regulatory improvements for the future as were developed in the MURDDI process.

1) A holistic grid planning process aligns short-term utility led grid planning with long-term STRATEGIC planning focusing decarbonizing the grid managed by the PUC.
2) Develop the grid architecture and control technologies that support our strategic plan to decarbonize the grid by beneficial electrification (BE) and distributed energy
3) Explore dynamic pricing and new methods in distribution management that further beneficial electrification and system reliability
4) Support methods that incentivize renewable generation and BE at locations that benefit the grid the most in relation to decarbonization. This can be done with new interconnection rules, value metrics and small tweaks in the NWA law.
5) Increase the focus on electrical grid innovation with pilot projects and new cost recovery options for utilities for that innovation.

Lastly, there has not been a successful purchase of an Investor-Owned Utility (IOU) by the public in decades the last successful purchase on Long Island has been a total failure with lowered quality and increasing rates. The last attempt in Boulder, Colorado culminated after a 10-year battle in the courts with a referendum by the people of Boulder to abandon the effort. The up to 10 years spent fighting this case will not get us to our goal of a renewable energy electrical grid but only slow the process down. Much better to use existing PUC authority, that is strengthened and make them a partner in the renewable transition. We can roll up our sleeves today and get started rather than handing our future to lawyers in ties, arguing in Federal court.

Sincerely Kay Aikin, CEO Introspective Systems/Dynamic Grid, Portland Maine (207) 245-4797

Maine Utility/Regulatory Reform and Decarbonization Initiative

Stakeholder recommendations to plan, build, and operate the electric grid that is needed to meet Maine's climate and energy requirements.

APRIL 2021

Co-convened by the Great Plains Institute (GPI) and The Nature Conservancy (TNC)

GREAT PLAINS INSTITUTE

The Nature Conservancy Maine

About this Report

AUTHOR

Trevor Drake, Great Plains Institute

USAGE OF THIS REPORT

This document summarizes the process and consensus recommendations of the Maine Utility/Regulatory Reform and Decarbonization Initiative. The viewpoints stated in this document represent the collective thinking of the participants. No view should be attributed to any specific individual or organization. Moreover, the recommendations captured in this document represent general consensus at the time this report was published and should not be used to constrain any party's advocacy efforts in the future.

ACKNOWLEDGEMENTS

The Great Plains Institute (GPI) and The Nature Conservancy (TNC) would like to thank the participants for their significant time commitment and thoughtful engagement throughout this process. In addition, GPI would like to thank TNC for the opportunity to serve as a neutral, third-party facilitator for these important conversations.

ABOUT THE CO-CONVENERS

Great Plains Institute: A nonpartisan, nonprofit organization, GPI is transforming the energy system to benefit the economy and environment. Working across the US, we combine a unique consensus-building approach, expert knowledge, research and analysis, and local action to find and implement lasting solutions. Our work strengthens communities and provides greater economic opportunity through creation of higher paying jobs, expansion of the nation's industrial base, and greater domestic energy independence while eliminating carbon emissions. Learn more at www.betterenergy.org.

The Nature Conservancy: The Nature Conservancy is a nonprofit conservation organization dedicated to conserving the lands and waters on which all life depends. Guided by science, we create innovative, on-the-ground solutions to our world's toughest challenges so that nature and people can thrive together. Working in more than 70 countries, we use a collaborative approach that engages local communities, governments, the private sector, and other partners. The Conservancy has been working in Maine for more than 60 years, conserving approximately 275,000 acres of land, restoring rivers and streams, rebuilding groundfish populations in the Gulf of Maine, and developing solutions to address the causes and impacts of climate change. Learn more at www.nature.org.

QUESTIONS ABOUT THIS REPORT

Questions should be directed to Trevor Drake, Great Plains Institute, 2801 21st Ave S, Suite 220, Minneapolis, MN 55407, tdrake@gpisd.net, 612-767-7291.

Table of Contents

I. Background

Across the US, utilities, regulators, elected officials, and many other stakeholders are actively working to align electric utility systems, which were built to deliver reliable and affordable power, with an economy that is increasingly decarbonized. Subsequently, relatively new technologies such as smart appliances, solar photovoltaic panels, electric vehicles, and battery storage are changing the role of customers on the electric system from passive consumers to active participants that have the ability to consume energy, produce energy, and flex their energy usage in response to price signals. These changes are leading to an evolution of utility systems and rules for managing distributed energy resources.

Several states have implemented comprehensive stakeholder engagement processes to better understand the challenges and opportunities associated with these changes occurring within and outside of the electric sector and to develop solutions for adapting utility business models and regulation to a decarbonized and technologically modern economy.

While no such comprehensive process has yet taken place in Maine, several new laws were enacted in 2019 that address decarbonization and emerging technologies in the electric sector, including the following:

- A requirement to reduce statewide greenhouse gas emissions 45 percent below 1990 levels by 2030 and 80 percent by 2050 and establishment of the Maine Climate Council to develop recommendations for achieving those requirements and mitigating and adapting to climate impacts.[1]
- An increase to the renewable portfolio standard, whereby renewable resources must account for 80 percent of electric sales by 2030 and meet a goal of 100 percent by 2050.[2]
- A distributed generation policy that (1) allows facilities up to 5 MW to qualify for net energy billing, (2) allows more customers to have a shared financial interest in a distributed generation resource, and (3) requires the Maine Public Utilities Commission (PUC) to facilitate the procurement of 375 MW of new distributed generation resources by July 2024.[3]
- The establishment of a non-wires alternative coordinator under the Office of the Public Advocate that is charged with reviewing small transmission and distribution capital

[1] An Act To Promote Clean Energy Jobs and To Establish the Maine Climate Council, S.P. 550 - L.D. 1679, 129th Legis. (2019), http://legislature.maine.gov/bills/getPDF.asp?paper=SP0550&item=3&snum=129.

[2] An Act To Reform Maine's Renewable Portfolio Standard, S.P. 457 - L.D. 1494 , 129th Legis. (2019), http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=SP0457&item=3&snum=129.

[3] An Act To Promote Solar Energy Projects and Distributed Generation Resources in Maine, S.P. 565 - L.D. 1711, 129th Legis. (2019), https://www.mainelegislature.org/legis/bills/getPDF.asp?paper=SP0565&item=4&snum=129.

investments and identifying opportunities for non-wires alternatives to those investments.[4]

- A requirement for Efficiency Maine Trust to study barriers to beneficial electrification of the transportation and heating sectors and a requirement for the PUC to support a transportation electrification pilot program.[5]

These laws establish what Maine must achieve in terms of climate and energy requirements, but they do not establish what changes to the electric system will be needed to accomplish them. The Maine Utility/Regulatory Reform and Decarbonization Initiative (MURRDI) is an effort to develop broad consensus around what is needed, in terms of electric grid planning and modernization, to achieve the recently established climate and energy requirements.

MURRDI was co-convened by the Great Plains Institute (GPI) and The Nature Conservancy (TNC). TNC asked GPI for a proposal to convene Maine's energy system stakeholders for a series of conversations about how to achieve the state's clean energy and climate goals. In the summer of 2020, GPI and TNC began interviewing stakeholders to better understand what specific issues they wanted to work on collectively.

This report documents the process that the group followed and the consensus recommendations that resulted. Importantly, these are not GPI's and TNC's recommendations; these are recommendations that were developed, refined, and agreed to by the full stakeholder group.

[4] An Act To Reduce Electricity Costs through Nonwires Alternatives, H.P. 855 - L.D. 1181, 129th Legis. (2019), https://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP0855&item=3&snum=129.

[5] An Act To Support Electrification of Certain Technologies for the Benefit of Maine Consumers and Utility Systems and the Environment H.P. 1071 - L.D. 1464, 129th Legis. (2019), http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP1071&item=3&snum=129.

II. Process

GPI and TNC sought to convene a stakeholder engagement process in which participants had the opportunity to collectively decide what they wanted to discuss and seek to accomplish, within the scope of utility and regulatory reform towards decarbonization in Maine. GPI and TNC began the process by interviewing over 30 of Maine's energy system stakeholders, including investor- and consumer-owned utilities, current and former regulators, state agencies, local governments, residential and low-income consumer advocates, commercial and industrial advocates, environmental advocates, energy sector businesses and developers, and electrified transportation advocates. The interviews were designed to identify what key issues stakeholders wanted to discuss, as well as ground rules and desired outcomes for the process.

During the first two meetings, the group reviewed and discussed the responses and perspectives that were shared in the interviews. Ultimately, participants agreed on the key questions, ground rules, and guiding principles listed below. We have also listed the individuals who participated, and a summary of topics covered at each meeting.

Participants

The following individuals participated in this process, representing a broad and diverse set of perspectives on Maine's energy system:

- Jeff Marks & Oliver Tully, Acadia Center
- David Littell, Bernstein Shur
- Jason Rauch & Eric Stinneford, Central Maine Power
- Troy Moon, City of Portland
- Julie Rosenbach, City of South Portland
- Greg Cunningham & Phelps Turner, Conservation Law Foundation
- Ian Burnes & Michael Stoddard, Efficiency Maine Trust
- Dan Burgess & Melissa Winne, Maine Governor's Energy Office*
- Kay Aikin, Introspective Systems, LLC
- Phil Bartlett, Maine Public Utilities Commission*
- Jeremy Payne, Maine Renewable Energy Association
- David Costello & Sue Ely, Natural Resources Council of Maine
- Rob Wood, The Nature Conservancy in Maine
- Barry Hobbins, Andrew Landry, & Susan Chamberlin, Maine Office of the Public Advocate*
- Peter O'Connor, Plug In America
- Tony Buxton, Preti Flaherty
- Barry Woods & Fortunat Mueller, ReVision Energy
- Tom Welch, consultant
- Dot Kelly & Matthew Cannon, Sierra Club Maine Chapter
- Steve Weems, Solar Energy Association of Maine
- Ken Colburn, Symbiotic Strategies
- Steve Clemmer, Union of Concerned Scientists
- James Cohen, Verrill Dana LLP
- Tim Pease, Versant Power

- Dave Wilby, Wilby Public Affairs, LLC

* *Participants from organizations marked with an asterisk participated as observers only.*

Key Questions

During the first two meetings, participants agreed that the process should explore and seek to answer the following key questions:

1. What is needed in terms of electric grid planning and modernization, both short and long term, to achieve Maine's climate and energy requirements?
2. What should be expected of Maine's electric utilities, both short term and long term, to achieve that?
3. What should be expected of the Public Utilities Commission, both short term and long term, to achieve that?

Notably, participants discussed whether the first question should include the additional language of either "at lowest cost" or "at lowest reasonable cost." While the group clearly felt that cost was important, participants did not come to consensus on which of the two options to use, so ultimately the language referencing cost was removed from the question. Below, we have summarized the general perspectives on both cost language options.

LOWEST COST

Stakeholders preferring *at lowest cost* as an addition to the first key question felt that, as long as the goal is to achieve Maine's climate and energy requirements, then lowest cost should be the driver of good decisions. In other words, no issue matters more in mitigating the climate crisis than does the cost of mitigation: the lower the cost, the more mitigation available, the less terrible the climate crisis, and the less harm to the vulnerable who always suffer disproportionately in natural disasters.

Moreover, supporters of this language felt that adherence to a lowest cost path is necessary for decision makers to maintain credibility and prudence in their actions, especially given the magnitude of investment that will be needed to achieve Maine's climate and energy requirements. Ultimately, these participants felt that the inclusion of lowest cost could enable action on a rational, credible, and effective basis to mitigate the climate crisis.

LOWEST REASONABLE COST

Stakeholders preferring *at lowest reasonable cost* as an addition to the first key question felt that good decisions must consider all costs and benefits including those that may be difficult to quantify.[6] Moreover, supporters of this language recognized three kinds of costs and benefits:

- Those that can be quantified and are internal to the system being analyzed
- Those that can be quantified and are external to the system being analyzed

[6] Some stakeholders noted that other states, such as Washington, use "lowest reasonable cost" for energy system planning. *See* WAC 480-100-238, https://apps.leg.wa.gov/wac/default.aspx?cite=480-100-238.

- Those that are real but are difficult or even impossible to quantify

These participants felt that understanding these three types of costs and benefits amidst energy production, sale, distribution, and regulation is exceedingly complex. This complexity could lead decision makers to pick and choose costs and benefits that can be easily quantified or that serve specific interests. Therefore, the addition of the word reasonable implies that good judgment is a necessary component of assessing costs and benefits.

Ultimately, stakeholders preferring the inclusion of lowest reasonable cost wanted to be clear that 1) energy matters are complex, and 2) that complexity must be fully considered to enable holistic decision-making.

Ground Rules

In the first two meetings, the group developed and agreed to a set of ground rules that were intended to support productive discussions of the key questions above and enable the participation of all key stakeholders.

These included rules to uphold respect for all stakeholder perspectives, focus on what was learned rather than what was said, be honest with concerns, and to openly share meeting materials and resources with all participants.

In addition, the group adopted two ground rules that are specific to Maine:

- The first was an agreement that this group was not seeking to make a determination about whether utilities should be investor- or consumer-owned. This speaks specifically to that fact that there is an ongoing effort in Maine to transition the state's investor-owned distribution utilities to a consumer-owned business model, and that members of the group may have differing viewpoints on this issue.
- The second was an agreement that the group was not seeking to determine new jurisdictional boundaries between the utilities and Efficiency Maine Trust, but was seeking opportunities for public-private collaboration. Efficiency Maine Trust independently administers customer-facing energy programs in Maine, including energy efficiency and electrification offerings.

Guiding Principles

The principles below were developed to provide high-level guidance to the group's work together and may be useful as group members work to implement the recommendations. These are numbered for reference purposes only; the numbers do not reflect a ranking or prioritization.

1. Foster a culture of trust, honesty, and collaboration amongst stakeholders, both now and into the future.
2. Utilize a systems approach, considering desired outcomes and how multiple different technologies and solutions might collectively contribute to or hinder those outcomes. Maintain the ability to adapt to changes in the future.
3. Develop metrics of success where applicable, to track progress and enable transparency and evaluation.

4. Identify areas of consensus that can allow many parties to act in alignment towards the same end goal.
5. Make decisions based on information and analysis that all parties find credible and transparent.
6. Develop solutions that are tailored to the unique physical, economic, social, and political characteristics of Maine's energy system.
7. Do no harm to meeting Maine's climate and other environmental goals, and consider other state climate and energy planning efforts.
8. Identify the root causes of issues and understand the ramifications of solutions.
9. Use this experience together to make progress on climate in the short term.
10. Ensure that equity and justice considerations are actively present in each of these discussions to help low-income, rural, and environmental justice communities receive benefits of the transition and alleviate or eliminate burdens and costs.

Meetings

GPI and TNC convened stakeholders for nine meetings from September 2020 to March 2021. All meetings were a half day in length and held virtually because of the COVID-19 pandemic. A brief list of the topics covered at each meeting is provided below. Notes and presentation slides from the meetings are also included as an attachment to this summary.

Notably, the group had a strong preference for using the meetings to foster discussion amongst the participants, many of whom are established energy system experts in Maine and beyond, rather than bringing in outside experts for presentations.

MEETING 1 (September 18, 2020): Kickoff

- Built a shared understanding of why this process was being convened and what various stakeholders would like to see come out of it.
- Began developing ground rules, guiding principles, and key questions to help govern the conversation.
- Built a shared understanding of the Maine Climate Council's Energy Working Group recommendations.
- Reviewed and gathered feedback to an initial list of topics to be discussed at future meetings.

MEETING 2 (October 2, 2020): Current State

- Reviewed and refined the key questions, ground rules, and guiding principles.
- Collected observations from the group about what has happened and is happening in Maine that is relevant to grid planning and modernization.

MEETING 3 (October 16, 2020): Siting Renewables

- Developed desired outcomes for grid planning and modernization (described later in this report).

- Short presentations from group members on issues related to siting renewables and storage where they can bring the greatest benefit to the grid.
- Developed an initial list of possible solutions for siting renewables and storage where they can bring the greatest benefit to the grid.

MEETING 4 (November 6, 2020): Aligning Load to Renewable Generation

- Revised ground rules, guiding principles, and grid planning and modernization desired outcomes as needed.
- Short presentations from group members on issues related to aligning load to renewable generation through load flexibility, rate design, distributed energy resources (DERs), and ISO-New England (ISO-NE) market changes.
- Developed an initial list of possible solutions for aligning load to renewable generation through load flexibility, rate design, DERs, and ISO-NE market changes.

MEETING 5 (November 20, 2020): Grid Planning I

- Short presentations from group members on issues related to grid planning, including the following topics:
    - Distribution system planning
    - Resource planning
    - Transmission planning
    - Planning considerations for ISO-NE
- Developed an initial list of possible solutions for improving grid planning in Maine.

MEETING 6 (December 4, 2020): Review of Possible Solutions

- Reviewed and discussed the results of a survey sent to collect feedback on the solutions discussed in previous meetings.
- Discussed gaps amongst the solutions.
- Formed subgroups and solicited participation from members.

MEETING 7 (January 15, 2021): Grid Planning II and Subgroups Check-in

- Presentation from Joshua Ryor, Director of Utility Programs and Initiatives at the Connecticut Public Utilities Regulatory Authority, about grid planning initiatives in Connecticut.
- Discussed what a holistic grid planning process might look like in Maine.
- Checked in on subgroup progress, including reviewing draft recommendations.

MEETING 8 (February 5, 2021): Review of Draft Recommendations

- Reviewed, discussed, and revised recommendations that had been developed by the subgroups.

MEETING 9 (March 5, 2021): Review of Final Report

- Reviewed and revised the final process summary (this document).

Subgroups

During the sixth meeting, GPI and TNC formed the following four subgroups that were tasked with developing draft recommendations to be brought back to the larger group for consideration and refinement:

- Interconnection, cost allocation, and information transparency
- Pricing, rate design, and aggregation
- Grid planning
- ISO-NE market changes

The subgroups were open for anybody from the larger group to join, and in addition, had the option to recruit outside expertise to inform their thinking. Each subgroup met multiple times in between the large group meetings listed above to develop draft recommendations.

The subgroups were asked to adhere to the following criteria in developing recommendations:

- Respond to the three key questions.
- Fulfill the guiding principles as much as possible.
- Develop recommendations that have a high likelihood of earning consensus amongst the larger group.
- Be as specific with recommendations as time and consensus will allow.

III. Outcomes

Grid Planning and Modernization Desired Outcomes

At the beginning of the process, facilitators asked the participants to clarify their desired outcomes for this effort. The resulting outcomes, listed below, are split into three categories: the ultimate desired outcome, which all other outcomes are intended to complement; the desired outcomes for stakeholders as a result of this work; and finally, the desired outcomes for the electric grid itself.

While these outcomes were developed for this specific process, they may also be useful to broader grid planning and modernization efforts in Maine, since they were collaboratively developed by many of Maine's energy system stakeholders and key actors.

1. **Ultimate desired outcome**

   The group's ultimate desired outcome is to plan, build, and operate the electric grid that is needed to meet Maine's climate and energy requirements,[7] while maintaining a safe, reliable, resilient, secure, and affordable grid.

   As noted above in this report, there was disagreement amongst the group about whether this should be at "lowest cost" or "lowest reasonable cost." Ultimately the group decided to move forward without making a consensus determination on this point.

2. **Desired stakeholder outcomes**

   These outcomes describe what the stakeholders involved in and affected by grid planning and modernization in Maine should seek to build together, in service to the ultimate desired outcome:

   a. Understanding and clarity around a set of common goals for what the state needs in terms of grid infrastructure;

   b. Broad stakeholder and public engagement;

   c. Coordination on planning and implementation across many entities, both public and private; and

   d. Identification of utility business model, regulatory, and market changes that can most effectively accomplish these outcomes.

3. **Desired grid outcomes**

   These outcomes define what the participants would like to see with regard to how the grid is planned, built, maintained, and operated, in service to the ultimate desired outcome:

   a. The grid is being planned, built, and operated (including non-wires alternatives) to efficiently accomplish the following:

[7] These include requirements to reduce statewide greenhouse gas emissions 45 percent below 1990 levels by 2030 and 80 percent by 2050, as well as to increase renewable resources to account for 80 percent of electric sales by 2030 and 100 percent by 2050.

i. Accommodate increasing deployment of electrified transportation and buildings, distributed generation, DERs, load flexibility, and renewable electricity supply resources, including grid-scale wind and solar;

ii. Support regional electricity market integration;

iii. Harness innovation and emerging technologies;

iv. Address both utility and consumer needs related to greenhouse gas emissions requirements, equity and environmental justice,[8] safety, reliability, resiliency, and other quantifiable benefits; and

v. Determine how best for the Maine PUC to consider climate benefits and requirements in its decision-making, in addition to costs and reliability.

b. Load is being aligned to renewable generation through the following:

i. Load flexibility and storage;

ii. Rate design;

iii. DER integration;

iv. ISO-NE market changes; and

v. Retail market changes to incentivize demand participation.

c. Renewables and storage, both distributed and grid-scale, are being sited where they can bring the greatest benefit to the grid through the following:

i. More granular data sharing to enable beneficial siting and greater market access and participation;

ii. Streamlined interconnection;

iii. Coordinated grid and generation expansion to be cost-effective;

iv. Integration to enable visibility and management; and

v. Minimizing adverse impacts on Maine's natural resources.

d. Safe, reliable, and resilient power delivery is being maintained by the following:

i. Adapting to current and future impacts of climate change (severe weather, sea level rise, storm surge);

---

[8] "Environmental Justice," United States Environmental Protection Agency, accessed February 4, 2021, https://www.epa.gov/environmentaljustice.

On its Environmental Justice webpage, the United States Environmental Protection Agency defines environmental justice as follows: "Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys: the same degree of protections from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, lean, and work."

ii. Enabling grid modernization for the purpose of managing two-way power flows for DERs;

iii. Fostering visibility and control for real-time grid operations that allows greater deployment and more renewable penetration for grid stability; and

iv. Maintaining enhanced cybersecurity and real-time operational control in a far more decentralized electric grid.

Recommendations

The following recommendations are the group's collective response to the key question of what is needed in terms of electric grid planning and modernization, both short and long term, to achieve Maine's climate and energy requirements. Many of the recommendations also speak to the other key questions of what should be expected of Maine's utilities and the PUC.

Through subgroup and large group conversations, stakeholders collaboratively developed, reviewed, and refined these in consideration of the grid planning and modernization desired outcomes. These recommendations are intended to be taken as a package, such that all members supported the full set of recommendations, but may not have supported an individual recommendation on its own.

While the group did not rank or prioritize the recommendations (they are numbered for reference purposes only), it did identify the advancement of a holistic grid planning process as an overarching recommendation that is crucial and supportive of all other recommendations. In addition, participants identified the following themes that are important to all recommendations:

- Moving forward with these recommendations will require a more extensive and more granular body of information about the grid, at all voltage levels, and also greater transparency and more timely availability of such information. This includes determining what data would be most useful, investing in systems to generate that data in a high-quality way, doing intelligent things with it, and making that data transparent and accessible, yet secure and respectful of customer privacy and confidentiality.
- Assessing costs and benefits is important when making implementation decisions for all of the recommendations, with an eye toward the ultimate goal of decarbonization.
- All key actors should consider equity and environmental justice in advancing the recommendations. In particular, stakeholders should work to (1) ensure that utility and regulatory reforms do not exacerbate current inequities or environmental justice issues, and (2) foster a more equitable and just energy system in Maine.

#1 A HOLISTIC GRID PLANNING PROCESS

Rationale: The ultimate desired outcome of the stakeholder group is for Maine to plan, build, and operate the electric grid that is needed to meet Maine's climate and energy requirements,[9] while maintaining a safe, reliable, resilient, secure, and affordable grid. Through a series of discussions, it became clear that achieving that outcome would require Maine to adopt and implement a forward-looking, holistic grid planning process with input from stakeholders that allows key actors to more strategically make system operations, planning, and investment decisions.

Moreover, holistic grid planning is vital to informing and enabling many of the other recommendations that the group discussed and should be taken as an overarching recommendation. If done well, a holistic grid planning process should do the following:

- Facilitate progress towards achieving the specified grid planning and modernization desired outcomes.
- Enable wise decision-making among the key actors that actively plan, build, and operate Maine's electric system.
- Inform the establishment and adjustment of expectations, requirements, and incentives for those key actors.
- Identify what is reasonable for utilities to do with respect to grid investments and provide a framework and information that the PUC can use to evaluate whether those investments are in the public interest.
- Inform the balance of cost allocation between utilities (i.e., costs socialized across customers) and project developers for grid modernization investments.
- Enable Maine to take advantage of innovation and new technologies that may emerge in the future by avoiding restrictive path dependencies.

Importantly, participants acknowledged that fully implementing this recommendation will require changes to state statutes, though there may be some actions that can be implemented in the interim without legislation.

Recommendation: Maine should investigate, adopt, and implement an all-encompassing, long-term, strategic grid planning process in coordination with existing proceedings and efforts such as the Maine PUC Grid Modernization effort, the Maine Climate Action Plan, and the Governor's Energy Office Renewable Energy Goals Market Assessment.

Below, we have described the group's grid planning recommendation in more detail. The alphanumeric format is for reference purposes only; it does not indicate a ranking or priority unless otherwise stated.

[9] These include requirements to reduce statewide greenhouse gas emissions 45 percent below 1990 levels by 2030 and 80 percent by 2050, as well as to increase renewable resources to account for 80 percent of electric sales by 2030 and 100 percent by 2050.

1. **What should be considered and included in the planning process?**

   The group envisioned a process that is holistic, considering all levels of the electric system and the key actors at each level, including the following:[10]

   a. Where the electric energy will come from, including generation from supply-side resources, distribution-connected resources, and behind-the-meter resources;

   b. How the electric energy will be moved, including transmission and distribution infrastructure;

   c. How much electricity will be used, where the usage will occur, and for what purposes. This should include forecasting for electrification of transportation and heating;[11]

   d. To what extent load flexibility—via changes enabled by intelligent rate design, autonomous customer-owned devices, active management of those devices, or other means—will contribute to satisfying grid reliability and balancing, affordability, and security needs, resulting in deferred or avoided infrastructure investments;

   e. What considerations and future utility capabilities will be necessary to plan and operate a safe, reliable, secure electric grid that enables and integrates high levels of DERs in front of and behind the meter, including electric vehicles, heat pumps, energy storage, and intermittent renewable generation;

   f. How planning, operational, and investment decisions will impact the following: the grid over the planning horizon, in terms of operations, reliability, and resilience; costs and cost allocation; and achievement of Maine's broad climate, economic, energy, environmental, and equity objectives;

   g. How interconnection should be handled, including transparency of and access to interconnection information, incentivizing project development in specific locations, identifying areas that will need additional hosting capacity, assessing how to value projects that have system benefits, evaluating resilience benefits, and identifying how to prioritize projects in the interconnection queue;

   h. The role of the utilities in grid planning, investment, and operations, including assessing whether the utility business model and related incentives/disincentives

[10] Many of the grid planning components described herein are consistent with integrated resource planning (IRP) and integrated distribution planning (IDP) processes. While separate IRP and IDP processes may be a good starting point, the group ultimately envisioned a more holistic and fully integrated planning process—something that many states with existing IRP and IDP processes are actively working towards.

[11] Notably, the utilities already conduct load forecasts as part of their rate cases, and ISO-New England provides 10-year projections in the Capacity, Energy, Loads, and Transmission Report. These should be updated as needed, and other forecasts and models may be necessary for effective short- and long-term planning in Maine. Additionally, the Maine Climate Council process resulted in forecasted electrification demand for both the transportation and buildings sector.

are aligned to implementing the electric grid that is needed to meet Maine's climate and energy requirements;

i. How to conduct grid planning with an eye towards phasing out fossil fuels in Maine, which will be necessary to meet our climate goals;

j. How the investments necessary to build the grid of the future should be allocated among the utility rate base, project developers, and others;[12] and

k. The implications of actions taken or planned by other states and provinces in the region.

2. What should the process look like?

While the exact details of the planning process will need to be further developed, the group provided the following recommendations to structure the process at a high level:

a. **Start with the goals:** Stakeholders broadly felt that any grid planning process, regardless of who leads it and what it specifically looks like, should start by establishing its desired goals. The group's grid planning and modernization desired outcomes, listed in this document, may be a good starting point for establishing those goals since they were developed and agreed to by a large contingent of Maine's energy system stakeholders. In addition, some participants suggested integrating existing legislative and regulatory goals, including those pertaining to the Maine Climate Council.

b. **Understand the current state:** many participants felt that, after establishing the goals, any successful grid planning process should start by understanding how Maine's utilities currently conduct forecasting and planning, and assessing where there are gaps between the existing planning efforts and the desired goals.

c. **Rely upon the PUC's existing authority where possible:** while the group acknowledged that legislation is ultimately needed to implement this recommendation, participants discussed that even without legislation, the Maine PUC could help to move this forward in the interim, including by establishing grid planning expectations, requirements, and incentives.

d. **Advance related recommendations in parallel:** The group discussed at length how a grid planning process could and should inform many of the group's other recommendations, including rate design, interconnection processes, and hosting capacity transparency. For example, the grid planning process may indicate that project development and interconnections should be incentivized for specific grid services at specific locations on the system. While conducting a planning process before making significant changes to critical elements such as the interconnection process would be ideal, stakeholders ultimately decided that

[12] This could include criteria to guide cost allocation, taking into account whole system benefits and costs, as well as externalities to the system and considerations that may be difficult to quantify, such as environmental justice.

given the time constraint to achieve Maine's emissions reduction targets and energy requirements, related recommendations should move forward in parallel.

e. **Establish the planning frequency and planning horizon:** There was general consensus that a successful planning process should take place on a recurring schedule, such as every few years, with one or more set planning horizons, such as 5 and 15 years out from the year in which each planning process takes place. Importantly, each subsequent reiteration of the plan may not require the same level of investment if only a slight recalibration is needed.

f. **Consider the process as well as the plan:** Some participants remarked that having the perfect plan is less important than having a comprehensive planning process that productively engages key stakeholders. The planning process should include broad stakeholder engagement, common access to underlying data and projections, and the opportunity for input from all interested parties. In addition, it may be helpful to consult with other jurisdictions that have experience implementing similar processes.

g. **Make the resulting plan actionable:** participants felt that for any resulting plan to be useful, it should be specific and executable by the utilities, which also requires that it can be used as a framework for decision-making by the PUC.[13]

h. **Act with urgency:** Given the significant effort and time it takes for a planning process to lead to desired outcomes, Maine needs to move very quickly. One key consideration for this urgency is that electrification of buildings and transportation will eventually require changes to how the electric system is built, operated, or both. At the current rate of electrification, those changes may not need to be fully implemented until 2030, but given the long timeline needed to plan and implement infrastructure investments, planning needs to begin soon. Importantly, load flexibility may be more cost-effective than infrastructure upgrades to address grid impacts from increasing electrification, but even it will require several years to ramp up.

3. Who should lead Maine's grid planning process(es)?

The group discussed at length the many options for who should lead a grid planning process in Maine and why, including consideration of utilities, government agencies, and establishing a new third-party entity to lead planning. Ultimately, participants could not reach consensus on this question, but agreed on the following: (1) the utilities play a critical role but should not lead the planning process given the long-term planning horizon and desire to holistically integrate generation and DERs; and (2) regardless of

[13] For instance, in Connecticut and New York, the utilities submit a two-year rolling distribution system implementation plan (grid modernization roadmap), which highlights the projects, investments, and capabilities (systems, process and workforce training) needed for integrated system planning and real-time operations, and addresses customer expectations through customer experience roadmaps. These roadmaps are then submitted for approval by the Commission in a utilities rate case to secure the needed funding to implement, including CapEx, O&M, and staffing.

who leads the planning process, both legislation and funding may be needed to enable it.

Below, we have listed the different planning leadership constructs that were discussed. In all cases, there was a desire for the planning process to be insulated from shifts in political power and to take as unbiased an approach as possible. In addition, there was consensus that regardless of who leads it, the process will need to support and inform PUC decision-making. The process should also coordinate with and build on the existing work of key stakeholders, such as the non-wires alternatives coordinator.

a. **Public Utilities Commission:** There was general support for the PUC to lead the grid planning process because it is uniquely positioned—as a quasi-independent, public-purpose entity—to organize and deliver the long-term, holistic perspective that would be required for successful grid planning. The group acknowledged that this would be a broadening of the PUC's function and would require additional resources, which could include establishing a new grid planning division within the PUC. Independent of whether it leads the planning process, the PUC could do the following (these are also captured under recommendations 8 and 9, respectively):

    i. Provide assurance to the transmission and distribution utilities that program innovations, including pilot programs and investments in physical infrastructure consistent with the long-term grid plan, would be approved if well-conceived and found to be prudent and in the public interest;

    ii. Be given authority to formally consider long-term goals and objectives such as the state's climate and energy requirements. It would be helpful to the PUC for any legislative direction in this area to include an indication of how various objectives should be weighted relative to one another to the extent they conflict.

b. **PUC and utilities:** as a modification to a process led solely by the PUC, the group considered a construct where the PUC would lead an overarching long-term planning process, underneath which the utilities would conduct short-term planning as they do today.

c. **Governor's Energy Office:** Some participants proposed that the Governor's Energy Office could advance a grid planning process by making it a priority and committing the resources of various state agencies to implement it. Importantly, one of the Maine Climate Council's recommendations in its December 2020 report was to "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."[14] Moreover, the

[14] Maine Climate Council, *Maine Won't Wait: A Four-Year Plan for Climate Action* (December 2020), 60, https://climatecouncil.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf.

recommendation stated that "the process will be managed by the Governor's Energy Office in coordination with the Maine Public Utilities Commission."[15]

d. **New independent entity***:* some participants suggested that a new, independent public or private entity should be established to lead grid planning in Maine.

4. **The importance of good data and modeling to support grid planning:**

   Stakeholders felt strongly that high-quality, accessible data and modeling is vital to support effective grid planning in Maine. This includes the following sub-recommendations:

   a. High-quality data should be a priority not only for planning purposes, but also as a precursor to many of the group's recommendations.

   b. The planning process should endeavor to identify what data is needed to support robust planning and what investments in technology, modeling, or staffing are needed to make that data available.

   c. Data collection and modeling should be an important component of understanding the current state as described above. The non-wires alternatives coordinator process may be a useful source for understanding what data is already available or being generated.

#2 BUILDING ON THE NESCOE VISION STATEMENT

Rationale: The New England States' *Vision for a Clean Affordable, and Reliable 21st Century Regional Electric Grid* dated October 16, 2020, expressed through the New England States Committee on Electricity (NESCOE), promises significant and appropriate changes to better honor the social license under which ISO-NE operates. The New England States plan a series of technical conferences to better engage electricity market participants, affected stakeholders, and interested members of the public regarding this *Vision* and the path to achieve it. MURRDI comprises a broad array of energy experts in Maine, so it is well-positioned to offer recommendations concerning that path.

Recommendation: Endorse[16] the *New England States' Vision for a Clean Affordable, and Reliable 21st Century Regional Electric Grid* dated October 16, 2020, and its specific recommendations regarding wholesale market design, transmission system planning, and governance.

Additionally, this *Vision* should be extended regarding DERs and demand participation, comprehensive integrated system planning, and state policy objectives.

---

[15] Maine Climate Council (December 2020), 61.

[16] The group generally endorses the principles in the NESCOE Vision Statement and will continue to follow the process to determine the extent to which they can support specific recommendations that would flow from it.

Further, the group offers several more specific recommendations below, consistent with the structure of the *Vision*. The alphanumeric format is for reference purposes only; it does not indicate a ranking or priority unless otherwise stated.

1. **Market Reforms:** ISO-NE's market design needs to explicitly and proactively better incorporate demand-side participation going forward, and must enable the market access, aggregation, and data transparency necessary to do so effectively. Among other changes, this will require allowing ISO-NE greater visibility into the availability and status of distributed energy resources (DERs) and allowing DER operators greater visibility and access into real-time ISO-NE markets. (Note: In "allowing ISO-NE greater visibility," the group is explicitly not recommending metering for passive energy efficiency or other onerous conditions on DER participation in ISO-NE markets.)

   Other, more specific, recommendations include:

   a. Tariff changes to comply with Federal Energy Regulatory Commission (FERC) Orders 841 and 2222, and

   b. Consideration of new market design(s).

2. **System Planning Reforms:** Transmission system planning should not involve only private interests; states must conduct or have suitable access to comprehensive integrated system planning from generation to behind the meter. ISO-NE's governance and practices should accommodate, facilitate where practical, and readily interface with states' integrated grid planning efforts and decarbonization initiatives.

   Other, more specific, recommendations include:

   a. Revise system planning to include greater consideration—at the grid- and distributed-resource scales—of state policy objectives, appropriate principles of resource adequacy for modern power systems, transformational industry changes (e.g., incorporation of DERs as a resource, technology developments, etc.), load flexibility opportunities, potential interregional collaboration, and longer-range planning horizons. In doing so, explicitly recognize and enable multiple values to be realized. This may require developing a mechanism for choosing among competing objectives and values.

   b. Expanded transmission planning (e.g., to include grid planning for the onshoring and transmission of offshore wind; to begin intraregional and interregional planning for offshore wind transmission, etc.).

   c. Reform of current cost-sharing practice to allow for multi-value projects (i.e., projects that serve reliability, decarbonization and renewable public policy, or market efficiency; non-wires alternative projects, etc.).

   d. ISO-NE's forward capacity market was designed at a different time when New England faced different challenges. We need to evaluate how ISO-NE's market design can be improved—or replaced if necessary—in order to achieve state policy objectives while ensuring reliability and affordability.

3. **Governance Reforms:** Through improved governance, ISO-NE will operate as a vehicle to assist and complement its states in meeting their policy objectives. ISO-NE and the states will also work together to revise outdated definitions of reliability and resource adequacy, and to implement practices whereby reliability decision-making is separate from the financial benefits of those decisions. In addition, the stakeholder group would like to see ISO-NE better consider the costs and benefits associated with reliability improvements.

   Other, more specific, recommendations include:

   a. Changes to ISO-NE's mission and tariffs, if necessary, to ensure that state policies (which may include decarbonization, cost-effective regulation, and/or equity/environmental justice) are accommodated in, and not inhibited by, wholesale markets and transmission planning;

   b. Changes to ISO-NE's board to reflect broader perspectives, including clean/renewable energy, climate change, residential consumer, and equity perspectives;

   c. States should have greater say in and influence in ISO-NE, such as participation in a state review process before submittal to FERC, because state regulators and policy makers charged with decarbonization and clean energy mandates are much closer to state laws and regulations and more accountable to customers'/citizens' needs and expectations;[17] and

   d. Greater representation by consumer advocates and greater consideration of consumer interests.

#3 LOAD FLEXIBILITY ENABLED BY DYNAMIC RATE DESIGNS

Rationale: Operating the electric grid to meet Maine's climate and energy requirements while maintaining safe, reliable, and affordable service will require flexible loads that can be aligned with renewable energy generation and managed to reduce demand peaks. Load flexibility can be achieved through consumer behavior changes enabled by intelligent and dynamic rate design, autonomous customer-owned devices, and/or active management of those devices. The full capabilities of these technologies are enabled by grid modernization such advanced metering infrastructure (AMI), operator visibility, and grid automation.

The group believes that load flexibility can substantially reduce the extent and cost of the infrastructure upgrades that would otherwise be required for beneficial electrification; for example, by smoothing out demand peaks throughout the day.

[17] In addition, while ISO-NE, NEPOOL and the Market Monitor are able to refer improper market behavior to FERC, reforms are needed that would allow ISO-NE to sanction or address other improper or illegal non-market actions that could influence the ISO.

The group noted that end-use technology advancements are increasingly making load flexibility a viable option for grid operations. As customer devices become more responsive, they can be linked to three key elements that should drive how load flexibility is deployed:

1. The price of electricity production and delivery
2. Grid constraints, such as temporal and locational congestion
3. Grid modernization to enable load flexibility

Recommendation: Maine should move toward a more dynamic grid with more granular load flexibility capabilities in a concerted manner. As a first step, the Maine PUC should immediately look more closely at time of use rates and/or other dynamic rate structures that more accurately reflect the cost of producing and delivering power. It should also take into account how time-varying rate designs could help to meet the state's climate and energy requirements.

Below, we have outlined a set of specific considerations to support this recommendation. The alphanumeric format is for reference purposes only; it does not indicate a ranking or priority unless otherwise stated.

1. **Time-varying rate design considerations:**
    a. The pricing for time-varying rates should include energy, capacity, transmission, and distribution costs; otherwise, the price differential is unlikely to be large enough to make time-varying rate designs worthwhile.
    b. The time periods for time-varying rate designs should take both cost and emissions into account (i.e., shifting load off-peak could be counterproductive if the electricity supplying the grid off-peak has higher emissions than the electricity supplying the grid on-peak). To support this, ISO-NE should explore more transparent reporting of marginal emission factors for carbon, nitrogen oxides, and sulfur oxides (this also applies to distribution locational marginal prices, which are part of recommendation 4).
    c. Time-varying rates can and should be designed carefully to bring about benefits to all customers, and must be paired with protections for low-income customers. Importantly, time-varying rates have been shown to save low-income ratepayers money.
    d. Time-varying rate designs need to be paired with complementary customer-side technologies to be most effective. The PUC should consider ways in which the utilities and Efficiency Maine can work more closely to deploy those technologies and ensure they're used effectively, including but not limited to expansion of grid flexibility pilots already managed by Efficiency Maine to test these technologies.
2. **Timing and process considerations:**
    a. Maine's utilities, the PUC, and stakeholders should consider which customer segments will elicit the greatest benefits in response to the costs of developing time-varying rate designs in the near term, as well as whether there are existing rate designs (e.g., Central Maine Power's time-varying Rate A-LM for customers

with thermal energy storage devices) that can be improved upon to begin making progress.

b. In cases where better data is needed to inform decision-making, the utilities, the PUC, and stakeholders should consider pilots that can generate that data.

c. It may be most effective to develop a general time-varying rate, with additional specific rate designs for particular customer segments as needed.

d. Developing time-varying rate designs can be a complex and time-consuming regulatory endeavor, yet doing so is necessary to enable the more granular load flexibility capabilities that will be needed in the future. Moreover, to make those capabilities available when they're needed, the process must begin in earnest now.

3. Specific actions for consideration:

a. Implement time-varying rates for electric vehicle (EV) home charging, which can immediately bring benefits to customers and the grid. In addition, consider the following:

   i. Ways to use innovative technologies to reduce or eliminate the cost of sub-metering, such as through Wi-Fi-connected Level 2 chargers, while maintaining acceptable data quality for customer billing

   ii. Ways to make the benefits of EV time-varying rates more accessible to low-income customers, such as subsidizing or reducing the cost of extending wiring and Wi-Fi service to the charger.

b. Encourage the PUC to require the standard offer service to reflect the hourly differentiated energy and capacity costs, which would align the energy side with the transmission and distribution side, reflecting the observation above that energy must be included to make time-varying rates fully worthwhile. In addition, consider the following:

   i. If the PUC were to only suggest to the suppliers that they could offer this, they likely wouldn't, so it would need to be required, which is arguably within the PUC's authority.

   ii. Alternatively, if this is suggested but not required, the PUC would need to create some assurances for suppliers that there will be uptake to make the product worthwhile.

   iii. Data transparency, and the systems necessary to support data transparency, are vital to enable this. Those systems include AMI and provision of hourly interval data to standard offer bidders.

#4 EXPLORING A DISTRIBUTION SYSTEM MARKET FRAMEWORK

Rationale: In order to operate a decarbonized electric grid in Maine, load will need to be flexibly aligned to renewable generation. One way to achieve this alignment would be to establish a market at the distribution level of Maine's electric system, with transparent and granular price signals that enable DERs to provide all load flexibility capabilities that they can provide. This would allow Maine to move toward a more dynamic electric grid that acknowledges and values flexible loads in real time, ultimately enabling more effective grid balancing and limiting the need for costly infrastructure upgrades.

One way to implement this would be through distribution-level locational marginal prices (LMP's). At the wholesale level of the electric grid, LMP's provide location- and time-based price signals to indicate grid needs in real time and allow suppliers to fulfill those needs through a market. LMP's at the distribution level could function similarly, indicating where and how DERs can provide value to the grid and receive compensation for that value.

Moreover, a market framework at the distribution level could allow a utility, third-party distribution system operator, or other entity or technology to manage the efficient utilization of DERs through optimization algorithms that are based on minimum system costs and the availability of load flexibility resources. Management of DERs in this way could be coordinated with ISO-NE and other distribution systems.

Importantly, participants acknowledged that establishing a market at the distribution level is a long-term goal and would require significant additional consideration, yet felt that calling attention to the possibility now was important to eventually move toward a more dynamic grid in Maine.

Recommendation: Maine's distribution utilities, the PUC, and other stakeholders should explore the opportunities, challenges, benefits, and drawbacks of establishing a market framework at the distribution level, including through pilot projects, as an initial step towards an electric system in Maine that allows DERs to provide all load flexibility capabilities that they can provide.

#5 EV FAST CHARGER DEPLOYMENT

Rationale: Strategically deploying EV DC and clustered Level 2 fast charging infrastructure can help to accelerate the transportation electrification that is needed to meet Maine's climate and energy requirements, since availability of charging infrastructure is a key consideration for potential new adopters of EVs.

The group initially considered this as a rate design recommendation because demand charges often make EV fast chargers uneconomical without high usage. However, it became clear over the course of several discussions that this issue is different from other rate design issues because the goal is to temporarily encourage fast charger deployment in the near term and because there may be approaches other than rate design to accomplish this.

Recommendation: Identify and implement temporary measures to advance new EV fast charger (including DC fast charging and clustered Level 2 charging) deployment in the near term, as Maine makes a shift in both peoples' driving habits and their purchase of EVs. Importantly, this should be done soon to be as effective as possible. These measures could include the following:

1. Temporary mitigation of demand charges for fast chargers, such as a rebate that's phased out over a specific time period.
2. Consider establishing incentives for fast charger deployment, including consideration of underserved areas.
3. Identify areas on the distribution system with excess capacity that could be good locations for fast chargers to operate with low demand charges (e.g., at a former industrial facility, at a substation, etc.) and temporarily incentivize deployment and/or usage at those locations, such as by enabling reduced charging prices.
4. Investigate utility make-ready programs that can reduce the upfront costs of deploying new DC fast charging stations.
5. Implement appropriate load flexibility to reduce grid impacts.

#6 INTERCONNECTION DATA SHARING

Rationale: One of the group's grid planning and modernization desired outcomes is to site renewables and storage where they can bring the greatest benefit to the grid through more granular data sharing and streamlined interconnection.

The current interconnection process used by Maine's utilities is generally ordered on a first-come, first-served basis, regardless of project size or necessary processing time. In addition, developers' understanding of distribution system hosting capacity is opaque and can only be determined in response to submitting an interconnection request—an action that is costly and can be avoided through utilities sharing more granular interconnection data with developers upfront as demonstrated widely by utilities in other jurisdictions. Notably, in some cases that more granular data may not exist and will need to be developed, maintained, and shared via new systems.

The goal of this recommendation is to provide information that developers can readily access and use to make the best project development decisions possible, given their own preferences and the state of the grid, ultimately to support increased, expeditious deployment of clean energy resources in Maine. In other words, enabling developers to know where to propose new generation will make the interconnection process better for the grid, more expeditious, lower costs, and more effectively contribute to meeting Maine's climate and energy requirements.

Finally, changes to interconnection processes and data sharing should be informed by a holistic grid planning process (see separate recommendation), but given the urgency to meet Maine's climate and energy requirements, the participants feel that these interconnection changes should be implemented in parallel with a grid planning process.

Recommendation: Utilities, the PUC, and the state should work to provide useful, accessible, transparent, and dynamic hosting capacity information to developers and customers, including enabling greater understanding of the data, tools, and processes required.

Successfully implementing this recommendation will require consideration of the following issues:

1. **Iteration in pursuit of sharing dynamic hosting capacity data**: The group would like to see Maine utilities provide timely, up-to-date hosting capacity information to developers, including hourly load profiles, yet participants recognize that achieving this will require innovation and iteration beyond the current state. Specifically, it will require developing an understanding of the data, and level of granularity, that would be most useful in consideration of a particular utility's system and developer needs. It will also require investing in new technologies, tools, and processes to enable sharing that data. For example, in order to share hourly load profiles, utilities will need to deploy AMI to collect hourly load data, meter data management systems to aggregate that data, and software tools to usefully share that data with developers. Moreover, those investments will need to be able to earn approval by the PUC, which should consider costs and benefits in determining the right level of dynamism and granularity for data sharing (see more on costs below).

   Some stakeholders suggested that as an interim step, utilities could prioritize developing hosting capacity maps for specific locations that have either existing data or a high degree of project interest from developers.

2. **Costs, benefits, and cost recovery:** Stakeholders acknowledged that there is a cost to acquiring the data that is needed for information transparency and putting that data into a format that is useable. Furthermore, utilities will need to recover associated costs that are approved by the PUC. The group believes that these costs should be evaluated against the broad benefits of increased transparency, including more cost-effective deployment of distributed energy resources to help meet Maine's climate and energy goals.

   Importantly, stakeholders discussed the notion that Maine tends to approach cost recovery after the fact, whereas some states enable the possibility of cost recovery upfront, which can make Maine less appealing for innovative investments from a utility perspective. This issue is addressed in the recommendation to create a Maine innovation initiative, but may also be germane to interconnection transparency investments.

#7 FOSTERING INNOVATION

Rationale: Planning, building, and operating an electric system that can meet Maine's emissions reduction targets while maintaining a safe, reliable, resilient, secure, and affordable grid necessitates ongoing innovation, including testing new approaches and sharing lessons learned to increase the wisdom of all key actors. The MURRDI stakeholders have observed that, compared to other states, Maine generally handles utility cost recovery in a way that can disincentivize innovative electric system investments from a utility business model perspective.

In addition, participants feel that Maine lacks a venue for discussing innovation and sharing insights.

To address similar concerns, some states[18] have developed programs or regulatory mechanisms that provide limited assurance of cost recovery for innovative investments that meet established criteria or that seek to generate useful insights to help solve complex problems. An innovation initiative in Maine could unlock utility investment in innovation to help meet the state's climate and energy requirements and provide a venue for sharing insights from innovative approaches being tested in the state, both by utilities and other entities.

Importantly, from a regulatory perspective, this recommendation is not intended to change the fundamental process of allowing cost recovery for prudent investments. Rather, the intent is to provide some upfront assurance to utilities or other actors that there is a high likelihood of cost recovery for certain innovation investments that are prudent, in the public interest, and limited in scope.

Recommendation: The Maine PUC, utilities, and stakeholders should explore opportunities to (1) enable using ratepayer dollars to pay for innovation investments in return for PUC oversight, and (2) create a forum for sharing innovative approaches being tested in the state and elsewhere, both by utilities and other entities, ultimately in service to meeting the state's emissions reduction targets.

The following issues should be considered when implementing this recommendation:

1. For this to be successful, there will need to be a clear definition of what is allowed or required in terms of collaboration, funding, and reporting.
2. Government agencies and NGO's, including the Governor's Energy Office and Efficiency Maine, have been working on innovation outside of rate based funding—these organizations remain important as collaborators and to push utilities to make competitive offerings.
3. To the extent utilities or other actors can recover costs for work on or investments in innovation, they should be required to prove their work in a transparent manner.
4. It may be beneficial for utilities to have an office of innovation, the costs of which are limited and built into their rate base, and for which there's an annual or periodic reporting process of what they have done.
5. Pilots might be a mechanism for proactive longer-term cost recovery. The state could establish a budget for innovation and/or a set of goals that have to be met to gain cost recovery.
6. If a formal process or venue for discussing innovation is established, it should seek to answer the following questions, among other things:

[18] Examples include New York's Reforming the Energy Vision, Hawaii's Clean Energy Innovation Plan, Vermont's Energy Innovation Program, and Utah's innovative utility programs statute, among others.

a. What innovative actions or approaches are the utilities undertaking, both within Maine and through related utilities in other jurisdictions?

b. What innovative actions or approaches are government agencies and NGO's undertaking?

c. What do Maine's stakeholders want to see?

d. Where are there funding, regulatory, or utility business model barriers to innovation, and how might they be addressed?

#8 TRANSMISSION DEVELOPMENT IN NORTHERN MAINE

Rationale: Northern Maine has tremendous potential for development of renewable energy, yet there's no way to get that energy into the load centers of New England now. This is a barrier to project development and should be addressed as cost-effectively as possible for Maine ratepayers.

Recommendation(s): The group supports development of transmission that is carefully sited to avoid and minimize environmental impacts, either as generation lead lines or as interconnection of the northern Maine region, to be examined and resolved at the Commission. In addition, this may inform or be informed by a holistic long-term grid planning process (Recommendation #1). As part of this recommendation, the following sub-recommendations should be considered:

1. **Decouple consideration of transmission to northern Maine's renewable energy resources from a discussion of interconnecting the Northern Maine Independent System Administrator (NMISA) to ISO-NE.**

   There is concern from some in northern Maine about being interconnected with the ISO-NE grid despite the reliability benefits due to the likely need to eventually pay the ISO-NE transmission and capacity charges. A generator lead line to renewable energy projects that does not interconnect with NMISA does not implicate these issues. Transmission-scale generation lead lines are subject to federal open access principles and potential FERC-granted exceptions that are time limited, so eventually they would be potentially available for broader open access.

   While transmission lead lines may or may not achieve immediate interconnection of the northern Maine grid to ISO-NE, considering generation lead lines allows for two separate discussions and determinations:

   a. A determination on public interest in sustainably developing northern Maine's renewable energy resources, providing jobs, economic and energy benefits; and

   b. Consideration of full interconnection of northern Maine to ISO-NE in separate public interest processes.

   Decoupling development of northern Maine's renewable resources, job creation, and economic benefits from the question of whether to fully interconnect NMISA to ISO-NE is legally and technically wise as a matter of process and discussion as they are two related but separate sets of issues and solutions. For this reason, the group supports

decoupling consideration of transmission to northern Maine's renewable resources from a discussion of interconnecting NMISA to ISO-NE.

2. **The Commission should be charged with providing solutions to develop renewable resources in northern Maine, including through the following:**

    a. Cost-effective financing mechanisms; and

    b. Expeditiously considering public interest proceedings to permit such lines to access Aroostook County's largely untapped renewable resources.

    There is overwhelming public interest that justifies charging the Commission with providing solutions to develop renewable resources in northern Maine as a strategy to meet the state's climate and energy requirements. Transmission can be funded cost-effectively by in-state developers, through RFP processes to engage out-of-state developers, or by traditional mechanisms. Past Commission considerations of both the development of transmission and interconnection of NMISA to ISO-NE have been ineffectual and inconclusive.

3. **Collaborate to advance transparent interconnection processes.**

    ISO-NE has created barriers to transmission development of certain multiple grid-scale transmission proposals in the past—even when fully paid for under long-term state contracts with southern New England states. ISO-NE's use of interconnection technical authority goes beyond any other RTO/ISO and needs to be called out when it occurs.

    Therefore, the Commission should work with other New England state utility commissions and energy interests to advance transparent ISO-NE interconnection processes and to better align ISO-NE with state procurement and policy decisions, including through complaints to FERC (also see Recommendation #2: Building on the NESCOE Vision Statement).

#9 PUC CONSIDERATION OF CLIMATE, EQUITY, AND ENVIRONMENTAL JUSTICE

Rationale: One of the group's desired grid outcomes is that the grid is being planned, built, and operated to address both utility and consumer needs related to greenhouse gas emissions requirements, equity and environmental justice, safety, reliability, resiliency, and other quantifiable benefits. While the PUC currently considers safety, reliability, and resiliency, it is not required to consider climate, equity, and environmental justice in its decision-making. Formal PUC consideration of these issues will help ensure that the grid is planned, built, and operated to address them. The group acknowledges that statutory changes would be needed to accomplish this. In addition, it would be helpful to develop guidance around how to consider climate, equity, and environmental justice; moreover, that guidance should recognize that these issues may require solutions beyond the electricity sector.

Recommendation: Expand the PUC's decision-making framework to consider Maine's climate requirements, equity implications, and impacts on environmental justice communities. This will enable consideration of the full costs and benefits of energy investments in all decisions.

IV. Conclusion

Across the US, many states are actively working to align electric utility systems, which were built to deliver reliable and affordable power, with an economy that is increasingly decarbonized. Subsequently, relatively new technologies such as smart appliances, solar photovoltaic panels, EVs, and battery storage are changing the role of customers on the electric system from passive consumers to active participants that have the ability to consume energy, produce energy, and flex their energy usage in response to price signals. These changes are leading to an evolution of utility systems and rules for managing distributed energy resources.

In Maine, several new laws were enacted in 2019 that address decarbonization and emerging technologies in the electric sector. These laws establish a requirement to reduce statewide greenhouse gas emissions 45 percent below 1990 levels by 2030 and 80 percent by 2050, as well as to increase renewable resources to account for 80 percent of electric sales by 2030 and 100 percent by 2050. However, they do not establish what changes to the electric system will be needed to accomplish this.

The Maine Utility and Regulatory Reform and Decarbonization Initiative (MURRDI) was an effort to develop broad consensus around what is needed, in terms of electric grid planning and modernization, to achieve the recently established climate and energy requirements.

Over the course of nine half-day meetings from September 2020 to March 2021, a broad group of Maine's energy system stakeholders came together to develop the following consensus recommendations to ensure that Maine can plan, build, and operate the electric grid that is needed to meet Maine's climate and energy requirements, while maintaining a safe, reliable, resilient, secure, and affordable grid:

1. Investigate, adopt, and implement an all-encompassing, long-term, strategic grid planning process in coordination with existing proceedings and efforts.
2. Endorse the New England States' *Vision for a Clean Affordable, and Reliable 21st Century Regional Electric Grid* and extend it with regard to distributed energy resources and demand participation, comprehensive integrated system planning, and state policy objectives.
3. Move toward a more dynamic grid with more granular load flexibility capabilities in a concerted manner. As a first step, the Maine PUC should immediately look more closely at time of use rates and/or other dynamic rate structures that more accurately reflect the cost of producing and delivering power, and take into account how time-varying rate designs could help to meet the state's climate and energy requirements.
4. Maine's distribution utilities, the PUC, and other stakeholders should explore the opportunities, challenges, benefits, and drawbacks of establishing a market framework at the distribution level, including through pilot projects. This is an initial step towards an electric system in Maine that allows DERs to provide all load flexibility capabilities that they can provide.

5. Identify and implement temporary measures to advance new EV fast charger (including DC fast charging and clustered Level 2 charging) deployment in the near term, as Maine makes a shift in both peoples' driving habits and their purchase of EVs. Importantly, this should be done soon to be as effective as possible.
6. Utilities, the PUC, and the state should work to provide useful, accessible, transparent, and dynamic hosting capacity information to developers and customers, including enabling greater understanding of the data, tools, and processes required.
7. The PUC, utilities, and stakeholders should explore opportunities to 1) enable using ratepayer dollars to pay for innovation investments in return for PUC oversight, and 2) create a forum for sharing innovative approaches being tested in the state and elsewhere, both by utilities and other entities, ultimately in service to meeting the state's emissions reduction targets.
8. Support development of transmission that is carefully sited to avoid and minimize environmental impacts, either as generation lead-lines or as interconnection of the northern Maine region, to be examined and resolved at the Commission.
9. Expand the PUC's decision-making framework to consider Maine's climate requirements, equity implications, and impacts on environmental justice communities. This will enable consideration of the full costs and benefits of energy investments in all decisions.

While the group did not rank or prioritize the recommendations (they are numbered for reference purposes only), it did identify the advancement of a holistic grid planning process as an overarching recommendation that is crucial and supportive of all other recommendations. In addition, participants identified the following themes that are important to all recommendations:

- Moving forward with these recommendations will require a more extensive and more granular body of information about the grid, at all voltage levels, and also greater transparency and more timely availability of such information.
- Assessing costs and benefits is important when making implementation decisions for all of the recommendations, with an eye toward the ultimate goal of decarbonization.
- All key actors should consider equity and environmental justice in advancing the recommendations.

These recommendations and themes, taken as a package, are important because they have been collaboratively developed and agreed to by a broad set of Maine's electric system stakeholders, including utilities, consumer advocates, environmental advocates, and renewable energy developers.

By implementing these recommendations, Maine has an opportunity to ensure that it can plan, build, and operate the electric grid that will be needed to meet its climate and energy requirements.