To: The Office of Governor Janet Mills  
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Maine’s Need to Enhance a Weak Transmission System Dealing with Modernization and Capacity Insufficiency

**Issue:** Maine’s energy development is restricted and does not allow for the future integration of more renewable energy sources into the grid. The main reason for this is the weak and aging transmission infrastructure in place and the lack of government action to modernize and update the grid system. This is a problem for both our current renewable energy production, but also for further renewable energy additions in the state.

**Background:** ISO-NE has noted that the current transmission infrastructure will need crucial state investments that will prove to be fundamental in meeting the state’s policy directives for renewable energy and to reliably further expand the integration of more renewable projects throughout the state, allowing more clean energy to be produced. At the same time Maine has to be mindful of how these required future incentives will impact consumers rates for electricity. Since, our state has seen a continuous trend of increasing consumers rates for electricity. According to LD 1401 by senator Lawrence and representative Berry, “Maine consumers may pay only about 8% of the total cost of transmission facilities which ISO-NE has determined are required for regional reliability purposes to allow energy from significant power sources to move freely on the major grid (PTF), but it’s important to realize that about 92% of the PTF transmission development Maine has paid for has occurred outside Maine’s borders, offering Maine only intangible regional reliability benefits”.

A testimony from the Maine Renewable Energy Association states clearly that it is widely known that there are already limitations on our existing system which prevent generators north of the Orrington interface from participating in the capacity market. And there are areas that require generators to be curtailed due to transmission limits, which ultimately impacts their ability to deliver their electrons to the market and reduces their project revenues. Above the Orrington interface as shown below is the majority of our states renewable energy generators, and the places where future renewable projects are requested to be built, including future wind farms, solar projects, hydroelectric dams, etc.

Modernizing Maine’s electricity infrastructure is a vital project for our state’s interest and future. Every year that passes without a policy among our legislature to cope with our weak transmission system increases the costs and risks for our future and takes us one step backwards from obtaining our state’s energy goals. Maine has spent $1 billion to build 11 renewable energy
wind projects with most of them not been able to produce what they were supposed to produce due to the weak grid that cannot carry their power through. To add to this phenomenon there have been at least six to seven official proposals for renewable energy projects in the state that were not allowed to invest in Maine due to the lack of transmission lines and transmission capacity. Most of these companies wanted to invest in Northern Maine that is ripe for space to build and develop but also that has an abundance of wind and other natural resources.

If Maine is looking into the future and is planning on keeping its promise of further increasing efforts to reduce Greenhouse Gas emissions by 45% below 1990 levels by 2030 and at least 80% by 2050, we need to act soon and solve this issue of congestion and curtailment that is slowing and restricting our Made-In-Maine clean energy from getting used.

Findings from research:

For this research I employed a variety of resources to be able to understand in depth this very complicated and crucial for the future of our state topic. The research proved to be quite challenging due to the complicated nature of the grid and the way it is operated today. All of the resources (Look Bibliography) had one goal for the future, that of modernizing our electric infrastructure but at the same time keep everything to be reliable and resilient, interoperable and secure, environmentally sustainable, affordable and financeable. Since, refurbishing and upgrading an aging distribution infrastructure, as well as incorporating advanced technologies in a timely fashion, will require significant capital spending.

According to Siemens Inc. new power plants are most of the time located far away from load centers for example here in Maine, Aroostook County. This creates a technical challenge for the existing power grids, which may not have been designed to handle large amounts of power transfer from remote locations. All of this new variable wind and solar resource has to be incorporated into a large-scale generation infrastructure.

Although the most recent controversy and antithesis within the local communities in the state for building new lines has caused a skepticism on the future of energy in the state, we need to think about alternative options to unlock these large amounts of wind and other renewables from plants far away from the grid, such as beefing up transmission lines closer to the sources, but also updating and modernizing our current grid transmission lines.

A robust transmission system lowers the net costs of electricity to consumers by allowing the next most-cost-effective megawatt to be dispatched. This reduces overall production costs for generators and the payments that the end users of electricity make. At the same time according to the ISO-NE the energy supply for Maine from the existing 3,227MW that is producing, it is proposed that it will increase up to 4,578MW threatening our current system, but also demonetize and discredit any future projects in the state.

Siemens Inc. states that the increasing installation of large wind power plants (especially off-shore wind parks far away from the shores) requires transporting large amounts of power over long distances. Due to reliability issues, the future of the existing point-to-point connections can be interconnected to from an AC/DC grid. Changes in the electrical power generation structure causes the need to strengthen today’s transmission systems. A solution that they are proposing for this is to build an overlay network forming a meshed DC grid since the future trend seems to be a combination of AC and DC systems.

When it comes to the numbers, 20% of the power at 4 Maine projects was curtailed last year, while our region has 700 megawatts of installed wind capacity, with 500 megawatts in
Maine. That’s enough installed capacity to supply more than 150,000 homes, based on average annual output. Projects that could triple today’s capacity are in the planning stages. The problem is, most are located in rural areas, far from customers. So far, for example every wind generator that has hooked up to CMP’s system has chosen to meet only the minimum standards. According to the Portland Press Herald “In the last few years, $1 billion has been spent on wind, and it doesn’t make a material contribution to the grid. If another $1 billion is spent, how much worse will congestion be, and how much more will that increase transmission rates? This raises concern within our communities and the future projects that are in the planning stages of being constructed. It seems like that curtailment will become a bigger issue as more renewables are integrated in the system. Since it was built in 1971, the 8,000-mile New England bulk transmission grid- the high voltage lines that carry electricity from generation sources to distribution sources- has not undergone a major overhaul, even as electricity consumption has doubled.

Maine Policy today:

Today in the Maine legislature there a few bills that initiate a first step into trying to find solutions for the issue of the transmission and the development of future renewables in the state.

- H.P. 1016, LD 1401, An Act to Study Transmission Solutions To Enable Renewable Energy Investment in the State. Just like Europe and the recent studies by the German Government we are on the right path to face this issue by utilizing this group that will analyze and examine the future needs of the transmission system and recommend changes.

- H.P. 1181, No. 1646, An Act To Restore Local Ownership and Control of Maine’s Power Delivery Systems. This is another bill that would enable a local understanding of the needs of the area. This local ownership will bring many changes as to how these grids are operated, who will be paying for them, and who will be updating them. Much of the future of the grid will have to rely on the undertaking for our communities of the state of the grid.

Recommendations:

There are certain ways in which policy can be implemented in the state to answer to some of the issues presented with transmission and the process of modernizing and increasing the electric capacity from the production facilities to the consumers. These are some recommendations proposed that will spark interest in facing this issue as a real threat for our future and inspire for current but also for future actions by the legislature.

- **Re-thinking and Re-channeling State Funds**

Maine can make the public and private investments to transform its energy economy without raising taxes or energy bills, it just simply needs to re-think and re-channel the money already spent on energy consumption and production. There is a whole cultural shift that needs to occur. In 2019 there were a few bills that supported the advancing of offshore wind projects and offshore wind initiatives, promoting energy efficiency heat pumps, and other initiatives that expand electric vehicle use across Maine. If the state has the funding to support renewable generators to be built and other offshore wind farms, it should certainly make the case that it has
funding to develop a multi year plan of developing and upgrading the transmission system in the state. There is a need for bills that will focus primarily on the modernization of transmission, while at the same time the state needs to “pause” spending on further renewable energy production, and redistribute those funds available to modernizing the transmission lines, which is a vital part for the continuation of our energy economy and development while making the switch to renewables and clean energy.

- **State Promoting Transmission Upgrades and Capacity Increase**

Most of the time securing resources to fund transmission projects is a great obstacle. The state needs to develop a sustainable system that would provide bonds, tax credits, and tax exemptions for clean energy projects that would include the transmission improvements associated with their project. Such example could possibly target the most increasing energy industry that awaits for further development in Maine, the wind power generation. One incentive will be to provide a grant tax exemption for wind power facilities that would include construction or upgrades for transmission in their plans. An alternative option would be to prioritize the transmission when it comes to state budgets allocated every budget year for energy, and under set provisions allocate capital from the state to support these updates of new constructions and modernizing. There needs to be a bill that will state the need to invest in the form of a public bond for the purpose of updating existing routes to increase transmission capacity. It has been done in other states, for example one bill in Illinois authorized bonds for transmission, and granted tax exemptions for wind power facility projects that included construction of new transmission facilities or upgrades for existing facilities and lines, and Michigan included a capital allocated towards advancing transmission and distribution technologies and infrastructure. Since 2009, 21 states have considered legislation that addresses renewable energy transmission problems. Most bills provide for a more robust transmission system that would increase energy reliability or encourage renewable energy generation potential.

- **Incentive for Profits**

State funding at this point is one of the few pathways that are available. At the same time the question of raising the consumers electric bill will play a vital role for the future since prices are already increasing rapidly. Energy companies like every other business, have the incentive of increasing their profits no matter the cost. If there was a significant support from the state on major transmission system upgrades, then we could have created a more stable and sufficient price rising. Maine should adopt a policy that would decouple utility’s revenues from volumes of electric sales. This will remove a majority of the incentives to increase their sales but would also encourage and promote a utility to achieve other policy areas of performance objectives. A big role in this process will have to be fulfilled by the State Public Utilities Commissions with their task to monitor the progress of programs to expand energy efficiency, behind consumers' meters, as well as distribution-network upgrades to accommodate two-way power flows and to increase distributed generation sited within distribution systems. As it is mentioned in a research study dealing with modernizing electricity infrastructure, a prerequisite for implementing performance or value-based regulation, Maine should decouple sales from rates.
Conclusion:

Our grid is holding us back from our future and our future energy goals. Not just from decarbonizing our environment, but also from becoming sustainable and energy independent. This grid is built as much from steel as from law and political action. It runs as much on state investment as well as on energy, and it provides profits as well as electrons to the consumers. Maine needs to rethink its future and start talking about its energy transmission at the same importance and the same level as constructing new renewables and increasing the portfolio standards. We need to come up with solutions to allow existing and future renewable generators to deliver their supply to the market and into our current grid. Policymakers should view the concept of grid modernization as creating a merged policy structure that will support and interconnect other initiatives at the same time, such as smart metering, energy storage, electric vehicle infrastructure and utility business models. If we allow this change and update our grid then we will be able to increase our renewable energy production more than any other state in NE, decrease our carbon footprint and establish an independent Made-In-Maine energy system. This is not something that we can think about in the future, it is about our future and the actions need to be taken now with utmost seriousness and the understanding that if we do not answer these issues, our future is going to look like our current transmission system, weak, and unable to support its citizens.

As Gretchen Bakke stated in her book *The Grid*, it is the world’s largest machine and the twentieth century’s greatest engineering achievement and we are remarkably oblivious to it. When these conversations and committees are set to determine a course of action to increase the states renewables and transition to a “clean” energy system, the grid rarely enters the larger conversation and it is like it doesn’t even exist, this needs to change.
Bibliography supporting this research: