MAINE STATE LEGISLATURE

The following document is provided by the

LAW AND LEGISLATIVE DIGITAL LIBRARY

at the Maine State Law and Legislative Reference Library

http://legislature.maine.gov/lawlib

Reproduced from electronic originals

(may include minor formatting differences from printed original)

Maine Public Utilities Commission

Report Regarding a Power-to-Fuel Pilot Program

Pursuant to An Act To Advance Energy Storage in Maine,

P.L 2021, ch. 298

Presented to the Joint Standing Committee on Energy, Utilities and Technology

January 21, 2022

I. Background; Overview of Report

During the First Special Session of the 130th Legislature, the Legislature enacted An Act To Advance Energy Storage in Maine, Public Law 2021, chapter 298 (Act)[1]. The Act established energy storage goals for the State of 300 MW and 400 MW by December 31, 2025 and December 31, 2030, respectively. The Act also directed certain related measures, programs, and reports applicable to Efficiency Maine Trust (EMT), the Governor's Energy Office (GEO), and the Public Utilities Commission (Commission).

Section 8 of the Act directs the Commission to consider and report back to the Legislature by February 1, 2022, on the feasibility of a Power-to-Fuel (PTF) pilot program. Specifically, the Act provides that:

> **Sec. 8. Public Utilities Commission; consideration of power-to-fuel pilot program.** The Public Utilities Commission shall consider the feasibility of a power-to-fuel pilot program that would result in the development of power-to-fuel projects utilizing renewable energy and would provide the developer with exemptions, for a period of at least 15 years, from distribution charges, including volumetric, demand and standby charges, charges associated with the procurement of energy efficiency resources by transmission and distribution utilities ordered under the Maine Revised Statutes, Title 35-A, section 10110, subsection 4-A and renewable portfolio standards requirements under Title 35-A, section 3210, subsections 3-A, 3-B and 3-C. The commission shall also:
>
> 1. Evaluate whether a power-to-fuel project would benefit the electric grid;
>
> 2. Provide estimates of the ratepayer impact of a pilot program and how that compares with other types of energy storage technologies; and
>
> 3. Review what measures other states have taken to facilitate the development of energy storage and whether those measures were successful in promoting energy storage, minimized ratepayer impacts and promoted a diversification of energy storage technologies.
>
> By February 1, 2022, the commission shall submit a report to the Joint Standing Committee on Energy, Utilities and Technology and the committee may report out a bill related to the report to the Second Regular Session of the 130th Legislature.
>
> For the purposes of this section, "power-to-fuel project" means a facility that converts renewable energy to hydrogen gas, methane or other fuel.

In addition, Section 9 of the Act directs the GEO to conduct an energy storage market assessment study (GEO Study), which will include an in-depth analysis and review of the opportunities and challenges facing the State in reaching the energy storage goals set forth in the Act. The Act directs that the GEO Study include an examination of energy storage technologies, policy and regulatory options, and ratepayer impacts related to achieving State policy goals, and that the GEO provide the

[1] Public Law 2021, chapter 298 (LD 528)

results of its examination to the Legislature by March 1, 2022. The GEO Study is expected to include technology, policy, and cost/benefit information and analyses that will provide background for, and may inform decisions about a PTF pilot program, thus serving as an important reference for this PTF Pilot Report.

Finally, given the overall context of the Act, the Commission interprets the provisions it includes for a PTF pilot program to apply to applications with a particular relationship to the electric power system. Thus, the primary focus of this report is on a pilot for PTF and related storage technologies and facilities, and how such a pilot may test their viability, design, operation, and their potential to provide benefits to Maine's power system and electric ratepayers. The Commission notes however, that there may be PTF-related applications related to natural gas which may provide benefits to natural gas ratepayers as well. Thus, although not the primary focus of this report, such applications are also noted. Finally, there are certain other technologies and potential applications related to PTF that are included in this report as background information or as part of an inventory of activity in other jurisdictions, but which may not be directly applicable to the Act.

II. Power-to-Fuel Processes; Potential Technologies and Applications

The power system's requirement for balance can pose particular challenges for systems seeking to integrate and operate with certain types of renewable resources, such as wind and solar, due to the intermittent nature of the generation from these resources as well as potential differences between the resource's output profile and the load requirements of the grid. For example, if the wind is blowing strongly at night when loads are typically lower, wind generators may be required to curtail their production. Without any way to store the wind or the power it could have generated if not for the curtailment, the energy is, in essence, lost. PTF and related storage facilities have the potential to capture and provide a "sink" for energy that might otherwise be lost. Moreover, these facilities may also be used as "storage tanks" for renewable energy produced when loads and market prices are low, making the energy available for use when loads and market prices are high and/or used to displace energy from non-renewable power sources, such as from generation fueled with natural gas or oil.

In addition, PTF and related storage facilities, depending on where they are located, may provide important benefits in terms of avoiding transmission and/or distribution (T/D) system upgrades or expansions. For example, instead of having to upgrade the T/D system to accommodate interconnection of a distributed generation (DG) project, it may be feasible and less costly to strategically site a PTF/storage facility and, by doing so, avoid the T/D upgrades that would otherwise be required.

As noted above, the Act defines a PTF project as "a facility that converts renewable energy to hydrogen gas,[2] methane or other fuel." The most commonly used process for this appears to be *electrolysis*, which uses electricity to split water into its basic

[2] This is also often referred to as "green" hydrogen.

elements of hydrogen gas and oxygen gas. The technology of electrolysis has been used for many years[3] and, as described by the U.S. Department of Energy (DOE) [4], uses a unit called an electrolyzer which consists of an anode, cathode and an electrolyte. Water enters the electrolyzer and reacts with the positively charged anode yielding oxygen gas (O_2) and four hydrogen protons - the hydrogen protons are converted to hydrogen gas at the cathode before leaving the electrolyzer. The hydrogen gas can then be used in a number of sectors such as power generation, transportation, natural gas, or as an industrial feedstock.

In the context of renewable energy and the power grid, this process can be used to store excess electric energy produced by a renewable generator that would otherwise be curtailed. The DOE notes, for example:

> Hydrogen fuel and electric power generation could be integrated at a wind farm, allowing flexibility to shift production to best match resource availability with system operational needs and market factors. Also, in times of excess electricity production from wind farms, instead of curtailing the electricity as is commonly done, it is possible to use this excess electricity to produce hydrogen through electrolysis. [5]

Although not as common as electrolysis, *pyrolysis* may be another PTF process of interest to Maine policymakers. As described by the United States Department of Agriculture (USDA), pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen which can then decompose the biomass into combustible gases and bio-char.[6] Most of the combustible gas can be condensed into a combustible liquid (pyrolysis oil, or bio-oil) and used to generate industrial or space heating, run electric generation. While pyrolysis of biomass may be possible without significant electricity use, there may be opportunities to improve the processes using electricity.[7] Given this, and the importance of the forest products industry to Maine, this process is noted as a potential application for PTF.

Although electrolysis and pyrolysis are not new technologies, using them to balance the output of, or facility upgrades associated with, renewable resources on the local and/or bulk power systems is a relatively new application and not yet widely deployed. Accordingly, the Commission supports the use of a pilot program as contemplated by the Act to test various aspects of PTF and their potential benefits for Maine.

In addition, if properly designed, there may also be ways to use PTF to produce gases that could be injected into the existing natural gas infrastructure to provide

---

[3] According to the National Renewable Energy Laboratory (NREL), electrolysis was discovered in 1800 by William Nicholson and Sir Anthony Carlisle. https://www.nrel.gov/docs/fy06osti/40605.pdf

[4] https://www.energy.gov/eere/fuelcells/hydrogen-production-electrolysis

[5] Ibid.

[6] What is Pyrolysis? : USDA ARS

[7] A review on microwave pyrolysis of lignocellulosic biomass - ScienceDirect

carbon-free space heating to the roughly 50 thousand Maine customers that currently use natural gas. While, as noted earlier, this application is not the focus of this report, PTF projects in other states that are exploring this possibility are included in the list of PTF projects in Section III.

III. Projects in Other States

A. Power to Fuel Projects

The following Figure provides a sample of PTF projects that are underway or being considered in other states: [8]

Figure 1 – Sample of PTF Projects in Other Jurisdictions

State	Entity	Project Description	Fuel
New York	New York Power Authority (NYPA)[9]	NYPA will conduct a pilot project to temporarily replace natural gas with a green hydrogen and natural gas blend at its Brentwood Power Station on Long Island.	Green Hydrogen blend for power
	Plug Power[10]	Construction on a $290 million electricity substation and state-of-the-art green hydrogen fuel production facility at the Western New York Science, Technology and Advanced Manufacturing Park located in the Town of Alabama, Genesee County.	Green Hydrogen for fuel
New Jersey	New Jersey Resources[11]	Power-to-gas project will use electricity from an adjacent solar facility to power electrolyzers. NJR will then blend the green hydrogen into its gas distribution system.	Green Hydrogen for pipeline
Florida	Chesapeake Utilities Corp[12]	The company plans to inject a 4% blend of green hydrogen — a zero-carbon form of the fuel produced using renewable electric power — into the gas stream that feeds the turbine at its Eight Flags Energy LLC combined heat and power plant on Amelia Island, Fla.	Green Hydrogen blend for power

[8] Some of these projects may not be related to the energy storage and power grid applications that are the focus of the Commission's report but are included for background and reference.

[9] https://www.ge.com/news/reports/generation-next-new-york-state-power-authority-starts-green-hydrogen-demonstration-on-long

[10] https://www.power-technology.com/news/plug-power-new-york/

[11] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/new-jersey-resources-starts-up-1st-east-coast-green-hydrogen-blending-project-67570888

[12] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/chesapeake-utilities-a-small-utility-operator-has-big-renewable-gas-plans-65393894

Figure 1 Continued			
State	**Entity**	**Project Description**	**Fuel**
California	Southern California Gas	NREL and Southern California Gas Company are evaluating a new "power-to-gas" approach—one that produces methane through a biological pathway and uses the expansive natural gas infrastructure to store it. The process involves using a low-temperature water electrolyzer to produce hydrogen from renewable power, such as wind and solar, and then feeding the hydrogen and carbon dioxide into a bioreactor where methanogens produce methane and water. With minor filtration, the product gas from the bioreactor will meet pipeline quality, allowing it to be injected into the existing natural gas infrastructure.	Green hydrogen to Renewable natural gas/ pipeline/ power generation
Minnesota	Xcel Energy	Working with Idaho National Lab, this is a pilot project at Prairie Island. It will produce hydrogen by electrolysis, using steam from its nuclear power production. The resulting hydrogen will initially be used at the power plant, but it could eventually be sold to other industries.[13]	Green hydrogen from nuclear for power and fuel.
Texas	University of Texas Austin[14]	The UT-Austin campus will host a "first-of-its-kind" integration of commercial hydrogen production, distribution, storage, and use. The project partners note that they will generate zero-carbon hydrogen onsite via electrolysis with solar and wind power, and reformation of renewable natural gas from a Texas landfill. The hydrogen will power a stationary fuel cell to provide power for the Texas Advanced Computing Center at UT-Austin. It also will supply a hydrogen station with fuel for a fleet of Toyota Mirai fuel cell electric vehicles.	Green Hydrogen Fuel Cell / Fuel

[13] https://energynews.us/2021/09/10/minnesota-utility-co-op-sees-big-battery-as-piece-of-grid-reliability-puzzle/

[14] https://energy.utexas.edu/news/h2scale-project-launched-texas

Figure 1 Continued			
State	**Entity**	**Project Description**	**Fuel**
Vermont	Highview Power/ Encore Renewable Energy[15]	The developers announced a long duration, liquid air energy storage facility for Northern Vermont scheduled for 2023. The proposed project is expected to be at least 50 MW /400 MWh with the potential to store renewable energy for weeks. It is being developed to resolve transmission challenges around the Sheffield / Highgate Export Interface and to integrate additional renewable energy in the region. It could also provide "grid synchronous inertia, market arbitrage, frequency management, reserve, and grid constraint management services.[16]	Liquid Air Energy Storage[17]
	Middlebury College	Middlebury uses locally sourced wood chips, which are superheated in a low oxygen chamber where they smolder (not burn) and emit wood gas. Oxygen is introduced on the backside of the boiler causing the gas to ignite, producing heat (at temperatures of over 1100° F) to make steam that is distributed throughout campus for heating, cooling, hot water, and cooking.	Biomass Gasification
Hawaii	AES West Kauai) Energy Project[18]	The project uses a combination of hydro power, solar, battery and pumped storage to generate renewable power and to use excess solar energy to serve evening and early morning peak load.	Solar/ Pumped Storage

In addition to the projects listed above, the DOE's National Renewable Energy Laboratory (NREL), in collaboration with multiple other entities, is conducting "The HyBlend Project (THB)" to address the technical barriers presented by blending hydrogen with natural gas in natural gas pipelines.[19] The project will evaluate the

[15] https://encorerenewableenergy.com/highview-power-and-encore-renewable-energy-to-co-develop-the-first-long-duration-liquid-air-energy-storage-system-in-the-united-states/

[16] https://www.powermag.com/market-prospects-heating-up-for-cryogenic-energy-storage/

[17] Liquid Air Energy Storage (LAES) uses electricity to cool air until it liquefies, stores the liquid air in a tank, brings the liquid air back to a gaseous state (by exposure to ambient air or with waste heat from an industrial process) and uses that gas to turn a turbine and generate electricity.

[18] https://www.kiuc.coop/sites/default/files/documents/WKEP/Decision%20and%20Order%20No.%2038095.pdf

[19] https://www.nrel.gov/news/program/2020/hyblend-project-to-accelerate-potential-for-blending-hydrogen-in-natural-gas-pipelines.html

feasibility of using the existing natural gas network to mix and transport green hydrogen, the effect the blended fuel has on end use applications, and the economic and climate opportunities for the hydrogen blended gas.

THB is organized into three research tasks, each led by one of the DOE national laboratories with existing research and capabilities in that area:

1. Hydrogen compatibility of piping and pipelines: Sandia National Laboratories (SNL) and Pacific Northwest National Laboratory (PNNL) will conduct evaluations to estimate the life of metal and polymer piping and pipeline materials (e.g., steel and polyethylene) when blends are used. This information will be incorporated into a publicly available model that can be used to estimate pipeline life given key engineering assumptions.
2. Life-cycle analysis: Argonne National Laboratory (ANL) will analyze the life-cycle emissions of technologies using hydrogen and natural gas blends, as well as alternative pathways such as synthetic natural gas.
3. Techno-economic analysis: NREL will quantify the costs and opportunities for hydrogen production and blending within the natural gas network, as well as alternative pathways such as synthetic natural gas.

B. Energy Storage

The following Figure provides a sample of other types of energy storage projects that are underway or being considered by utilities in other New England states:[20]

Figure 2 – Sample of Other Types of Energy Storage Projects in Other Jurisdictions

State	Utility	Project Scope
New Hampshire	Liberty Utilities[21] (Residential)	Phase 1 of this project involves the installation of not fewer than 100, nor more than 200, Tesla Powerwall 2 batteries by 2022. Phase 1 concludes with an initial test period, beginning once the first 100 batteries are operational, and lasting for not less than 18 months. Participating customers will pay $50 a month for 10 years or about $5,000 upfront for installation of two Tesla Powerwall batteries. Participants will be enrolled in a time of use rate, and the utility will operate the battery as needed to manage peak periods. Phase 2, which is conditioned on the demonstrated success of Phase 1, involves the installation of up to 300 additional batteries at customers' premises. This phase will demonstrate a "bring your own battery" option, like a program in Vermont.

[20] Many of these projects are not related to PTF and/or the power grid applications that are the focus of the Commission's report but are included for background and reference.
[21] DE 17-189

Figure 2 Continued		
State	**Utility**	**Project Scope**
Vermont	Green Mountain Power (Residential)	Frequency Regulation Pilot Program (Extension of the 2017 Tesla Power Wall Pilot Program): A virtual power plant program that will consist of a network of residential battery systems. This new Pilot Program allows customers to share stored energy with the utility and onto the regional grid to reduce the peak and to provide additional system reliability.
		Bring Your Own Device[22]: Customer's batteries are enrolled batteries for a ten-year period. Upfront payments of $850 per kW of storage enrolled for three hour discharge, $950 per kW for four hour discharge or a bonus payment of $100 per kW for retrofitted existing solar system in one of the areas of the state where extra storage will help the grid most.
Connecticut	Eversource Energy (Eversource) and United Illuminating (UI)[23]	Program elements include both upfront and annual performance-based incentive structures to reduce the cost of buying and installing a storage system for customers of Eversource Energy (Eversource) and United Illuminating (UI). Average upfront incentives for residential customers will initially be around $250 per kilowatt-hour (kWh), with a maximum per project incentive of $7,500. Commercial and industrial customers will also be eligible for upfront incentives, with a maximum incentive of 50% of the project cost. Residential, commercial, and industrial customers will all be eligible for performance incentive payments based on the average power an electric storage project contributes to the grid during critical periods.
MA	Multiple	National Grid program in MA/ RI /NY which pays enrolled customers a performance incentive as opposed to the rebate model used by other utilities. Under this program, a customer can earn approximately $1,500 per year depending on your battery system and settings for 30-60 events during the summer period.

[22] Case Nos. 19-3537-TF & 19-3167-TF, Order of 5/20/2020.

[23] Docket No. 17-12-03RE03

Figure 2 Continued		
State	**Utility**	**Project Scope**
Rhode Island	All RI distribution utilities	Energy Storage Adder Pilot Program: small-scale, commercial-scale, and brownfield solar PV systems earn an adder incentive for pairing eligible energy storage systems. These incentives range from $2,000 to $40,000, depending on the type of energy storage system.

With respect to activity in Maine, Figure 3 below provides a summary of various relevant storage projects or initiatives implemented or considered over the past several years:

Figure 3 – Maine Storage Projects or Initiatives	
Entity	**Project Scope**
CMP	Boothbay Non-wires Alternative Pilot Project (PUC Docket No. 2011-00138): As part of the "Boothbay NWA Pilot", a portfolio of non-wires technologies including battery and thermal energy storage were employed to reduce peak load levels in the local area to avoid the need for a transmission line rebuild project.
CMP/ Efficiency Maine Trust	Electric Thermal Storage Heat Pilot: This 2013 pilot project provide incentives for up to 500 CMP residential and small business customers to install electric thermal storage heating systems. Although not a new or commonly used technology, electric thermal energy storage devices contain high-density ceramic bricks heated by electric resistance coils to store heat. This stored heat can be released throughout the day when electricity prices are typically high and charged at night when costs are lower. Both Versant and CMP have special rates designed to make the use of "thermal energy storage" attractive as a heating option for customers.
Efficiency Maine Trust	EMT Load Shifting Initiative (LSI): The LSI Initiative (LSI) is a new program that is included in EMT's Triennial Plan for 2023-2025 (Fifth Triennial Plan). The LSI will incentivize flexible loads that can be controlled to run outside of peak hours, initially with battery storage systems, electric vehicle (EV) charging station controls, and thermal storage solutions.

Figure 3 Continued	
Entity	**Project Scope**
Efficiency Maine Trust	Load Management Innovation Pilot[24]: A pilot project intended to test a fleet of residential Air Source Heat Pumps, Heat Pump Water Heaters, Electric Vehicle Chargers and Batteries used as an aggregated resource that could be operated to provide grid benefits such as peak reduction.
Efficiency Maine Trust / Isle au Haut[25]	Pilot project to install active load demand management, air-to-water heat pumps, and thermal storage to use excess solar production more efficiently and cost effectively[26].
Efficiency Maine Trust	Cold Storage Facility Load Management Pilot[27]: This pilot will implement passive load management using phase change material (PCM) technology in cold storage applications at food production facilities and warehouses. The provider will deploy and evaluate the impact of PCM-based thermal storage technologies with advanced controls. Four participants enrolled and installed equipment in FY2021.
City of Eastport	City of Eastport has been selected by the DOE for an Energy Transitions Initiative Partnership Project (ETIPP)[28] to explore the planning, siting, and optimal sizing of a microgrid with battery energy storage and baseload tidal power generation. This is a collaboration with the Island Institute, Versant Power, ORCP and several of the national labs.
Islesboro	Islesboro, also through an ETIPP award, is exploring options for a microgrid with renewable energy and battery storage. The focus of the microgrid project is to improve reliability by keeping a core set of facilities running during extended power outages.

In addition to the Maine projects noted above, there are more than 70 battery storage projects (representing approximately 340 MW) in the distributed generation interconnection queues of CMP and Versant, most of which are paired with solar PV facilities.[29]

[24] https://www.efficiencymaine.com/docs/Efficiency-Maine-Revision-DER-Pilot-Final-Report.pdf
[25] https://www.isleauhautmaine.us/wp-content/uploads/2021/03/Power-Company-Update-3.4.21.pdf
[26] https://www.efficiencymaine.com/docs/FY21-Annual-Report_11.17.2021_final.pdf
[27] Ibid.
[28] The U.S. Department of Energy's (DOE) Energy Transitions Initiative Partnership Project (ETIPP) works alongside remote, island, and islanded communities to transform their energy systems and increase energy resilience through strategic energy planning and the implementation of solutions that address their specific challenges.
[29] https://www.cmpco.com/wps/portal/cmp/networksfooter/suppliersandpartners/servicesandresources/interconnection/ and https://www.versantpower.com/energy-solutions/connecting-renewable-resources/distributed-generation-interconnection-process/#2

At the grid-scale, energy storage is developing as a viable wholesale market resource option in New England. Figure 4 below provides a list of storage resources currently in operation in the ISO-NE region, including three such facilities that are in operation in Maine:[30]

Figure 4 – Grid-scale Energy Storage Projects Currently Operating in the ISO-NE Region

State	In-Service Date	Lead Participant Name	Nameplate (MW)
ME	5/14/19	Madison ESS, LCC	4.741
ME	12/31/16	NextEra Energy Marketing, LLC	16.699
ME	12/31/20	Brookfield Renewable Trading and Marketing	20.952
MA	6/19/20	Genbright, LLC	1.584
MA	04/01/21	Marie's Way Solar, LLC	1.240
MA	07/01/21	Boston Energy Trading and Marketing, LLC	2.376
MA	11/04/20	Enel X North America, Inc.	4.950
MA	04/30/21	Genbright, LLC	1.999
MA	04/30/21	Genbright, LLC	4.000
MA	04/30/21	Genbright, LLC	4.000
MA	07/01/21	Genbright, LLC	3.750

According to the ISO-NE[31], more than 600 MW of capacity from energy storage projects cleared the market in its most recent Forward Capacity Auction and secured a "capacity supply obligation" for FCA 15, which corresponds to the "capacity commitment" period June 2024 – May 2025. Included in this 600 MW is a new 175 MW project, Cross Town Energy Storage, to be developed by Plus Power in Gorham, Maine.[32] Looking forward, the ISO-NE notes that state energy policy directives, such as the Massachusetts 1,000 MWh Target will further accelerate the adoption of battery storage in the region.[33]

IV. PTF Pilot Program

As noted above, PTF facilities in conjunction with energy storage have the potential to provide benefits to the Maine power system in two basic ways. First, such facilities could complement the operation of certain renewable resources, most notably solar and wind, serving as a balancing resource and a "sink" for energy that might

---

[30] https://www.iso-ne.com/static-assets/documents/2021/04/2021_celt_report.xlsx

[31] https://www.iso-ne.com/static-assets/documents/2021/03/a6_energy_storage_in_transmission_planning_studies.pdf

[32] https://www.pluspower.com/home/crosstown

[33] https://www.mass.gov/energy-storage-initiative

otherwise be lost or produced at sub-optimal times. Second, the facilities, if strategically sited, could allow T/D upgrades or expansions to be avoided or delayed.

Examples of these potential benefits can be seen by looking at system issues that exist today. For example, in certain locations in Maine, such as north of the "Orrington-South Interface" on the transmission system, the applicable wholesale energy prices (Locational Marginal Prices, or LMP) can be relatively low and even significantly negative due to locational factors and the supply/demand balance. Faced with the prospect of low LMPs, particularly exposure to negative LMPs, a generator may have a strong incentive to reduce or curtail production. In addition, the substantial development of new renewable generation resources in Maine, including a very large number of distributed solar projects, is driving the need for potentially major T/D system upgrades, modifications, and expansions. These T/D upgrades can be costly, require substantial time and process to evaluate and construct, and, in certain cases, can include facilities (e.g., the NECEC) that are the subject of public opposition. PTF and storage facilities may be beneficial in this context as well.

Additionally, as noted above, pyrolysis, which is a process that can convert biomass to an intermediate liquid product that can then be refined to drop-in hydrocarbon fuels, oxygenated fuel additives and petrochemical replacements,[34] may also present potential benefits. As the most heavily forested state in the country[35] and with an estimated 1 in 24 jobs related to the forest industry,[36] it may be worth considering as part of a pilot whether there is a possibility of developing a PTF pyrolysis project to use biomass or sawmill waste to produce products such as bio-oil or bio-char to substitute for fossil-fuels such as home heating oil, diesel fuel and/or coal.

Finally, there may be PTF applications that could yield benefits for Maine's natural gas consumers. Experience in other jurisdictions as well as ongoing studies suggest the potential for blending hydrogen and synthetic natural gas with natural gas in existing pipelines. As the Legislature is aware, Summit has described a potential project in Maine that would make use of wind energy that would otherwise be curtailed due to transmission constraints to produce hydrogen which could then be stored or injected into the natural gas transmission system. Projects similar to this that are underway or being considered in other states are summarized above.

The Commission notes that PTF-related technologies and projects, although being studied and piloted extensively, are in relatively early stages of commercial development and deployment. Additionally, using these technologies in Maine to achieve the system balancing and T/D upgrade-related benefits described above, while conceptually feasible, may present technical and operational challenges when such

[34] https://www.ars.usda.gov/northeast-area/wyndmoor-pa/eastern-regional-research-center/docs/biomass-pyrolysis-research-1/what-is-pyrolysis/
[35] Natural and Working Lands | Maine Climate Council
[36] Maine's Forest Opportunity Roadmap: FORMaine_Report_DL_041119.pdf

facilities are actually planned, designed, and operated. Thus, the Commission concurs with the use of a pilot program, as contemplated by the Act, to test the feasibility and benefit propositions of various types of PTF-related projects and program designs.

As was done for electrification in the transportation sector[37], the Legislature could direct the Commission to seek proposals for power-to-fuel pilot projects that would be designed to gather information about and test relevant questions and issues, including the following:

- The efficacy and cost of various technologies;
- Specific applications for Maine, including optimal locations on the T/D system;
- Development and operational issues, including the potential roles of Maine's utilities, the ISO-NE, and owners/operators of grid-scale and distributed generation;
- Relevant contractual, regulatory, and/or market issues and mechanisms;
- Potential costs and benefits;
- Key economic drivers of PTF projects to inform appropriate rate design mechanisms or pricing models, including the need (if any) for distribution charge exemptions such as those included in the Act; and
- The costs and benefits of power-to-fuel facilities compared to other energy storage technologies.

A pilot program could also explore the availability of external funding to support PTF projects in Maine. A sample of potential funding sources is provided below:

- DOE: Hydrogen Shot Program[38]
- DOE: Energy Efficiency & Renewable Energy Office[39]
- USDA[40]
- Maine Technology Institute[41]

The results of such a pilot could be provided in a subsequent report to the Legislature and used to inform and guide potential future PTF policies and programs.

[37] An Act to Support Electrification of Certain Technologies for the Benefit of Maine Consumers and Utility Systems and the Environment, P.L. 2019, ch. 365, § 5.

[38] https://www.energy.gov/eere/fuelcells/hydrogen-shot

[39] https://eere-exchange.energy.gov/

[40] A Guide to Funding Resources: USDA Rural Information Center

[41] https://www.mainetechnology.org/mti-funding/