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Prepared for

MAINE DEPARTMENT OF
Energy Resources

MAINE CLEAN ENERGY
Financing Study

November 2025

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Executive Summary

To strengthen the state's economy and stabilize energy costs for households and businesses, Maine must accelerate the deployment of cost-effective clean energy resources. Maine's reliance on fossil fuels including heating oil and natural gas has led to high energy costs for residents and businesses, particularly in recent years with significant price swings driven by global energy markets. In addition, demand for electricity in Maine is expected to double by 2050, underscoring the need to add significant resources to the grid. These efforts require a substantial buildout of new energy infrastructure, and the state is focused on ensuring projects built in Maine deliver affordable electricity while being responsibly integrated with host communities. This buildout will necessitate significant capital investment, and will require a supportive policy, program, and planning ecosystem.

Guided by Governor Janet Mills, in coordination with the Maine Legislature, Maine has emerged as a leader in clean energy and energy efficiency in recent years. The state is working to diversify its electricity resources and shift towards an affordable and clean energy portfolio, with statutory requirement to reach 100% clean and renewable electricity by 2040.[1] The Maine Energy Plan and underlying technical report demonstrate that by expanding local clean energy production and embracing energy efficient technologies, Maine can lower energy costs while supporting good paying jobs and growing the state's economy.

The Maine Department of Energy Resources (DOER) commissioned a study examining the financing conditions that shape large-scale clean energy development in Maine. The study, prepared by Banyan Infrastructure, highlights the substantial investment needed to meet the state's energy needs and underscores how reducing project development risks can lower long-term energy costs. By mapping existing financing tools, identifying gaps, and outlining the factors that influence project viability, the study provides recommendations for Maine to attract cost-effective private capital while navigating a shifting federal landscape.

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[1]https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/energyplan2040

Methodology

The Maine Clean Energy Financing Study (“the Report”) presents a comprehensive study of Maine's current energy investment landscape, drawing on more than 30 interviews with a diverse range of stakeholders, an independent analysis, and a review of the existing program portfolio conducted in early 2025. DOER hosted a public comment webinar to present key findings and gather public input, and received 12 written comments, which informed revisions to the study while supporting future policy and program development. The Report assesses existing state-supported project financing mechanisms, including those that foster energy startup growth, energy research, and economic development, and analyzes gaps. The Report outlines the variety of challenges that can occur throughout the life cycle of a project, and categorizes risks by distinct groups: project development (e.g., siting, permitting, interconnection); construction (e.g., supply chain, labor, delays); pricing (e.g., market volatility, policy changes); and operations (e.g., technology performance, curtailment). This risk framework was applied to determine where Maine projects faced the greatest risks and how the state could support increased investment. Based on research, interviews, and analysis, the Report recommends potential solutions the state could implement to overcome barriers and support the buildout of a diverse and resilient energy portfolio.

Importantly, the period during which this study was conducted coincided with a significant transition in the federal policy landscape, which led to rapid changes in federal clean energy policies and funding mechanisms. Recognizing the inherent uncertainty of evolving federal and state policies, this study may benefit from periodic reviews and updates to ensure its recommendations align with Maine’s energy goals and priorities.

Programs in Maine

There are a variety of programs and initiatives in Maine that are related to or otherwise contribute to energy affordability, resilience, economic development, and job creation in the state. Several programs provide financing and incentives for smaller projects (e.g., behind-the-meter projects) and prioritize supporting energy efficiency and clean energy for businesses, lowering energy costs, and mitigating greenhouse gas emissions. Other programs are targeted at emerging companies and promote innovation, provide capital for clean energy startups, and stimulate local economies through job creation. Programs designed to support larger projects (e.g., FTM) play an important role in enhancing infrastructure to deliver affordable electricity for Maine communities.

Findings & Recommendations

The Report finds that there is sufficient private capital to build projects that meet the capital market's traditional risk/reward profile in the State of Maine. However, there are risks and roadblocks to clean energy growth. Maine will need to navigate a complex financing landscape, further complicated by policy headwinds at the federal level, to attract the private-sector capital required to fund the development of new energy infrastructure.

By focusing on risk mitigation throughout the project life cycle, Maine can drive greater investment in energy infrastructure while managing costs. Risk mitigation efforts support the state's clean energy and economic development goals by attracting more developers to the state to grow the clean energy portfolio, increasing the percentage of projects that move forward to completion, accelerating the timeline for more clean energy on the grid, and decreasing the cost of financing for projects, leading to more affordable electricity for ratepayers.

Finally, the report recommends the state focus its efforts on four objectives: increase awareness of existing programs and clean energy financing resources and improve energy information dissemination, expedite project timelines through engagement and analysis, increase project certainty, and expand capital and workforce ecosystems. Each of the solutions entails specific actions for the state to evaluate in the context of its budget and strategic priorities.

Potential solutions include:

Solution 1.	Support Jurisdictions in Developing Local Regulatory Frameworks
Solution 2.	Improve Energy Education & Awareness Through Fact-Based Information Resources
Solution 3.	Evaluate Permitting and Siting Processes and Explore Opportunities
Solution 4.	Connect Communities and Developers Through Technical Assistance
Solution 5.	Enhance Procurement Processes and Contracting
Solution 6.	Promote Capital Solutions for Large Clean Energy Projects with Non-Traditional Risk Profiles
Solution 7.	Address Workforce Gaps Through Programs

Taken in concert, these recommendations can empower Maine to shorten project timelines, create a more attractive environment for energy investment, and reduce costs to build infrastructure. This strategic approach aligns with the state's clean energy targets, balances private sector and ratepayer interests, prioritizes economic benefits for host communities, and can help deliver affordable energy to all Maine ratepayers.

Image 1: Downeast Wind, DOER

Section 1: Introduction

To achieve its energy and economic development goals, Maine must accelerate the deployment of clean energy resources. Under the policy leadership of Governor Janet Mills and the Legislature, Maine has emerged as a leader in clean energy and energy efficiency. In 2025, the passage of LD 1868 increased Maine's RPS from 80 percent by 2030 to 90 percent by 2040 and added a complementary 10 percent CES to reach 100 percent clean energy by 2040.

These efforts require a substantial buildout of new energy infrastructure, and the state is focused on ensuring projects built in Maine deliver affordable electricity while being responsibly integrated with host communities. This clean energy deployment will necessitate significant capital investment, and will require a supportive policy, program, and planning ecosystem.

To evaluate methods to accelerate this buildout, the Maine Governor's Energy Office (GEO) (now the Maine Department of Energy Resources, or DOER) commissioned a report in 2024 detailing capital investment in clean energy infrastructure, identifying risks to project development, categorizing existing state-supported efforts, and identifying potential state and federal-level programs that could address project development risks. Through interviews, research, and independent analysis conducted over the course of the past eight months, this report identifies de-risking large, front-of-the-meter (FTM) energy generation and related infrastructure — defined as utility-scale projects exceeding $5 million — as a key opportunity for Maine.

This report presents a comprehensive study of Maine's current energy investment landscape, drawing on more than 30 interviews with a diverse range of stakeholders, an independent analysis, and a review of the existing program portfolio conducted in early 2025. It identifies key risks associated with energy infrastructure investment and highlights critical areas where state support is needed. In addition to assessing existing state-supported project financing mechanisms, including those that foster energy startup growth, energy research, and economic development, the report analyzes gaps that hinder the deployment of large-scale, cost-effective clean energy projects with community support. Based on these findings, it recommends potential solutions the state could implement to overcome barriers and support the buildout of a diverse and resilient energy portfolio.

The appendices contain additional findings from research conducted during the course of the study that complement the core body of work. The study team is grateful for the engagement of stakeholders who provided time for interviews; a description of the study team and acknowledgements of stakeholders contributing to the study may be found in Appendix 7.

Maine Energy Targets and Current Energy Landscape

Maine is a leader in clean energy transition policy, with targets to achieve 80% clean electricity by 2030 and 100% clean electricity by 2040[2]. As of 2023, approximately 70% of Maine's total in-state electricity generation came from renewable sources,[3] with hydroelectric accounting for approximately 27% and biomass for 14% of total generation. As of 2024, Maine had 1,545 megawatts (MW) of solar installed[4] and over 1,000 MW of wind[5]. The state has set energy targets, including 400 MW of energy storage by 2030[6], and 3,000 MW of offshore wind by 2040[7], among others.

Maine is at a pivotal moment in its clean energy transition. The state must navigate a complex landscape, with electricity sales forecasted to more than double from 2023 to 2050. To meet its targets and obligations, Maine will need to ensure roughly 24,000 GWh per year of clean energy is available by 2040[8]. Additionally, Maine will need to significantly expand transmission capacity and modernize local grid infrastructure to accommodate electrification and increased clean energy generation.[9]

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[2] https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/energyplan2040

[3] https://www.eia.gov/state/?sid=ME

[4] https://seia.org/state-solar-policy/maine-solar/

[5] https://windexchange.energy.gov/maps-data/321

[6] https://www.mainelegislature.org/legis/bills/getPDF.asp?paper=SP0213&item=3&snum=130

[7] https://legislature.maine.gov/doc/10198

[8] https://www.maine.gov/energy/sites/maine.gov.energy/files/202501/Maine%20Pathways%20to%202040%20Analysis%20and%20Insights.pdf

[9] https://www.maine.gov/energy/sites/maine.gov.energy/files/202501/Maine%20Pathways%20to%202040%20Analysis%20and%20Insights.pdf

To meet these targets and plan for a robust energy future, the Maine Energy Plan[10], which was published by GEO (now, the DOER) in January 2025, offers five objectives, actions, and associated strategies to advance affordable, reliable, clean energy for Maine's people and economy:

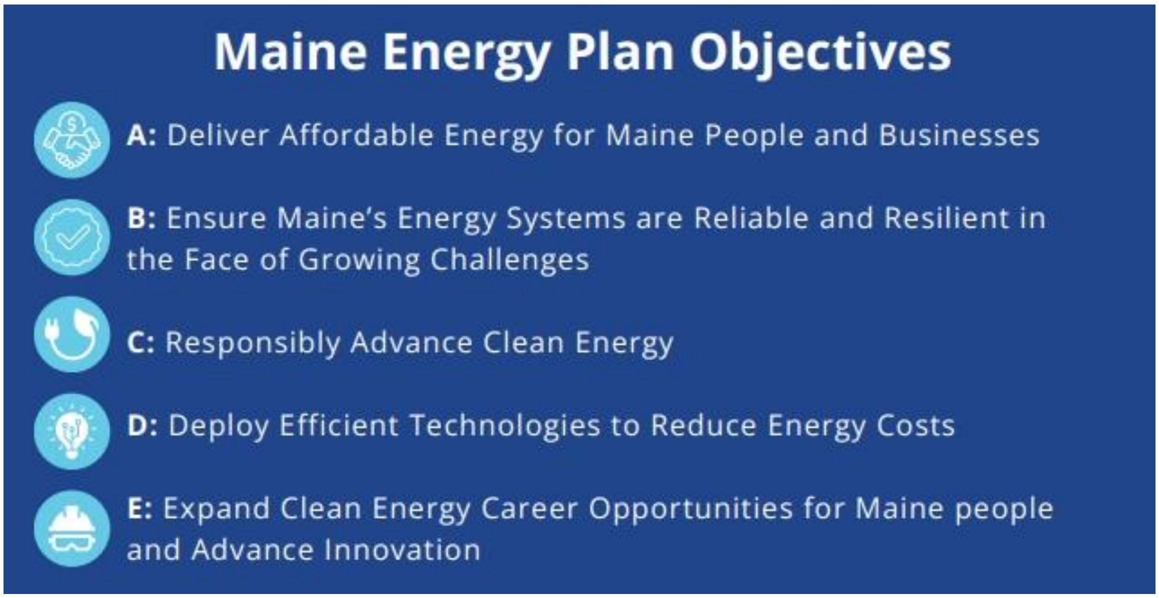

Image 2: Maine Energy Plan, published January 2025

Complementing the Maine Energy Plan is Maine's Climate Plan, "*Maine Won't Wait*", a four-year climate plan containing strategies and goals to emit less carbon, produce energy from renewable sources, and protect natural resources, communities and people from the effects of climate change[11]. Residents of Maine are particularly susceptible to fluctuations in fuel prices due to a high concentration of household petroleum product usage and imported natural gas for electricity. Approximately half of Maine households use petroleum products for home heating, primarily fuel oil or propane.[12] Maine also spends $4 billion per year to import fossil fuels.[13] Deployment of large-scale clean energy projects and enabling infrastructure to displace use of these fuels will be critical to achieving these targets and reducing energy price volatility, while also achieving statutory targets and policy goals and objectives in Maine.

[10] https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-01/Maine%20Energy%20Plan%20January%202025.pdf

[11] https://www.maine.gov/climateplan/

[12] https://www.eia.gov/state/?sid=ME

[13] https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-01/Maine%20Energy%20Plan%20January%202025.pdf

The State of Maine can act as a critical bridge between the interests of developers and ratepayers by leveraging policy, finance, and planning to create a stable, predictable, and cost-effective environment for clean energy deployment.

Eligible Clean Energy and Renewable Energy Technologies

Navigating the complexities of Maine's clean energy targets and existing energy landscape requires an understanding of two key policies, namely the Renewable Portfolio Standard (RPS) and the Clean Energy Standard (CES). While both policies are designed to reduce carbon emissions and promote a cleaner grid, they operate with different criteria for eligible technologies. The RPS has historically been the cornerstone of the state's renewable energy push, mandating that a significant portion of electricity come from specific renewable sources. In contrast, the more recent CES is a broader policy that complements the RPS by including additional clean, zero- or low-carbon technologies to help Maine meet its statutory requirement of a 100% clean energy portfolio by 2040. The following sections detail the specific technologies that qualify under each of these distinct but complementary standards.

Maine's Renewable Portfolio Standard (RPS)

The RPS is a long-standing policy in Maine that mandates a certain percentage of electricity sales come from renewable sources. It has been updated over time to increase the requirements and create different categories for eligible resources. The most recent statutory requirement for the RPS is to have 90% of the state's electricity portfolio from renewable sources by 2040. Eligible technologies are often divided into different "classes" based on when they were brought online and other specific criteria. This is a key detail, as a project's eligibility can change depending on its in-service date[14]. The following renewable technologies are eligible under Maine's RPS[15][16]:

- **Solar:** Solar arrays and installations.
- **Wind:** Wind power installations.

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[14] Readers may find detailed information on the specific RPS and CES classes from the Maine Public Utilities Commission (PUC)(https://www.maine.gov/mpuc/regulatedutilities/electricity/renewableprograms/rps#:~:text=Renewable%20generation%20facilities%20can%20be,below%20to%20submit%20the%20application), Maine State Legislature (https://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html), and on the DOER website.

[15] https://legislature.maine.gov/legis/bills/getPDF.asp?paper=SP0738&item=3&snum=132

[16] Thermal Energy: Maine also has a requirement for thermal renewable energy credits, which applies to projects that generate useful thermal energy for heating, cooling, or industrial processes. This is an important consideration for projects like biomass or CHP facilities.

Additionally, the following resources are eligible where total power production capacity does not exceed 100 megawatts and relies on one or more of the following:

- **Fuel Cells:** Fuel cells.
- **Tidal Power:** Tidal power installations.
- **Geothermal:** Geothermal installations.
- **Hydroelectric:** Hydroelectric generators are eligible, but they must meet all state and federal fish passage requirements.
- **Biomass:** This includes generators fueled by wood, wood waste, landfill gas, or;
- **Anaerobic Digestion:** Anaerobic digestion of by-products of waste from animals or agricultural crops, food or vegetative material, algae or organic refuse.
- **Municipal Solid Waste:** Facilities that use municipal solid waste in conjunction with recycling.

Maine's Clean Energy Standard (CES)

Maine's Clean Energy Standard (CES) is a newer policy designed to help the state achieve its long-term decarbonization requirements. While the RPS focuses exclusively on renewable sources, the CES is broader, allowing for a mix of renewable and other zero- or low-carbon technologies. The CES is intended to complement the RPS by covering the remaining portion of Maine's clean energy target. The current statutory requirement is to have 100% of the state's electricity portfolio from clean energy by 2040, with the CES accounting for the final 10%. The definition of "clean energy" is intentionally flexible to allow for the inclusion of emerging and innovative technologies that are critical for a fully decarbonized grid. Eligible technologies under the CES include[17]:

- **Zero- or Low-Carbon Sources:** This is the primary category and is designed to be inclusive. It can include technologies that are not typically considered "renewable."
- **Large-Scale Hydropower:** Unlike the RPS, the CES may allow large, existing hydropower projects to qualify for credits.
- **Nuclear Power:** Nuclear power plants are eligible under the CES.
- **Next-Generation Technologies:** The CES is also forward-looking and is intended to be flexible enough to accommodate technologies that may not yet be commercially viable, such as advanced geothermal, fusion, or hydrogen. The eligibility of these sources would be determined by verifiable performance criteria to be established by the Department of Environmental Protection (DEP).

[17] https://legislature.maine.gov/legis/bills/getPDF.asp?paper=SP0738&item=3&snum=132

Clean Energy Project Life Cycle

Energy project pre-development is driven by both market and policy forces. Economics, voluntary targets and actions, and policy action have driven clean energy deployment over the last few decades.[18] The declining technology costs for clean energy like solar, wind, and batteries, among others, have also helped drive adoption of clean energy nationwide. State-level policies have strongly correlated with the buildout of clean energy generation as well. According to a recent study by Lawrence Berkeley National Laboratory, roughly half of all growth in U.S. renewable electricity generation and capacity since 2000 is associated with state renewable portfolio standard (RPS) requirements, though that percentage has declined in recent years, representing 30% of all U.S. renewable energy capacity additions in 2022. The study noted that particularly in the Northeast, RPS policies continue to play a central role in motivating clean energy growth.[19] At the federal level, tax incentives such as investment tax credits (ITCs) and production tax credits (PTCs) have historically played a pivotal role in project economics by reducing the needed upfront capital for qualifying renewable energy projects.

Note that the period during which this study was conducted coincided with a significant transition in the federal landscape, which led to the rapid evolution in federal clean energy policies and funding mechanisms. While historic federal legislation previously provided incentives and certainty for clean energy projects, the recent shift in federal policy has introduced uncertainty regarding the continuation of these economic support mechanisms, which raises project development risk.

The decision to pursue certain types of energy projects is also driven by market appetite. Cost is the primary driver for project financiers, however risks associated with acceptance for certain generation assets can play into decisions. To attract energy developers, states are increasingly implementing supportive legislation and setting ambitious targets. The alignment of project costs with suitable state and federal policies is crucial. Ultimately, however, the realization of these projects hinges on the willingness of capital providers to invest upfront during the initial stages of development, even when favorable local and state policies are in place.

The development and financing of clean energy infrastructure projects follow a structured life cycle on a by-project basis, with investors engaging throughout the project based on

[18] https://www.epa.gov/green-power-markets/market-drivers

[19] https://eta-publications.lbl.gov/sites/default/files/lbnl_rps_ces_status_report_2023_edition.pdf

project maturity and type of capital provided. Clear communication, standardized processes, and risk-mitigation strategies are critical to ensuring project success and financial viability. Financial support from a variety of stakeholders is critical to development, as project finance is a blend of equity, debt, tax incentives, and other funding for energy projects. And consistent policies — from the federal, state, and local level — can play a critical role in providing risk certainty and cost certainty for project financiers and project offtakers of electricity.

For developers, the project progresses through three key stages: development, construction, and operations.

Development

Development includes market evaluation and policy considerations, site selection, site control, feasibility analysis, permitting, and queue application for interconnection to a grid. This process can vary by generation type and size, community acceptance, and contracting process (e.g., revenue and offtake). Given that project siting and interconnection constitute the biggest uncontrollable risks in the lifecycle, development constitutes a large opportunity to de-risk projects and establish a strong foundation to attract investment. This stage constitutes the most risk due to the complexity of site selection and interconnection approval. Most of the development process will typically be financed by development and infrastructure equity, with debt and tax equity conversations beginning as development progresses.

Construction

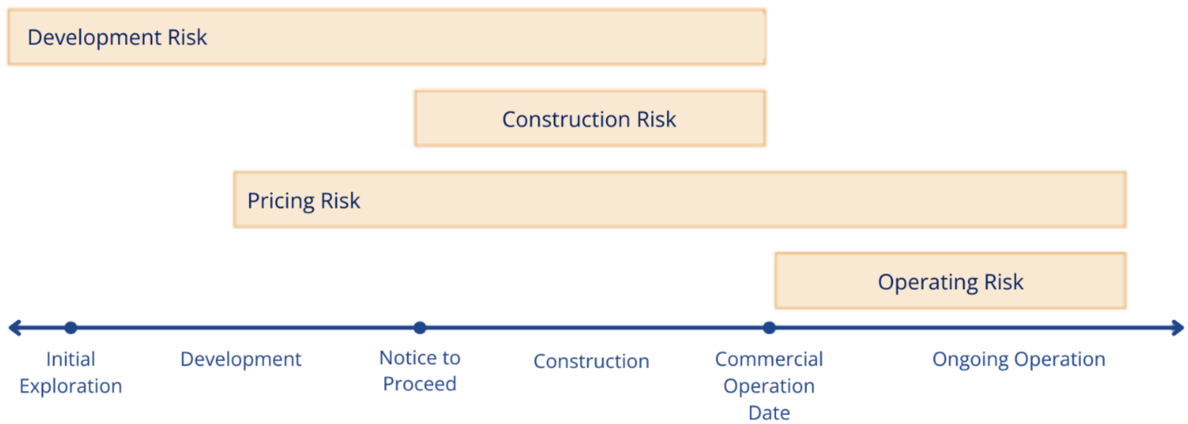
Construction entails finalizing the project's detailed design, overseeing construction and installation, and commissioning. Construction constitutes a different set of risks, such as budget overruns and unforeseen regulatory hurdles. Construction requires careful coordination to manage cost and timeline risks while ensuring compliance with financing agreements. Construction entails a balance of attracting and deploying the majority of capital required to build a project while minimizing outstanding risks.

Operations

Operations: After a project comes online, the focus shifts to operations. Operations responsibilities include performance optimization, cash flow stability, and ongoing risk management. Standardized measurement and verification (M&V) processes provide data transparency for investors, while routine operations and management (O&M) ensures long-term asset reliability.

Each phase of the project life cycle comes with a unique set of risks, which influence a project's ability to progress and investors' willingness to engage. This report discusses these risks and the opportunities which they create in greater depth in subsequent sections.

Figure 1: Project Risk Factors



Investors typically provide sponsor equity during the development phase, followed by tax equity and debt as projects mature. Investors conduct extensive diligence prior to investing in projects. This may constitute assessments of location, technology, design, financials, risks, development team history and composition, and track record, among dozens of other variables. These are accompanied by risk-mitigation strategies for a variety of scenarios.

Once a contract is signed, funds are disbursed in line with the type of capital and agreement in place. Investors continue to monitor projects, relying on M&V reporting to assess performance, ensure compliance with financial agreements, and manage risk exposure. Investors will also evaluate other market considerations aside from project specifics, including potential for policy and incentives changes through the development and operation periods.

There are various intervention points, particularly in the development stage of projects, where state support for additional policies, analysis, convening, and resources could help to address risks across the energy project life cycle.

Section 2: Capital Investment in Clean Energy Infrastructure

Maine's renewable portfolio standard (RPS)[20] and clean energy standard (CES)[21] play vital and complementary roles in supporting the market for large clean energy projects. RPS policies have been instrumental in driving the deployment of renewable energy technologies by creating direct demand and market mechanisms. CES policies, with their broader definition of clean energy, can accelerate overall decarbonization by including a wider array of low-carbon sources and focusing directly on emissions reduction, often complementing and building upon the foundation laid by RPS policies. Additionally, the use of competitive procurement authorities—where state entities solicit and contract for clean energy and power over long terms—serves as an indispensable mechanism to attract private capital, offer revenue certainty, and translate policy goals into tangible infrastructure projects. Together, they provide the necessary policy frameworks to guide energy markets, de-risk investments, and foster the growth of large-scale clean energy projects at the lowest possible cost.

The deployment of energy projects fundamentally requires private capital finance, at a cost that is determined in part by risk. The clean energy industry largely relies on private-sector investment to support clean energy project development, with private debt markets accounting for over 60% of global energy transition investments in 2023.[22] However, the energy transition will require continued and enhanced economy-wide actions funded by public and private investments and there are roadblocks to clean energy growth at the policy, program, and project levels. Maine will need to navigate a complex financing landscape, further complicated by policy uncertainty at the federal level, in order to attract the private-sector capital required to fund the development of new energy infrastructure.

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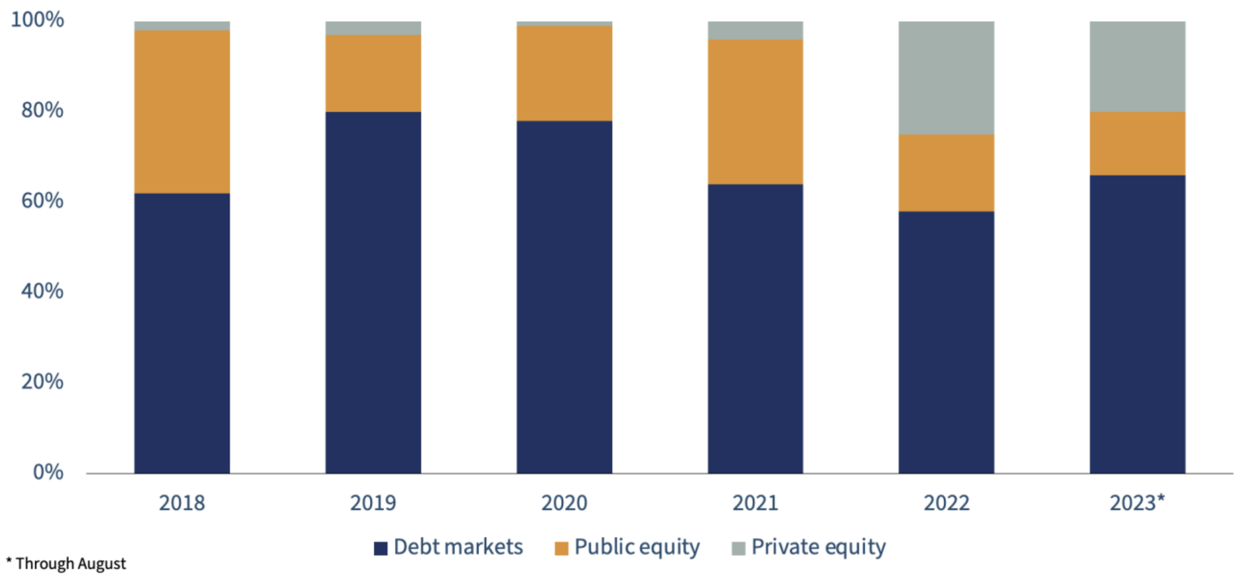
[20] https://www.maine.gov/energy/initiatives/renewable-energy/renewable-portfolio-standard

[21] https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-01/Maine%20Energy%20Plan%20January%202025.pdf

[22] https://www.spglobal.com/commodity-insights/en/news-research/blog/energy-transition/010824-financing-the-energy-transition

Figure 2: Global Energy Transition Investment Share by Capital Type[23]



* Through August
Source: Transaction data from S&P Global Market Intelligence (supplemented by Crunchbase, Refinitiv in the CapIQ platform)

Clean Energy Project Finance Capital Stack

The financing of clean energy projects can vary significantly, particularly based on their size and technology maturity. However, for the large clean energy projects in focus here, defined as utility-scale front-of-the-meter (FTM) projects exceeding $5 million, there is relative standardization in capital structure. Clean energy projects are often structured as project finance, where debt is secured against the project's assets and cash flows, and equity may come from developers and tax equity investors. As project size and maturity grows, the capital stack exhibits fairly consistent elements, with variability driven less by early-stage uncertainty (e.g., technology viability) and more by predictability of execution and cash flows over longer time horizons.

[23] https://www.spglobal.com/commodity-insights/en/news-research/blog/energy-transition/010824-financing-the-energy-transition

For large-scale clean energy projects, the project capital stack typically comprises several key components:

Tax Equity

This is a critical component that allows projects to monetize federal tax incentives like the Investment Tax Credit (ITC) and the Production Tax Credit (PTC). Investors provide upfront capital in exchange for these tax benefits and a portion of the project's cash flows. Tax equity can cover a significant portion of the project costs, often in the range of 30-50%.

Senior Debt Financing

This typically comes in the form of loans from commercial banks or financial institutions and comprises 50 -80% of total clean energy project costs. Senior debt represents the most secure and primary form of financing in a project's capital structure. It holds the highest priority for repayment in case of default or liquidation, meaning senior lenders are the first to receive proceeds from any asset sales before other creditors or equity holders. Due to this lower risk profile, senior debt typically carries the lowest interest rates compared to other forms of debt. Debt is often secured by the project's assets and the long-term revenue contracts, such as Power Purchase Agreements (PPAs), with typical tenors of 7-15 years for conventional energy projects and up to 20 years for renewable energy assets. Government loan guarantee programs, such as those offered by the U.S. Department of Energy (DOE), can enhance the debt component by reducing lender risk and improving terms.

Mezzanine Financing

Typically accounting for 10-20% of the capital structure, bridges the gap between senior debt and equity. Mezzanine financing is subordinate to the senior debt, meaning it has a lower priority for repayment in the event of a borrower's bankruptcy or liquidation. Mezzanine financing may be used to cover construction or interconnection, and act as a bridge to tax equity, among other uses. Green banks and state-sponsored investment funds increasingly participate in this layer, often offering below-market terms to catalyze private investment in clean energy projects.

Equity Investment

Typically, 20-30% of project costs come from project sponsors, strategic investors, and institutional investors. The combination of federal tax incentives (e.g., investment tax credits) and state incentive programs can make equity returns more attractive through non-dilutive alternatives and reducing outstanding capital needs, particularly in the renewable energy sector, leading to increased competition among equity providers.

The capital structure for energy infrastructure projects typically follows a layered approach, combining various funding sources to optimize risk-adjusted returns while ensuring project viability. Traditional project finance for clean energy infrastructure generally maintains a 50/50 to 80/20 debt-to-equity ratio, though this can vary significantly based on technology maturity, market conditions, and available government incentives. The interest rate on debt is lower than the return required by equity investors, making it a more attractive option for funding a significant portion of the project costs. Furthermore, predictable cash flow (e.g., from long term PPAs) makes clean energy projects attractive to lenders, as it ensures the project's ability to service debt obligations over the long term.

For project developers, successfully navigating both government incentives and private capital markets has become crucial for project execution. The ability to optimize these various funding sources, including the timing and structuring of government incentives, often determines project viability and long-term financial success. Creating a landscape which enables both the utilization of these incentives and the ability to appeal to private investors by reducing risk throughout the project life cycle, thereby increasing deal certainty, will help foster additional project activity in the clean energy sector.

Comparison to Fossil Fuel Project Capital Stack

The capital stack for large clean energy projects typically exhibits a higher proportion of debt compared to large fossil fuel projects. Clean energy projects, characterized by high upfront capital costs and predictable, long-term revenue streams, allow them to rely heavily on debt financing. These revenues primarily come from two contractual sources: Power Purchase Agreements (PPAs), which provide a fixed or agreed-upon price for the physical energy generated, and Renewable Energy Certificates (RECs), which are tradable commodities representing the environmental attributes of clean energy. The combined revenue from these PPAs and RECs is critical, as it underpins the project's long-term cash flows, enabling it to secure project finance debt. This debt is secured against the project's assets and these predictable cash flows. Equity in clean energy projects may come from developers and increasingly from tax equity investors who monetize tax incentives.

In contrast, large fossil fuel projects, while also capital-intensive, have historically relied more on equity financing, particularly with established players often funding new projects through retained earnings. While debt is still a significant component, the higher inherent risks associated with fuel price volatility and environmental regulations can make lenders more cautious, potentially leading to a lower debt-to-equity ratio compared to the often-contracted revenue streams of clean energy projects. While government support for renewable energy development has grown in recent years, these investments follow more than half a century of subsidies in the form of tax breaks to support the oil and gas industry in the United States.

Role of Government Mechanisms & Incentives

State government incentives and mechanisms are vital for creating favorable conditions for large-scale clean energy projects. By reducing financial barriers, establishing clear regulatory frameworks, and supporting market development, states play a crucial role in driving the clean energy transition and achieving their climate and economic goals. In Maine, state-level mechanisms such as the RPS provide revenue certainty through power purchase agreements (PPAs) and renewable energy credits (RECs), enhancing project bankability and enabling higher leverage ratios.

Federal tax incentives, particularly investment tax credits (ITCs) and production tax credits (PTCs), have historically played a pivotal role in project economics by reducing the needed upfront capital by 20-50% for qualifying renewable energy projects. Since the early 2000s, the federal government has provided a variety of ITCs and PTCs for technologies such as solar, wind, and water power. In recent years, the federal government has also created expanded opportunities for local governments, public power entities, and new developers because the new direct pay and transfer options allow more organizations to utilize clean energy tax credits. In addition to tax credits, federal mechanisms have included grants to provide upfront capital for specific types of projects such as innovative or rural energy projects. Conversely, changing federal and state policies and funding can create uncertainty regarding the continuation of economic support mechanisms and raise project development risk.

Role of Power Purchase Agreements and Renewable Energy Certificates

While not a direct source of capital, long-term PPAs and contracts for RECs with creditworthy off-takers (utilities, corporations, etc.) are fundamental to securing both debt and tax equity financing. PPAs and REC contracts provide a predictable revenue stream, which lenders and investors rely on to assess the project's financial viability and ability to repay obligations. The value of RECs, especially in compliance markets driven by RPS and CES policies, is often separated from the electricity price itself but is critical for determining a project's bankability. Virtual PPAs (vPPAs) are also increasingly in use across the country, especially by corporate buyers seeking to support renewable energy development in regions where they may not directly consume the power.

Section 3: Role of Risk Mitigation in Capital Attraction

Development Timeline & Risk Factors

Renewable energy projects face several forms of risk as they move from initial exploration to operation.[24] These can be bucketed into project development risk, construction risk, pricing risk, and operational risk, as shown below. Developers, investors, and policymakers can decrease risk broadly or at the project level through various tactics[25]. A stable policy environment that creates the conditions for project viability lowers the risk premium[26], making a market or project more attractive to private capital and helping secure lower-cost financing instruments.

By focusing on risk mitigation throughout the project life cycle, Maine can drive greater investment in large-scale renewable energy projects and associated transmission infrastructure while managing cost impacts, thereby supporting the state's energy and climate priorities. Risk mitigation efforts support the state's clean energy requirements and economic development goals by: 1) attracting more developers to the state to grow the clean energy portfolio; 2) increasing the percentage of projects that move forward to successful development, accelerating the timeline for more clean energy on the grid; 3) decreasing the time it takes for a project to come online and delivering clean and affordable energy; and 4) decreasing the cost of financing for projects in Maine to decrease the cost of delivered electricity for the residents of Maine.

Projects face several binary go/no go failure points during development, as detailed in Figure 3: Project Development Timeline. In Maine specifically, high interconnection costs and limited grid infrastructure, permitting timelines, geographic constraints, and a limited labor pool were cited in interviews as risks, which is supported by general assessments of

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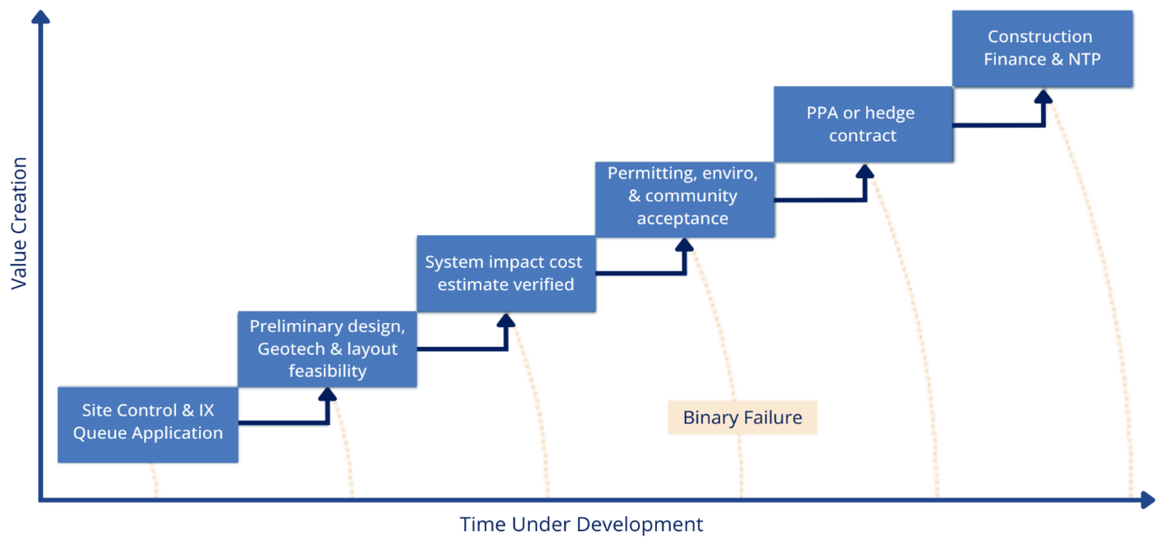
[24] https://www.sciencedirect.com/science/article/pii/S0301421520301816

[25] https://www.swissre.com/dam/jcr:3260a7b2-960d-48c4-9e4c-3ada7922aec0/Profiling-the-risks-in-solar-and-wind.pdf

[26] The risk premium in large clean energy finance refers to the additional return that investors or lenders demand as compensation for the perceived higher risks associated with these projects compared to less risky investments. It's the difference between the expected return on a clean energy investment and the return on a risk-free asset (like a government bond) or a benchmark with lower risk. A higher risk premium means a higher interest rate or higher required rate of return, which increases the cost of the financing to the borrower.

Maine and the ISO-NE. Maine's rural grid infrastructure and need for long tie lines to existing transmission results in expensive interconnection upgrades that can make projects financially unattractive. Policy uncertainty at the state level has also impacted investment confidence, leading to reduced consideration of Maine as a geography for projects according to stakeholders.[27] Reducing project attrition requires improved grid planning, stable policies, and workforce development. Addressing these risks will be essential to ensuring a reliable pipeline of renewable energy projects that meet Maine's climate and economic goals.

Figure 3: Project Development Timeline



Credit: Development Timeline, LevelTen Energy

Clean energy project development involves inherent risks, and a certain level of project attrition throughout the development life cycle is to be expected, as not every site evaluated for wind or solar installations will ultimately advance to the construction phase. From the perspective of capital providers, an optimal environment is one that de-risks projects early in the development process, ensuring that once construction financing is locked in, there will be few material changes to the costs and revenues of the renewable resource. Offtake prices are typically set based on the best estimate of costs and future market prices developed during the pre-construction phase, meaning that the longer the timeline between contract execution and project completion becomes, the more risk there is that a material change will occur and cause the project to become uneconomic.

[27] Subject matter expert interviews conducted by Banyan Infrastructure team January - April 2025

The following table details general information about categories of risk for clean energy project development and implementation. For further information on each risk category, please see Appendix 3.

Table 1: Risk Factors Overview

Project Phase	Risk	Description	Examples	Financial Impact
Development	**Siting**	Ability to identify and obtain site control of a suitable location for development	• A site is found not to be viable due to presence of wetlands • Landowner won't grant site control • Local community members have concerns about development	Ability to secure financing, higher costs due to need to cover failed development efforts, carrying costs from longer timelines
	Permitting	Ability to obtain required local, state and/or federal permits in a timely manner	• An Authority Having Jurisdiction (AHJ) puts a temporary moratorium on development of renewable energy projects to determine its permitting standards • Permits are challenged in court by community opponents	Higher costs due to need to cover failed development efforts, carrying costs from longer timelines, inability to access financing before permits are secured
	Interconnection and Grid Access	Ability to secure an interconnection agreement in a timely manner and at a reasonable cost	• Interconnection costs from the study process come in too high for financial competitiveness • Interconnection studies take years to complete, drawing out development timelines	Project is out of the market for offtake agreements, carrying costs from longer timelines, and willingness to provide financing before costs are known

Project Phase	Risk	Description	Examples	Financial Impact
Construction	**Loss or Damage**	Theft and other damage to equipment required for construction	• A hailstorm damages solar panels waiting to be installed • A wind turbine blade is dropped during construction, rendering it unusable	Higher costs due to equipment replacement, carrying costs from longer timelines to replace equipment
	Supply Chain	Ability to secure required equipment in a timely manner at the expected cost	• Construction is delayed due to transformer shortages • Delivery of solar panels is delayed due to implementation of new tariffs	Carrying costs from longer timelines
	Labor	Availability of labor pool with appropriate skill sets for construction activities	• Engineering, procurement, and construction (EPC) struggles to find qualified workers for a project in a remote rural area • EPC faces high housing costs for construction workers in rural areas	Higher overall costs, carrying costs due to longer construction timelines
	Construction Delays	Delays during the construction phase due to weather conditions, unforeseen site conditions, completion of interconnection infrastructure, or supply chain delays	• Harsh winter weather conditions create a short construction season and commissioning window • Unanticipated site conditions make installation of panel racking more difficult	Higher overall costs, carrying costs due to longer timelines, contract renegotiations

Project Phase	Risk	Description	Examples	Financial Impact
Pricing	**Counterparty**	Possibility of either party (developer or offtaker) defaulting on their contractual obligations related to project delivery and offtake payment	• A developer defaults on project delivery due to unexpected delays or costs • An offtaker goes out of business and defaults on PPA payments	Higher risk premiums, higher credit posting requirements
	Market Volatility	Change in the value of a renewable energy project or contract based on wholesale market prices	• Extreme weather causes a price spike • Regional outlook changes due to interconnection queue reform	Higher risk premiums, contract renegotiations
	Policy Change	Prospective or retroactive changes to policies that fund, support, or enable clean energy development	• Laws promoting clean energy are retroactively overturned • Administration change creates uncertainty about future of tax credits	Higher risk premiums, contract renegotiations
	Cost Overruns	Unexpected price increases may occur after a fixed-price offtake agreement has been signed	• Utility charges a higher cost than expected for construction of grid interconnection infrastructure	Pressure to renegotiate offtake agreements, higher risk premiums
Operating	**Extreme Weather**	Extreme weather events may damage project infrastructure or cause market conditions that create financial strain	• Windstorm damages solar panels • Winter Storm Uri causes default on shaped offtake agreements	Higher risk premiums

Project Phase	Risk	Description	Examples	Financial Impact
	Technology	Ability of the technology to perform as expected without unplanned outages, unexpected failure of project components, or unanticipated maintenance needs	• Inverter failure • Rate of degradation in solar panels over time	Underperformance on revenue forecast
	Curtailment	Risk of curtailed energy production due to renewable oversupply or transmission constraints — generally increases with rising renewable penetration in a region	• Oversupply of solar during midday periods in the spring leads to curtailment of renewable energy generation in California • Transmission constraints in west Texas cause wind farms to be curtailed	Underperformance on revenue forecast if curtailment is higher than anticipated
	Forecasting	Divergence of forecasted and actual energy production or variation in forecasting assumptions	• Two developers use different assumptions about resource potential and project downtime in their request for proposal (RFP) response, making it hard for utilities to compare costs on a 1:1 basis	Underperformance on revenue forecast if generation is lower than forecasted

Impact of Project Development Risk on Capital Stack

Because developers need to cover costs associated with unsuccessful early-stage development activities through their margins on successful projects, higher rates of failure in the initial project development phase may result in higher overall costs for clean energy in a region. Alternatively, developers who are unable to successfully move projects through early-stage development may move to a different geography or exit the industry altogether.

High interconnection costs can make it difficult for clean energy developers to secure signed offtake agreements because buyers are typically seeking low-cost resources and, without offtake agreements, it is challenging to secure development capital. Financiers may also demand higher returns for earlier-stage projects because of the potential for development-related risks to result in delays or harm the overall project economics.

Impact of Construction Risk on Capital Stack

Construction risk is a key consideration in the capital stack for clean energy projects, as cost overruns, delays, and contractor performance issues can impact financial viability. Investors typically assess construction risk by evaluating the developer's track record; the experience and financial stability of the engineering, procurement, and construction (EPC) contractor; and the comprehensiveness of the project plan and will typically demand a higher risk premium from less experienced developers or decline to finance those projects at all.[28] This is particularly relevant in Maine, where the state's clean energy requirements are driving new project development and attracting both experienced and new developers. As the state seeks to expand its renewable energy infrastructure, a thorough understanding of construction risk is essential for both investors and developers to ensure the successful and financially sound completion of these projects.

Impact of Pricing Risk on Capital Stack

Price changes after project financing has been secured can be particularly difficult for clean energy developers to absorb. Competition among clean energy developers is significant, resulting in relatively small profit margins.[29] In general, greater price certainty enables projects to access a lower cost of capital and provides assurances to the offtaker that the

[28] https://www.energy.gov/lpo/articles/how-doe-loan-programs-office-understands-and-manages-portfolio-credit-risk

[29] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4953515

project will deliver on time and within budget. Renewable energy projects are often sold to new owners at various stages of their development — offtake agreements signed early in the development process when a high degree of pricing uncertainty remains are particularly susceptible to requests from the new owner to renegotiate pricing.[30]

In some cases, financiers will decline to support clean energy projects unless offtake pricing is renegotiated, effectively forcing projects to renegotiate pricing or drop out of development. In response, offtakers may also demand higher security postings from clean energy developers as an attempt to hold developers accountable for the timelines and pricing they propose in the initial PPA.[31]

Impact of Operating Risk on Capital Stack

Elevated operating risks for clean energy projects influence financial structuring, as investors and lenders seek higher returns to compensate for uncertainties. Additional factors — such as extreme weather events, grid instability due to the increasing prevalence of “duck curve” days[32] and unplanned outages — contribute to the perception of higher risk among investors. To mitigate these concerns, financiers may require comprehensive insurance coverage against natural disasters, robust maintenance agreements, and the incorporation of advanced energy storage solutions to ensure consistent energy delivery. Demonstrating proactive risk management strategies can enhance project bankability and attract investment by reducing the perceived operational risks associated with a clean energy project.[33]

Maine-Specific Factors

Specific factors and conditions in Maine also apply to the development timelines and risks associated with renewable energy projects. These factors directly and indirectly impact investment in renewable energy in the state, with some contributing to a favorable environment and others serving as a barrier to capital investment. Some factors, such as geography, are challenging for any party to influence, while others, such as workforce availability, lend themselves well to policy solutions.

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[30] https://www.projectfinance.law/publications/2022/august/renegotiating-ppas/

[31] https://www.projectfinance.law/publications/2022/august/renegotiating-ppas/

[32] “Duck curve” days occur when midday electricity demand dips in tandem with high solar generation, followed by increasing electricity demand as solar declines later in the day.

[33] https://usea.org/sites/default/files/event-/Risks%20at%20the%20Margin%20Presentation.pdf

Geography and Climate Risks

Maine is part of the northeast regional electric grid, managed by independent system operator ISO New England (ISO-NE), as well as another grid managed by the Northern Maine Independent System Administrator (NMISA). Maine is planning grid improvements to address long-standing reliability challenges with the goal of building a more resilient grid and integrating more clean energy projects. More information on grid initiatives is available through resources like the 2025 Maine Energy Plan[34] and the DOER website[35]. The state has benefited from regional coordination efforts through ISO-NE, which has initiated transmission planning efforts to support the influx of clean energy resources such as their firm long-term transmission study.[36] Recent upgrades have improved reliability and increased capacity, enabling better integration of distributed generation assets.

Maine is well-positioned to expand its clean energy production, thanks to its significant offshore wind potential and existing renewable resources like hydropower, onshore wind, and solar. In addition, while onshore wind resources in the Northeastern U.S. broadly lag those in high wind regions of the country, Maine's wind resources are competitive within New England. On the solar side, cost declines have allowed solar installations to be competitive in Maine where solar resources are competitive within New England, even though the region receives significantly less sunlight than places like the American Southwest. This is evidenced by the 1,545 MW of solar deployed in Maine (as of 2024)[37].

Maine is a large, rural state. It can be challenging for developers to find parcels of land suitable for hosting larger 100+ megawatt (MW) projects.[38] Additionally, the rural nature of the state creates challenges for both grid infrastructure and workforce availability. For example, the location of attractive onshore wind resources far from existing transmission infrastructure drives high interconnection costs relative to other parts of the United States. The majority of onshore wind projects studied by ISO-NE from 2018 to 2021 were located in inland Maine: Projects in this rural area typically require the construction of long stretches of new transmission in order to connect to the existing grid, resulting in high interconnection costs.[39] Additionally, many areas within Maine that have high clean energy

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[34] https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-01/Maine%20Energy%20Plan%20January%202025.pdf

[35] https://www.maine.gov/energy/press-releases-firm-grant-announcement-oct-2024

[36] https://www.iso-ne.com/static-assets/documents/100008/2024_02_14_pac_2050_transmission_study_final.pdf

[37] https://www.maine.gov/energy/initiatives/renewable-energy/solar-distributed-generation

[38] Subject matter expert interviews conducted by Banyan Infrastructure team January - February 2025

[39] https://eta-publications.lbl.gov/sites/default/files/iso-ne_interconnection_costs_vfinal.pdf

potential are export-constrained because load in the region is limited and there is insufficient transmission capacity to move electricity to regions with higher loads.[40]

Image 3: Mountain Wind, DOER

Maine's climate drives a short summer construction season, which can create challenges for clean energy project developers. The harsh winters, with snow, ice, and frozen ground, significantly limit the time available for outdoor construction. This is a major factor for projects like utility-scale solar farms and onshore wind turbines that require extensive site preparation, foundation work, and installation. Developers must carefully plan their construction schedules to make the most of the limited fair-weather window. This may involve starting work in late spring or early summer to ensure the project can be substantially completed before winter sets in. As an example, with construction often starting in spring, solar project developers must perform commissioning testing under non-ideal winter conditions with low solar insolation, prolonging the time to commercial operation date.[41]

Climate also influences energy generation and demand. ISO-NE has experienced an increasing number of "duck curve" days, often on sunny days with mild temperatures. In 2024, ISO-NE reported 106 such days, up from 73 in 2023 and 45 in 2022, underscoring the need for effective demand management and energy storage solutions to maintain grid stability.[42] This leads to very low wholesale market prices during those hours when zero-

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[40] https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/Maine-RPS-Impacts-and-Procurement-Policy-Options-Report-Master-FINAL.pdf

[41] Subject matter expert interviews conducted by Banyan Infrastructure team January - February 2025

[42] https://www.mainepublic.org/climate/2025-01-06/in-2024-solar-contributed-to-the-new-england-grid-like-never-before

marginal cost supply is abundant and demand is low, paired with significant ramping costs in the early evening as the sun sets, both of which impact the cost associated with operating the grid.

Additionally, extreme winter weather events, including severe wind, flooding, and prolonged power outages, have become more frequent in Maine. Over the past two years, the state has endured nine significant natural disasters, leading to substantial infrastructure damage and highlighting the vulnerability of energy assets.[43] Costs associated with repairing damage to the electrical grid caused by natural disasters is categorized as a distribution expense, not a generation expense, but from a ratepayer perspective, the focus is typically on rising overall electricity costs, not the breakdown within specific categories.

Labor Risk

Maine's demographic trends, including a growing number of retirements among skilled tradespeople, present challenges for clean energy deployment and reflect broader national workforce shortages in key roles such as electricians and other essential clean energy professionals. Workforce shortages in Maine's clean energy sector have been well documented, with reports highlighting the challenges of reaching and attracting workers to various parts of the state.[44] Developing a 100 MW solar project creates about 1,100 construction jobs and a 100 MW wind farm creates about 400 construction jobs.[45]

Maine is proactively seeking to address workforce availability through programs like the Clean Energy Partnership, led by Maine DOER. The Clean Energy Partnership provides funding to clean energy-related workforce development and training programs, as well as supporting development of an online platform to connect workers with jobs and training opportunities.[46] These efforts aim to build a more sustainable labor pipeline and ensure that the state has the skilled workforce necessary to meet its clean energy deployment requirements. Additional workforce development and talent attraction programs are discussed in the Program Availability in Maine section of this report. These programs are

[43] https://www.maine.gov/governor/mills/news/maine-climate-council-releases-updated-2024-action-plan-2024-11-21

[44] https://www.maine.gov/energy/sites/maine.gov.energy/files/inlinefiles/2022%20Maine%20Clean%20Energy%20Workforce%20Report.pdf

[45] https://www.energy.gov/sites/prod/files/2019/05/f63/gagne-rule-thumb-ppt.pdf

[46] https://www.maine.gov/jobsplan/program/clean-energy-partnership-workforce-initiative

already demonstrating results, with the clean energy economy in 2023 accounting for over 2% of jobs in the state[47].

Jurisdiction and Policy

Several different entities hold jurisdiction over critical functions such as siting, permitting, and grid interconnection, with the potential for overlap and complexity under certain scenarios. Maine's home rule approach means there is no centralized permitting process for clean energy projects — each community has important authority over land use, permitting, and property taxation. Local opposition, often centered on visual impacts and concerns about potential impact on local character, can result in drawn-out permitting processes or local moratoria that slow development timelines and disincentivize developers from exploring projects in Maine. A recent national study by economic consulting firm E3 found that local moratoria became more common after state regulations to fast-track distributed energy resource (DER) deployment allowed the development of a wave of small projects in rural areas that were not subject to the same setback requirements as utility-scale projects.[48] Conversely, communities who are supportive of renewables development have the ability to create local policies that help fast-track project development and generate local economic benefit.

Thoughtful community engagement efforts focused on understanding the needs and concerns of host communities have helped some clean energy developers move projects forward. Stakeholders interviewed for this study noted that Maine has seen high levels of community engagement around clean energy development. Mainers care deeply about their heritage industries and the character of their rural communities. The goal of protecting natural resources and the character of Maine communities can at times appear to conflict with the goal of developing additional clean energy projects to meet the state's climate targets. This has led to a perception among some developers that Maine is a more challenging environment to move projects forward in than other states, limiting their interest in developing renewables in the state. In interviews, it was also noted that on the public perception side, rising utility bills paired with a narrative that clean energy is more expensive than fossil fuels have created confusion.[49]

[47] https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-03/2024%20Maine%20CEIR%20Final%20Version.pdf

[48] https://www.ethree.com/wp-content/uploads/2024/04/Renewable-Siting-and-Permitting-Policies-E3-Public-Version-04.17.2024.pdf

[49] Subject matter expert interviews conducted by Banyan Infrastructure team January - February 2025

Additionally, large-scale clean energy projects in Maine are subject to interconnection studies with ISO-NE. ISO-NE interconnection queues have grown substantially in recent years, rising from about 10 gigawatts (GW) in 2015[50] to more than 35 GW in 2023.[51] These backlogs and delays are not unique to New England; they are a nationwide issue that the Federal Energy Regulatory Commission (FERC) has sought to address through FERC Order No. 2023. In response to this order, ISO-NE has been directed to reform its procedures, shifting from a “first-come, first-served” serial study approach to a new “first-ready, first-served” cluster study process. This new approach groups multiple projects together for simultaneous review. The shift aims to streamline the process, reduce speculative projects, and provide more cost-effective solutions for developers. The transition to this new model is currently underway and the Transitional Cluster Study, which is expected to begin in late 2025, will be the first interconnection study under the new process.

Under the older serial study process, a recent industry scorecard that evaluated interconnection processes across the US assigned ISO-NE a low score,[52] and noted that ISO-NE has a relatively low interconnection volume. Portions of its system are highly constrained (including Maine and in southeast Massachusetts) and require cost-intensive upgrades, which are difficult to build and can chill interconnection.

This transition to the new “first-ready, first-served” cluster study process has introduced short-term uncertainty for some legacy projects in the queue.[53] For example, a solar project in Southern Maine, which was selected through the Maine Public Utilities Commission (MPUC)’s RFP process and filed for interconnection in October 2019, received its initial study results in June 2022. It then experienced multiple re-studies and delays due to factors like the withdrawal of other projects and the discovery of incorrect assumptions under the legacy process. The facility now has a target commercial operation date (COD) of September 2027[54], illustrating how the previous slow interconnection process and permitting challenges have delayed projects.

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[50] https://www.utilitydive.com/news/wind-solar-and-storage-take-up-95-of-iso-new-england-interconnection-queu/573680/

[51] https://www.iso-ne.com/static-assets/documents/100005/20231114_rsp_final.pdf

[52] https://advancedenergyunited.org/hubfs/2024%20Advanced%20Energy%20United%20Generator%20Interconnection%20Scorecard%20(1).pdf

[53] https://www.maine.gov/mpuc/sites/maine.gov.mpuc/files/inline-files/2023%20Annual%20Report%20Final.pdf

[54] https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocRefId={C02F2391-0000-C415-8599-FEF287801AA8}&DocExt=pdf&DocName={C02F2391-0000-C415-8599-FEF287801AA8}.pdf

The interconnection process is administered by ISO-NE under FERC's jurisdiction, and the location of a project's interconnection is the critical factor for determining which process it is subject to. Projects that interconnect to the Administered Transmission System are subject to ISO-NE's procedures, while smaller projects (typically under 10 MW) that connect to the distribution system may be governed by the MPUC, as outlined in Chapter 324 Small Interconnection Procedures. Utilities in Maine adhere to ISO-NE interconnection procedures. This includes System Impact Studies and Facilities Studies, and utilities implement the required infrastructure upgrades as outlined in executed interconnection agreements.

Project developers have reported significant changes from initial interconnection cost estimates and later requests from Maine utilities, with those changes sometimes occurring after the interconnection agreement had been executed and project construction was underway or even completed.[55] These costs can materially impact the financial viability of projects, and the practice by utilities of attempting to recover previously un-identified or undisclosed costs from developers later in the development process creates a perception of higher development risk among developers.

Developers also express concerns about the stability of the policy environment in Maine, raising, as an example, recent debate in the state around the net energy billing (NEB) framework, including 2025 legislation that implemented changes to the policy.[56] While NEB does not directly apply to larger-scale clean energy development[57], developers and investors expressed concern that rule changes in one area could apply other market segments in the future.[58,59]

Market Factors and Procurement

Maine's requirement of 100% clean electricity by 2040 represents a strong mechanism to drive further development in the state, where 67% of in-state electricity generation is from

[55] Additional information on this 2022 investigation is available here: https://mpuccms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocExt=pdf&DocName=%7BEEBE9AD8-68CA-4F65-9C44-81B502B28CB8%7D.pdf&DocRefId=%7BEEBE9AD8-68CA-4F65-9C44-81B502B28CB8%7D. Note that the case ended in a Stipulation and that "[t]he Stipulation addresses the issues presented in this proceeding through significant commitments by CMP.

[56] https://legislature.maine.gov/legis/bills/display_ps.asp?LD=1777&snum=132

[57] Projects were originally limited to less than 5 MW; projects as of January 2025 must be renewable generators less than 1 MW in size (https://legislature.maine.gov/doc/11392)

[58] https://www.jdsupra.com/legalnews/latest-updates-on-maine-s-net-energy-8076206/

[59] Subject matter expert interviews conducted by Banyan Infrastructure team January - February 2025

renewable resources[60] today, and across the region in support of Maine's 2040 targets. Both the RPS and CES are designed to allow eligible resources from across the New England region (and potentially the Maritimes) to qualify for compliance, ensuring that Maine benefits from the regional electricity market. The CES can lead to further development in a few different ways, including a signal about the seriousness of future development to investors, increased project revenue in the form of RECs (to track renewable generation) and a foundation for specific technology targets, such as the recent target of 400 MW of energy storage by 2030.

Maine utilizes a centralized procurement process, where the MPUC oversees the procurement of electricity required to serve standard-offer customers of the state's investor-owned utilities (Central Maine Power and Versant Power)[61], as well as historically overseeing clean energy PPAs. Maine is a deregulated state, and consumers have the option to select a competitive power supplier instead of receiving standard-offer service through their utility.[62]

Maine has seen substantial attrition of clean energy projects previously selected through the MPUC procurement process. In total, 71% of the 2,647.9 MW selected by the MPUC under Section 3210-C, Community Renewables, 3210-G, and 3210-I never moved beyond selection to contract (9%), had their contract terminated or termination was expected by the MPUC (58%), or withdrew post-selection (4%).[63] Determining the exact cause of attrition is challenging, but factors contributing to attrition for procurement include interconnection issues, as well as broad supply chain delays, permitting and local siting challenges, and high interest rates faced by the clean energy industry as a whole in the wake of the COVID-19 pandemic and are not unique to Maine. *An Assessment of Maine's Renewable Portfolio*

[60] https://www.eia.gov/state/?sid=ME

[61] As of July 2025, Governor Janet Mills has signed LD 1270 to create the Maine Department of Energy Resources, a new cabinet-level department that will lead State-level energy policy and programs, coordinate across State agencies and regional partners, engage with stakeholders, and address energy opportunities and challenges for Maine. The Department is also authorized to conduct competitive energy procurements to advance new, cost-effective clean energy projects that are approved by the Maine Public Utilities Commission (PUC). The Department is expected to formally launch later this year. Learn more at https://www.maine.gov/governor/mills/news/governor-mills-signs-legislation-establish-maine-department-energy-resources-2025-07-02

[62] https://www.maine.gov/meopa/electricity/electricity-supply

[63] Refer to Table 20 "Summary of Maine PUC Selected Projects (MW) by Program and Current Status" of this study: https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/Maine-RPS-Impacts-and-Procurement-Policy-Options-Report-Master-FINAL.pdf

Standard identifies several steps GEO (now the DOER) and MPUC can consider to support successful procurement of renewable energy going forward.[64]

One of the key risk factors in any PPA is the creditworthiness of both the project developer/owner and the offtaker. In Maine, Central Maine Power and Versant Power serve as the offtakers on renewable PPAs identified through the MPUC procurement process. Both utilities have a BBB+ credit rating at the parent company level.[65] Under those circumstances, utility offtakers are rarely asked to post security.[66] Because the clean energy industry relies heavily on project finance with limited or no recourse to the parent company, capital providers typically focus on the specific risk profile of a project, rather than the credit rating of the developer's parent company.[67] However, offtakers, especially utilities, are typically concerned about the creditworthiness of their counterparty and seek credit postings to assure that the project is delivered on time and within expected performance parameters.[68] Credit posting requirements may be higher for smaller for less experienced developers.

[64] https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/Maine-RPS-Impacts-and-Procurement-Policy-Options-Report-Master-FINAL.pdf

[65] Fitch Ratings

[66] https://www.stoel.com/insights/reports/the-law-of-solar/power-purchase-agreements-utility-scale-projects

[67] https://www.wsgr.com/PDFSearch/ctp_guide.pdf

[68] https://www.stoel.com/insights/reports/the-law-of-solar/power-purchase-agreements-utility-scale-projects

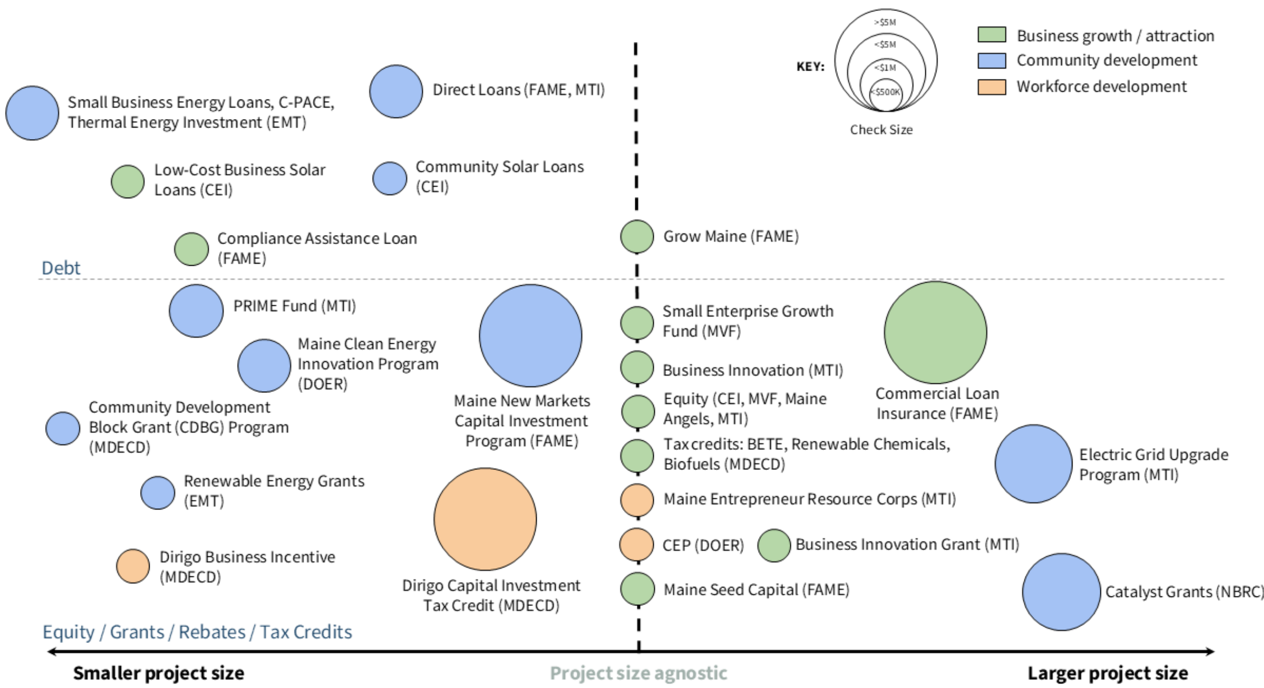
Section 4: Funding Program Availability in Maine

Maine Landscape

An overview of programs in Maine creates a baseline understanding of the state's current project finance landscape. There are a variety of programs and initiatives in Maine that are related to or otherwise contribute to energy affordability, resilience, economic development, and job creation in the state. Several programs provide financing and incentives for smaller projects (e.g., behind-the-meter projects) and prioritize supporting energy efficiency and clean energy for businesses, lowering energy costs, and mitigating greenhouse gas emissions. Other programs are targeted at emerging companies and promote innovation, provide capital for clean energy startups, and stimulate local economies through job creation. Finally, programs designed to support larger projects (e.g., FTM) can also play an important role in enhancing infrastructure and supporting large-scale clean energy projects to deliver affordable electricity for Maine communities.

Image 4: Downeast Wind, DOER

Figure 4: Landscape of Maine Programs with Potential to Finance Clean Energy Efforts[69]



Smaller & Behind-the-Meter Projects

The majority of programs evaluated in both Maine and comparable states focus on support for a range of relatively smaller (i.e., not meeting the "large" criteria defined above) BTM projects, such as residential and commercial energy efficiency and electrification and small community solar. These include programs such as direct loans from Efficiency Maine Trust (EMT), loans and financial assistance from Maine Rural Development Authority (MRDA), and small business solar loans from Coastal Enterprises, Inc. (CEI). Other programs support entrepreneurship and innovation of advanced energy and environmental technologies, such as the Maine Technology Institute (MTI)[70].

[69] This chart depicts programs that offer financing or forms of financial support for commercial and utility scale clean energy projects and associated infrastructure. It does not include other programs such as those for energy efficiency or single family residential.

[70] MTI offers direct loans of up to $1M to businesses to fund innovation-focused projects, including in the renewable energy sector up to $1M.

Benefits and Opportunities: By offering low-interest loans and tax incentives, programs like small business solar loans from CEI[71] and Small Business Energy Loans and Commercial Property-Assessed Clean Energy (C-PACE) by EMT[72] make renewable energy installations and energy-efficiency upgrades more accessible to businesses and communities. These investments may help lower energy costs, stabilize prices, and expand clean energy access, particularly in rural and economically distressed areas where infrastructure funding is often limited.

Beyond affordability, these programs can strengthen climate resilience by supporting DERs and efficiency measures that enhance grid stability. Investments in distributed generation, such as rooftop solar and battery storage, serve as local, resilient power sources during extreme weather events or grid outages, reducing reliance on centralized transmission. Energy efficiency is also an important tool to manage energy demand. Initiatives like GROW Maine by FAME[73] and direct loans from MTI attract investments that can foster innovation in clean energy and energy efficiency technologies in Maine. This growth fuels local job creation, expanding opportunities for skilled labor in clean energy installation and energy-efficient construction.

Image 5: Longroad Energy, DOER

[71] CEI offers loans ranging between $15k-$1M with interest rates of 6-8% over 5-7 years for solar installations on communities' facilities and organizations. https://www.ceimaine.org/financing/climate/#clean-energy-for-communities

[72] EMT offers loans ranging from $75K-$750K that cover up to 100% of the cost of an energy savings improvement for commercial property owners. https://www.efficiencymaine.com/docs/C-PACE_Program_Guidelines_12-20-2023.pdf

[73] FAME offers state income tax credits of up to $5M to investors to encourage equity investment in Maine businesses. FAME has allocated over $62M to this program. https://www.famemaine.com/business-financing/for-business-owners/fame-financing-programs/grow-maine-small-business-loan-capital-program/

Limitations: While these programs incentivize BTM project development across the state, there are three factors in these smaller, project-specific programs that prevent large-scale renewable energy projects from accessing available capital:

Funding Limitations

The maximum check sizes for loans (around $1 million for FAME, MTI, EMT, and CEI) are typically insufficient for large-scale renewable energy projects, which often require multimillion-dollar investments.

Focus on small businesses and community projects

Many programs cater to small businesses and community projects, leaving a gap for large commercial or industrial-scale renewable energy initiatives.

Lack of grant or equity funding

Among the programs supporting BTM projects, most offer loans rather than grants or equity investments, which could limit participation from developers without sufficient upfront capital

Larger & Front-of-the-Meter Projects

There are a handful of Maine programs that can be deployed in support of larger clean energy projects. These are FAME's Commercial Loans Insurance,[74] MTI's Electric Grid Upgrade Program[75], and Northern Border Regional Commission (NBRC)'s Catalyst Grants.[76]

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[74] Through this program, FAME offers loan insurance of up to $7M to incentivize commercial lenders to provide financing to businesses, including those in renewable energy. The total funds allocated by FAME for this program is $54M. https://www.famemaine.com/business-financing/for-lenders/commercial-loan-insurance/

[75] MTI has allocated $8M to support electric grid upgrades for Maine-based business operations and projects that will create significant economic impact and create quality jobs for Maine residents. The maximum check size under this program is $4M. $6.5M has already been disbursed as of 2024. This program was active when this study was initiated, but as of July 2025, the program has been moved to the "Completed Programs" page of the MTI website and may no longer be available. https://www.mainetechnology.org/impact/completed-programs/

[76] The Catalyst Program offers grants ranging between $50K-$30M to public entities, non-profits, and Indian Tribes for economic development initiatives that will modernize and expand the four-state region's basic infrastructure and revitalize communities to support and attract the region's workforce. The total available capital is $50 million and over $7.3M has been disbursed in 2024. https://www.nbrc.gov/userfiles/files/Catalyst%20Program/2025%20Catalyst%20Program%20Overview_FINAL%20omb%20approved%2012192024.pdf

These programs can be leveraged to fund infrastructure projects that enhance the electric grid and support broader economic development. As with the BTM programs above, these mechanisms have a strong focus on economic development and job creation in Maine and its surrounding states.

Benefits and Opportunities: These programs have the potential to contribute to Maine's energy affordability, climate resilience, economic development, and job creation. The Commercial Loan Insurance program could be used as a credit enhancement to incentivize Maine lenders to finance a business' energy projects in Maine, thereby improving access to capital and/or lowering the costs of capital. The Electric Grid Upgrade Program funds electric grid upgrades for Maine-based business operations and projects, allowing them to invest in new infrastructure, expand operations and facilities, and grow their workforce. Additionally, Catalyst Grants stimulate long-term economic development by supporting projects that modernize infrastructure, including energy projects. By revitalizing rural communities and creating job opportunities, these grants help reduce energy disparities and foster growth in areas that may otherwise face higher energy costs.

Limitations: There are limits similar to those identified in programs for BTM projects that hinder large-scale clean energy development in the state:

Too few options for FTM projects

With only three primary programs, there are fewer capital stack options for large-scale FTM renewable energy projects in Maine compared to programs for smaller-scale BTM projects.

Limited overall capital availability

While the initial capital pools for these programs were relatively large, significant portions have already been allocated (e.g., through the Maine Jobs and Recovery Plan), reducing the availability of remaining funds for new applicants. Funding that could be directed to helping reduce risk in project development, and reduce overall cost and size of capital, could result in streamlined projects that have lower overall funding costs, and lower delivered cost of electricity.

Maine's collection of energy project finance programs can enhance energy affordability, climate resilience, and economic growth. Programs for smaller projects can lower energy costs and bolster climate preparedness, while investment funds for emerging companies continue to drive innovation, support clean energy startups, and create jobs. Larger FTM project initiatives strengthen infrastructure, expand renewable energy capacity, and improve grid reliability.

Company-Level Financial Programs

Maine boasts many programs, initiatives, and investment funds that emerging or small businesses can leverage to support their clean energy installations. The majority of programs reviewed in this report fall under this category. These include the Dirigo Capital Investment Tax Credits from the Maine Department of Economic and Community Development (DECD),[77] the Compliance Assistance Loan from FAME[78], and equity investments by MTI[79] and Maine Venture Fund (MVF).[80]

These programs support clean energy startups and small businesses through funding, tax incentives, and workforce development. These company-level programs represent a broad set of tools, including equity investments, tax incentives, and workforce development opportunities that can help companies scale, encourage capital investment, and develop a skilled labor force. Collectively, these initiatives promote innovation, economic growth, and Maine's transition to a resilient clean energy economy.

Benefits and Opportunities: These programs can play an important role in advancing energy affordability, climate resilience, economic development, and job creation in Maine. By offering grants, tax incentives, and loans, these programs help clean energy companies reduce their operational costs, which can lead to lower energy prices in the long term. For instance, Low-Cost Business Solar Loans from CEI help businesses adopt clean energy, decreasing their reliance on fossil fuels and stabilizing energy prices. Programs like the Department of Energy Resources (DOER) Clean Energy Partnership foster job creation by developing a skilled workforce and supporting innovation for the growing clean energy sector.

[77] Capital investment credit of up to 10%, $2K per worker, or $2M per business per year for five years. https://www.maine.gov/decd/business-development/financial-incentives-resources/incentives/dirigo

[78] Loans of up to $400K over up to 15 years to help businesses finance the renovation, removal, disposal or replacement of certain oil storage facilities or tanks and certain air quality improvement equipment. https://www.famemaine.com/business-financing/for-business-owners/fame-financing-programs/direct-loan-programs/compliance-assistance-loan-program/

[79] MTI's Business Innovation Funding offers grants, loans, and equity investments ranging between $10K-$250K for innovative Maine companies, including in industries like renewable energy. https://www.mainetechnology.org/explore-funding-programs/business-innovation-funding/

[80] MVF offers equity investments ranging between $100K-$2M for Maine-based emerging companies. https://www.maineventurefund.com/find-funding/faq/

These initiatives also strengthen Maine's climate resilience by supporting companies to adopt clean energy that avoids greenhouse gas emissions and enhances energy efficiency. The Dirigo Capital Investment Tax Credit incentivizes the development and deployment of new technologies which support the state's clean energy requirements. Moreover, programs such as MVF's equity investments and FAME's Maine Seed Capital Tax Credits encourage investment in emerging clean energy companies, spurring economic development by attracting capital and fostering innovation. This, in turn, supports Maine's transition to a clean energy economy, creating new business opportunities and promoting sustainable growth.

Limitations: As with other project-specific programs, however, there are several gaps in the programs geared toward emerging companies' clean energy adoption:

Limited funding for large-scale projects

The available check sizes range between $100,000 and $1 million. While helpful for small and medium-sized businesses, these figures may be insufficient for large-scale clean projects.

Focus on business resilience and innovation over expansion

The emphasis of most of these programs is on small-scale resilience and sustainability improvements, rather than enabling large-scale clean energy development.

Limited direct support for manufacturing and renewable energy supply chains

While some programs support research and development (R&D) and early-stage innovation, there is less focus on scaling clean energy manufacturing, particularly for wind and solar components.

Section 5: Objectives & Solutions

Maine possesses a strong foundation of state-led programs and private capital investment on which to build, with the goal of accelerating clean energy project development in the state. State funding should be limited in its scope to provide a bridge to address risks and barriers to energy development with the purpose of lowering overall costs of delivered energy, and to provide ratepayers and taxpayers with affordable energy that benefits communities. Still, state governments have significant influence over the ability to bring capital to their jurisdiction, and levers exist to attract this investment without requiring Maine to directly provide new pools of capital to investors and developers.

Project financing is largely driven by private-sector investors, with a standard set of government support mechanisms (e.g., tax credits) improving project economics. While ample private capital exists to finance new infrastructure projects that meet the capital market's traditional risk/reward profile in the State of Maine, decisions to deploy capital are influenced heavily by the set of risks inherent in each project. A state's ability to reduce project risks across core areas and create clear sets of rules can influence both new development and the attraction of new capital.

The rest of this report explores opportunities to attract capital through addressing these project risks. The report identifies solutions and specific actions that support four objectives: increasing awareness and engagement, expediting project timelines, increasing deal certainty, and expanding capital and workforce ecosystems.

Based on interviews and analyses of the risks identified with project development and construction in Maine, four objectives were identified, including:

Increase Awareness and Energy Information

Developers and stakeholders identified the need for factual, evidence-based information to support clean energy development. Best practice sharing — both between communities and with developers — is needed to address questions about energy projects. Best practice sharing can be integrated with the implementation of local ordinances. Increasing the understanding of both energy project types and impacts is critical for engagement with communities and developers.

Expedite Project Timelines Through Engagement and Analysis

Permitting uncertainty and long timelines can lead to higher project costs and investment reluctance, according to both interviews and empirical research. There is a need to provide analysis on permitting processes and improvements, as having better data on permitting timelines at the state and local level can provide more certainty to all stakeholders. There is also a need to have more direct support to engage communities with project developers earlier through direct technical and financial assistance (e.g., grant funding to defray the upfront costs of site identification and selection).

Increase Deal Certainty

Maine has more than a decade of experience implementing the direct request for proposal (RFP) process for renewable energy projects and is considering modifications to this process with the legislature. This new process would more closely align with the Maine Energy Plan and allow for more timely procurements and incorporate broader climate and clean energy requirements to incentivize effect projects in the state. By incorporating key risk factor mitigants through the RFP, Maine could help minimize the potential that projects fail to materialize or fail to perform as expected and increase certainty at the state level, addressing a gap that was expressed in interviews and through analyses of the project approval queue in Maine.

Expand Capital and Workforce Ecosystem

While private-sector capital is available for clean energy project financing, there are a number of new potential public-sector capital programs that would expand availability of resources to energy developers. These could serve as programs to support energy development. Meanwhile, Maine has been pursuing new workforce development programs; supporting initiatives that specifically address clean energy jobs that can help Maine in addressing workforce gaps identified by project developers.

Each of the four objectives (labeled O#) has one or more solutions (labeled S#) conveying strategies, programs, and policy recommendations to support the objectives. There are a total of seven solutions, summarized in Figure 5 below. These solutions were discussed through interviews with stakeholders relevant to the State of Maine as part of the diligence process.

Figure 5: Objectives and Solutions for State Support of FTM Clean Energy Projects

	Objective	Solution
01	Increase Awareness And Energy Information	1. Support Jurisdictions In Developing Local Regulatory Frameworks 2. Improve Energy Education and Awareness Through Fact-Based Information Resources
02	Expedite Project Timelines Through Engagement And Analysis	3. Evaluate Permitting and Siting Processes and Explore Opportunities 4. Connect Communities and Developers Through Technical Assistance
03	Increase Project Certainty	5. Enhance Procurement Processes and Contracting
04	Expand Capital And Workforce Ecosystems	6. Promote Capital Solutions for Large Clean Energy Projects with Non-Traditional Risk Profiles 7. Address Workforce Gaps Through Programs

O1: Increase Awareness and Access to Energy Information

The solutions presented in this section focus on increasing awareness and engagement regarding clean energy projects in Maine, particularly addressing risks pertaining to siting, permitting, interconnection, and areas of local government domain. These solutions recognize the importance of stakeholder engagement, knowledge sharing, and capacity building to ensure a balanced and informed approach to clean energy development. The solutions also draw on successful state and national programs to provide actionable recommendations for Maine. Relevant state and national programs can be found in Appendices 1 and 2.

S1: Support Jurisdictions in Developing Local Regulatory Frameworks

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting**	Helping jurisdictions proactively develop the regulatory frameworks that apply to energy projects allows developers to focus siting in appropriate locations. Standardizing property tax calculations can create greater clarity for project pricing.
	Permitting	Proactive planning prevents permitting delays. Best practice sharing and technical assistance enable communities with limited resources to create structures that align with their local priorities.

Proposed Solutions

To support local jurisdictions while respecting home rule, state agencies can focus on the development of a voluntary, state-supported ordinance guidance package and a coordinated support platform for municipalities. This would enable communities to develop policies that align with their priorities and empower them to engage with energy project developers in an informed manner. Guidance should touch on all types of energy projects, including wind, solar, energy storage, and transmission, each of which brings a unique set of siting considerations and best practices.

Partnerships where DOER provides energy expertise and other Maine-based organizations provide expertise on local community development and engagement could be a fruitful avenue for disseminating these resources, leveraging each organization's existing channels while providing capacity-building knowledge from energy experts within DOER. Government entities with strong local community engagement capabilities include the newly formed Maine Office of Community Affairs (MOCA) and Department of Economic and Community Development (DECD), while the Maine Municipal Association is also an important stakeholder for conversations focused on municipalities.

Potential Actions

Model Ordinances and Guidance: There is an opportunity to develop model ordinance language for solar, energy storage, onshore wind, and transmission infrastructure. While ordinances themselves require technical language, the supporting materials should be accessible to non-experts and tailored to Maine's legal and planning context. Supporting materials could also discuss the tradeoffs associated with various approaches in a factual manner, helping municipalities think through how to align local policy with the priorities of their community.

Enhance Property Tax Best Practices: Similar to the model ordinance work, Maine agencies can support the development of best practices and methodologies for assessing the taxable value of large energy projects. This could include collaborating with appraisal experts to develop detailed guidance about how to apply various valuation methodologies, including case studies or examples from specific projects. Encouraging local appraisers to use a widely accepted approach would eliminate a source of uncertainty regarding total project costs, yielding more accurate cost estimates and pricing for projects.

Disseminate Fact-Based Information on Community Benefits Agreements[81]: Maine agencies can also help facilitate best practice development on both the structure of Community Benefits Agreements (CBAs), serving as a neutral convener for best practices on how to negotiate CBAs with communities and tracking lessons learned on delivery of CBAs.

Conduct Outreach, Engagement, and Capacity Building: Developing best practice documentation and sample ordinances is the first step in successfully executing this recommendation. Once the resources exist, support is needed to ensure that municipalities that would benefit from these materials are aware of them. Additionally, facilitated opportunities for peer-to-peer knowledge sharing, discussion, and capacity building are important components to ensure that the resources are accessible to local decision makers.

Periodic webinars, workshops, and office hours could be used to help orient municipalities to the available resources. Peer-to-peer sharing opportunities for municipalities, which could be in-person, virtual, or asynchronous, are also highly valuable and facilitate knowledge transfer between municipalities that have already experienced energy project development and those that are new to the process. This helps disseminate best practices more rapidly, increasing the number of municipalities with clear guidance for developers to follow.

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[81] A Community Benefits Agreement (CBA) is a legally-binding contract between a project developer and a community coalition. It ensures that the community receives specific, tangible benefits from an energy project in exchange for its support. These benefits can include commitments to local hiring, job training programs, environmental protections, and financial contributions to a community fund.

Establish Knowledge-Sharing Platform: Establishing a searchable online repository focused on siting ordinances and taxation resources could help improve knowledge sharing and best practice dissemination within the state. Resources of this type are often hosted by either government entities or public universities, and include downloadable templates, local case studies, and FAQ sheets. This resource would not be a repository of all existing policies, as that type of resource is currently available at the national level. Materials should be updated regularly to reflect legal changes, new technologies, and feedback from involved stakeholders.

Deploying this solution requires investing resources in several key activities:

- Development of best practice materials, model ordinances, valuation methodologies, and depreciation schedules
- Staffing resources to facilitate best practice sharing and knowledge dissemination
- Creation and maintenance of an online portal housing relevant materials in a single location
- Capacity building and other technical assistance support for local municipalities seeking to implement siting ordinances
- Periodic refreshes of best practices, model ordinances, and other relevant materials

S2: Improve Energy Education and Awareness Through Fact-Based Information Resources

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting**	Fact-based, targeted outreach and initiatives to ensure that all communities, regardless of socioeconomic status or geographic location, have a voice in the clean energy transition and can benefit from it

Proposed Solution and Potential Action

Enhance Access to Fact-Based Information Resources
DOER can build upon and expand existing educational resources and initiatives to facilitate the efficient and effective implementation of clean energy projects in Maine. The DOER website already serves as a primary source of information, however there is an opportunity to create more easily accessible resources that are tailored to the needs of different stakeholders (e.g., residents, developers, municipalities).

O2: Expedite Project Timelines through Engagement and Analysis

The solutions presented in this section focus on increasing the availability of data in the development phase and the provision of services to communities and developers for support with advancing large clean energy projects. These solutions can address risks associated with siting, permitting, and interconnection that involve developers and local communities interacting with parties across the state and potentially at the federal level. It emphasizes the importance of stakeholder engagement, knowledge sharing, and capacity building to expedite processes and project development timelines. The section also draws on successful state and national programs to provide actionable recommendations for Maine.

S3: Evaluate Permitting and Siting Processes and Explore Opportunities

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting**	Increase awareness over siting jurisdiction and data.
	Permitting	Provide transparent information on the role of different state entities for permitting and make data available on local and federal permits for major state projects.
	Interconnection and Grid Access	Increase data availability for permitting processes.

Proposed Solutions

Permitting and siting processes cannot be made efficient by a single entity alone, and the complexity of the permitting and siting environment can pose challenges to creating an expedited development process. However, there are options for the state to consider across multiple domains.

Add Technology Solutions

There are continuous advancements in technologies that can support permitting and siting. As an example, while there is a “one-stop shop” for state permitting, a state-developed portal to address process challenges could be refined to streamline permitting at the local, state, and federal levels.

Commission a Permitting and Siting Study: Commission a study to evaluate permitting for generation, transmission, and storage to have quantitative data of the timelines and costs associated with different technologies and projects. Such a study could explore permitting, with a specific focus on generation and transmission, as well as timelines and evaluation of local and interstate processes, to provide quantitative data of the timelines and costs associated with different technologies and projects. The study could also identify key areas for more standardized negotiations as part of the project development process, including ranges of financial acceptance and negotiation of property taxes.

Evaluate Existing Efforts and Ongoing Coordination

Maine has developed a number of efforts to streamline permitting through DEP. However, evaluation of existing processes and potential for multi-agency collaboration could be undertaken to further enhance local, state, and interstate siting and permitting.

Potential Actions

Add Technology Solutions

To enhance systems and technologies, the state can consider:

- Developing an internal RFP among state partners to identify existing capabilities and opportunities for improvement. The purpose of this effort would be to evaluate current procurement of information technology (IT) opportunities, as well as ongoing environmental review and monitoring, and to identify top potential investments to modernize permitting and siting information collection and dissemination.
- Evaluating the development of a platform similar to other states that details the permitting processes and needed paperwork for all types of energy generation, storage, and transmission projects in a transparent way on a state-owned website.
- Identifying funding available to augment existing capabilities, like using the application of artificial intelligence (AI) to support permitting.

Commission a Permitting and Siting Study

To shape a study focused on permitting, Maine could:

- Aggregate existing data on permitting and siting. Coupling this data with any existing timing and/or permitting data could serve as a strong foundation for this research.
- Release an RFI on permitting timelines and cost data to inform preliminary analysis before issuing any RFP for a permitting study.

- Release an RFP for a permitting and siting study to explicitly examine the cost and timelines associated with local, state, and interstate permitting for large FTM projects, including forecasted amounts for offshore wind.

Evaluate Existing Efforts and Ongoing Coordination
To evaluate opportunities for greater coordination across various agencies throughout the permitting process, Maine could:

- Develop educational materials on the permitting process that are accessible to developers and communities.
- Evaluate the current process of intrastate permitting and identify future improvements.

S4: Connecting Communities and Developers Through Technical Assistance

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting**	Work with stakeholders early in the process to address time delays and community acceptance.
	Permitting	Local ordinance and permitting can delay projects. Connecting developers in a streamlined way with communities through early engagement could reduce costs and accelerate times for projects with community support.
	Interconnection and Grid Access	While not directly supporting the interconnection process, addressing timelines for project securing can help to accelerate the process.

Proposed Solutions

Communities and developers share a fundamental interest in a reliable and stable energy supply. This reliability provides ratepayers with consistent power and offers developers a predictable market for their investments. Furthermore, successful infrastructure development directly contributes to economic growth through job creation in construction, operation, and maintenance, and indirectly benefits ratepayers via increased local tax revenues. Developers must earn community acceptance for their projects, and while short-term costs may be a point of contention, both parties ultimately benefit from cost-effective, long-term energy solutions, leading to lower bills for ratepayers and better returns for developers. The adoption of technological advancements also presents a shared benefit, offering improved service and environmental advantages to ratepayers, and opening new markets and operational efficiencies for developers. Both groups have a vested interest in meeting Maine's clean electricity targets, contributing to a cleaner environment and a more resilient energy grid.

To provide support for communities to defray the upfront costs of site identification and selection, as well as technical assistance through access to dedicated resources such as staff or consultants, Maine can create a program that provides both technical assistance and grant funding for project development.

This solution's best practices for developers and communities can be combined with best practices for ordinance development. While valuable and information-rich, these voluntary guidance materials can only go as far as interested municipalities are willing to embrace them, underscoring the need for funding and collaboration to not only leverage guidance materials but walk municipalities through the process of adopting and tailoring updated zoning ordinance rules to meet both community needs and state policy goals.[82]

Communities could be engaged specifically in the energy planning and siting process, by providing them with both the technical and financial resources to offset early costs associated with this stage and requests from developers of communities for knowledge and resources. Creating a program that combines direct financial assistance with technical assistance can build off lessons learned from other state and federal programs.

Potential Actions

Technical Assistance

Maine can consider providing assistance for communities navigating the earliest stages of a project being developed. This could range from technical diligence to environmental compliance. The following steps include potential processes to develop the list of technical assistance providers and offering:

- Advance development of resources programs for local governments — like model ordinances — and best management practices, to help them thoughtfully consider how energy infrastructure may fit into local comprehensive plans.[83]
- Aggregate technical assistance providers, in combination with internal resources and documents, to prepare before the launch of any program offering to communities.

[82] https://acadiacenter.org/resource/the-energy-is-about-to-shift/

[83] https://acadiacenter.org/resource/the-energy-is-about-to-shift/

- Develop an RFP for nonprofit and for-profit entities, as well as universities, to develop a menu of technical assistance measures and support offerings for communities. Technical assistance offerings could include technology evaluation, environmental engineering, water quality assessments, community benefits negotiations and considerations, and disposition assessments, among other key elements needed for development.
- Foster a transparent and inclusive process for negotiating Community Benefits Agreements that builds community understanding and support and allows communities to define their priorities, thereby reducing risks that projects fail to align with community interests.

Grants for Engagement

Funding for staff support of community engagement could be negotiated as a part of any technical assistance program, but these initial steps should be contemplated:

- Develop right-sized expectations of grant funding for grants to support communities alongside technical assistance. Ensure financial resources are adequate for communities to participate in the program through empirical assessment and engagement.
- Provide funding and resources for staff to participate in the program over a 12- to 18-month-long process.
- Develop a solicitation to detail areas of opportunities for communities to partner with developers to participate in engagement programs, potentially in collaboration with MOCA.

O3: Increase Project Certainty

The solution presented in this section focuses on increasing project certainty via RFP process improvements. Bidding for projects and contractual negotiations represent some of the greatest uncertainty throughout development. There are a variety of opportunities to streamline processes and enhance deal clarity, many of which can be applied in Maine. These include adding transparency, reducing process timelines, creating stronger guarantees, and contemplating the broad range of considerations such as risk allocation. Executed effectively, each action represents an opportunity to reduce execution timelines and uncertainty, leading to more engagement and lower costs for Maine stakeholders.

S5: Enhance Procurement Processes and Contracting

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting**	Lay initial groundwork with confidence in ability to build projects.
Pricing	**Counterparty**	Create transparency and align with best practices.
	Market volatility	Properly allocate risks across relevant stakeholders.

Proposed Solutions

Increase Transparency and Planning

Creating transparency around procurement can deliver benefits in the form of increasing developer engagement, reducing bid prices,[84] and enabling more activity and investment in advance of RFPs being issued. Stakeholders may be more willing to engage knowing that investment in a bid may result in another opportunity to bid in future procurements, and a broader group of stakeholders can be encouraged to engage in both the pre-procurement discussion and response to the RFP itself with more time to plan and a big-picture focus in mind. However, stakeholders caution that excessive planning, pre-engagement, or repetitive requests for information (RFIs) that do not quickly advance toward a timely award can introduce new challenges. Therefore, the goal of transparency and planning must be centered on the swift achievement of project outcomes, i.e., effective action.

Actionable steps to create more transparency in procurement include establishing a multi-year procurement schedule[85], which can include varying levels of detail, from minimum volumes by year and by load-serving entity (LSE), similar to the California Public Utilities Commission (CPUC)'s 10-year requirement in California,[86] or more specific technology-based targets in line with the New York State Energy Research and Development Authority (NYSERDA)'s three-year schedule for large-scale renewables in New York.[87] Regardless of method, transparent procurement processes include enough specificity to enable meaningful engagement and adherence to timelines defined.

[84] https://www.nrel.gov/docs/fy17osti/69080.pdf

[85] Legislation enacted in Maine during the study period aims to implement this approach by requiring the establishment a 2-year procurement schedule. See An Act to Establish the Department of Energy Resources, H.P. 845, 132nd Legislature, §10313 Competitive Solicitations. [Link: https://legislature.maine.gov/legis/bills/getPDF.asp?paper=HP0845&item=1&snum=132]

[86] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M269/K933/269933879.PDF

[87] https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?Mattercaseno=15-E-0302

To provide visibility and enable maximum participation once RFPs are released, Maine can also enhance pre-RFP stakeholder engagement processes where appropriate (e.g., workshops, requests for information or feedback) and provide early notification of planned RFP release. Early notification could include a plan for engagement, RFI milestones, and a draft of the RFP[88]. Combining one or more of these approaches with incentives to avoid delays throughout the process could facilitate a decrease in overall procurement and execution timelines.

Provide Additional Contract Detail for Awarded Projects

Maine can enhance RFPs by including draft contract terms and subsequent contracts by including standard language, greater detail relevant to the awarded clean energy project(s), and narrowed points of negotiation. Implementing these changes can decrease execution timelines, associated legal costs, and execution risk. These adjustments can also bring more parties into the conversation due to increased understanding of requirements and likelihood of execution.

Actionable steps to advance this goal include providing documents with more specific definitions of negotiable terms and requirements for bidders during the RFP process. This may take the form of a predefined agreement akin to Electric Reliability Council of Texas (ERCOT)'s Standard Offer Agreement [89]or contracts provided alongside each RFP with clear delineation of non-negotiable and flexible terms, with the goal of minimizing post-award legal negotiation. Bidders can be required to identify expected deviations during the proposal process to flag pre-approved terms for specific types of projects.[90,91]

Add Flexibility to Price Guarantees in Long-Term Contracts

Price volatility can hamper clean energy project development, as lenders may view power plant investments as too risky if pricing is unpredictable, or as counterparties seek to renegotiate terms. Maine routinely incorporates long-term fixed pricing for energy and/or renewable energy credits (RECs) in generation contracts, evidenced by the initial Northern

[88] Legislation enacted in Maine during the study period aims to implement this approach by requiring RFPs to be filed with the Maine PUC for approval before issuance, providing substantial advance notice to interested parties. See An Act to Establish the Department of Energy Resources, H.P. 845, 132nd Legislature, §10313 Competitive Solicitations. [Link: https://legislature.maine.gov/legis/bills/getPDF.asp?paper=HP0845&item=1&snum=132]. In addition, the Maine PUC issued a draft RFP on 10/3/2025 for comment in the Northern Maine procurement process. [Link: https://mpuc-cms.maine.gov/CQM.Public.WebUI/MatterManagement/MatterFilingItem.aspx?FilingSeq=131389&CaseNumber=2024-00099]

[89] https://www.ercot.com/services/rq

[90] The term "security" refers to collateral or guarantees that lenders require to finance a project.

[91] https://mn.gov/puc/activities/economic-analysis/community-solar-gardens/

Maine Procurement's Standard Form Power Purchase Agreement (PPA)[92] and the 2024 RFP for the Sale of Energy and REC to Promote the Reuse of Contaminated Land's Standard Form Contract[93]. This is a common practice in the region and across the U.S.

To add flexibility to the pricing guarantees in long-term contracts and further mitigate the risk of pipeline attrition, Maine can consider including price adjustment clauses, on an optional basis, that allow the price of goods or services to be adjusted based on specific external factors[94]. Factors may include inflation, changing costs for raw materials, rising tariffs, labor costs, taxes, or other economic conditions. The consideration of price adjustment clauses is a direct response to market volatility, and a mechanism to try to balance the risk between developers and ratepayers. When considering implementation, DOER should evaluate utility and developer tolerance for managing risks associated with price adjustment clauses, as well as a potential government role in financial risk mitigation should either party stand in opposition. NYSERDA, for example, is party to energy and REC purchase contracts[95], whereas in Maine, the contracts are between utilities and bidders.

Price adjustment clauses in long-term PPAs involve careful balancing of interests and risks. They offer valuable mechanisms for managing long-term uncertainties and ensuring the financial sustainability of projects. However, they also introduce complexity and expose both counterparties and ratepayers to certain risks. The specific design and terms of these clauses are crucial in determining the ultimate balance of benefits and drawbacks for each party. Careful negotiation and a thorough understanding of the chosen indices and formulas are essential to creating PPAs that are fair and effective for all stakeholders.

Where implemented, price adjustment clauses should be simple and formulaic to minimize room for interpretation. For example, NYSERDA included inflation indexing in its recent large-scale renewable energy solicitations to "help mitigate the financial risks faced by developers due to fluctuating costs." Specifically, the state agency includes inflation indexing as a formulaic and optional item within standard form agreements for large-scale,

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[92] https://www.maine.gov/mpuc/sites/maine.gov.mpuc/files/inline-files/2021%2000369%2023%20Feb%2022%20Standard%20PPA%20Final.docx

[93] https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocRefId={10DC6C92-0000-C63A-9854-D23CFF713790}&DocExt=pdf&DocName={10DC6C92-0000-C63A-9854-D23CFF713790}.pdf

[94] https://www.icertis.com/learn/price-adjustment-clause/#:~:text=These%20clauses%20reference%20an%20economic,line%20with%20broader%20economic%20trends.

[95] https://www.barclaydamon.com/alerts/psc-to-nyserda-offer-renewable-developers-rec-bidding-flexibility-to-meet-governors-clean-energy-standard

land-based renewable energy solicitations and offshore wind solicitations[96]. Such clauses may encourage long-term contracts when inflation is high and minimize the need for price renegotiations that can strain counterparties.

Finally, software can be leveraged to digitize, standardize, and centralize information on price adjustment clauses across procurements, and/or integrate artificial intelligence with existing contract management software to automate discovery and calculation of price adjustments based on predefined formulas and market data. This would provide regulators with key information on which contracts required the use of a price adjustment clause, type of clause, and magnitude of the adjustment. However, any system designed to centralize this level of financial and contractual detail must be approached with extreme caution, prioritizing robust cybersecurity, data confidentiality, and the protection of proprietary market information to avoid unintended consequences.

Digitize Processes

Digitized platforms represent a way to further streamline procurement. While many of the benefits accrue in the form of reduced administrative burden, centralized digital platforms can provide increased transparency, more efficient communication, standardization and tracking of data, and more efficient document sharing and review. Digitization can supplement many of the other actions discussed in this report to further streamline processes and enhance replicability. Digitization is also key for continuous iterative improvement, enabling insight into where projects get stuck, or where and why they drop out of the process.

Digitization could consist of a few different elements to enhance processes. One element of digitization could be a centralized platform for bid submission and evaluation, similar to the PJM Interconnection's Capacity Exchange Portal[97] or New York's Office of Renewable Energy Siting and Electric Transmission (ORES) application portal.[98] These platforms provide a standardized approach to bid submission and tracking, with the ability to understand how submissions are progressing at varying levels of granularity. These can be further supplemented with standardized data and form requirements to ensure submission of specific documentation in desired formats, increasing the ability to track and compare data while also embedding written guidance on best practices.

[96] https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/RES-Tier-One-Eligibility/Solicitations-for-Long-term-Contracts/2024-Solicitation-Resources

[97] https://www.pjm.com/markets-and-operations/rpm.aspx

[98] https://dps.ny.gov/ores-permit-applications

Reduce Post-Selection Timelines

Post-selection contracting represents a significant opportunity to further enhance procurement efficiency. The post-selection process today varies by project, with timelines and degrees of stakeholder engagement varying by project. Actions to address post-selection contracting can provide broader visibility into timelines, decrease uncertainty associated with extended negotiations, provide role clarity, and reduce associated costs. Potential actions include setting firm milestones and defining specific, time-bound opportunities for various parties to engage in order to reduce timelines and associated uncertainty.

Implementing structured timelines with clear, enforceable deadlines can reduce contracting periods. This includes defining specific milestones, the number of days to achieve these milestones, and actions which are triggered in the event that milestones are not met. Pre-established fallback provisions for common negotiation sticking points combined with maximum negotiation windows can further streamline the process. The California Renewable Auction Mechanism Program[99] demonstrates how defined timelines with automatic intervention for missed deadlines can accelerate project development.

Active facilitation represents another opportunity, where either DOER or stakeholders with procurement or regulatory authority assign dedicated staff to oversee negotiations. Regular progress reporting against milestones, joint issue resolution sessions, and coordinated teams from utilities, developers, DOER, and MPUC staff can help maintain momentum throughout the process. Additionally, parallel processing of interconnection studies, permitting reviews, and other approvals during contract negotiations could further condense development timelines.

Potential Actions

While most actions identified require relatively low engagement, the complexity varies significantly throughout the solution set. Execution can be broadly assessed as:

- Adjustments to RFP and contract design
- Adjustments to stakeholder engagement throughout procurement process
- Procurement and/or creation of new technology tools to support processes
- Exploration of roles and responsibilities during procurement process

[99] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/rps/rps-procurement-programs/rps-renewable-auction-mechanism

- Longer-term planning, execution, and communication

Enhancements to procurement represent a broad set of actions which can have significant influence on engagement, risk, and resulting costs. The benefits of adjustments to the procurement process are detailed throughout this section. In summary, these include:

- **Encouraging broader developer engagement** through increased transparency, decreased risk associated with delays, and approachable procurements with optional features such as price adjustment clauses. Doing so may promote competition and render the process more efficient, ultimately lowering project costs for ratepayers.
- **Increasing speed to deployment** through decreasing contracting timelines and defining risks which can be addressed in advance.
- **Decreasing project costs** by reducing timelines and administrative and legal burdens associated with contracting.

O4: Expand Capital and Workforce Ecosystems

The solutions presented in this section focus on expanding the ecosystems of capital and labor to support a diverse set of clean energy projects in Maine. The goal is to support projects with broad public benefits and challenging risk profiles that struggle to obtain capital from traditional sources and balance the supply and demand of a clean energy workforce during construction. It emphasizes the importance of using existing procurement mechanisms and partnerships in decision-making and solution design. The section also draws on successful state and national programs to provide actionable recommendations for Maine.

S6: Promote Capital Solutions for Large Clean Energy Projects with Non-Traditional Risk Profiles

Project Stage	Risk	Mitigation Measures From Solution
Development	**Siting, Permitting, and Interconnection**	Early-stage funding for feasibility studies, environmental assessments, and technology validation. Concessional loans or grants to cover development costs. Financing for projects in underserved communities or in particular locations that need it most (i.e., locational value).
Construction	**Supply Chain**	Loan guarantees and insurance products to protect against construction-related risks. Long-term, low-interest loans to finance construction. De-risk the supply chain.
Pricing	**Counterparty, Market Volatility**	Credit enhancements. Long-term agreements at more favorable interest rates than typically available in the market.
Operating	**Technology**	Flexible financing for early-stage technologies.

Proposed Solutions

Public Finance: Operationalize State Revenue Bond Authority for Large-Scale Energy and Transmission Projects

Revenue bonds represent a critical financing mechanism for state and local governments, enabling the funding of specific projects that generate their own revenue streams. Unlike general obligation bonds, which are backed by the full taxing power of the issuer, revenue bonds are secured by the revenues derived from the operation of the financed project, such as tolls, user fees, or lease payments. Green bonds are a type of bond where the proceeds are specifically earmarked for environmentally friendly or "green" projects, and they combine the revenue-generating aspect of traditional revenue bonds with a commitment to environmental sustainability and pursuit of the public interest. For example, the revenue generated by a green project (e.g., a solar farm selling electricity) is used to repay the bondholders. These bonds adhere to standards that ensure the projects funded have positive environmental impacts. Additional information on the use of bond financing is available through the US EPA[100] and US DOE[101].

Several state entities outside of Maine have successfully utilized revenue bonds to fund energy and transmission projects, demonstrating the feasibility of this approach (refer to

[100] https://www.epa.gov/statelocalenergy/municipal-bonds-and-green-bonds

[101] https://www.energy.gov/sites/default/files/2020/11/f80/Leveraging-Bond-Financing_resource-summary_0.pdf

Appendix 2's S5 writeup for detail on Massachusetts, New York, and Connecticut green bond programs). However, it's crucial to acknowledge that the legislative, regulatory, and market landscapes in these examples diverge from Maine's. Therefore, a thorough examination of existing and new legislative and authoritative powers within Maine would be required to implement a similar revenue bonding strategy. Additionally, further study would be required to define specific goals, priorities, benefits, and constraints for issuing municipal bonds or green bonds for large-scale energy and transmission projects.

Blended Finance: Expand State-Level Capabilities Through Innovative Capital Solutions

As states plan to meet their decarbonization, grid resilience, and energy affordability policy objectives, innovative financing approaches like state green banks can be leveraged to accelerate investments in energy and infrastructure projects.[102] There are many ways that blended finance entities active in Maine could work with large-scale private capital investors, including direct market-based lending, co-lending, loan guarantees, favorable lending rates and credit enhancements, warehousing, and securitization[103]. No entity in Maine appears to have the specific mission or resources to support large-scale energy projects, but several entities could develop such a capability.

Public Finance: Expand Use of Federal Energy Finance Programs for Large-Scale Energy Projects[104]

Federal government funding acts as a catalyst, bridging the gap between innovative energy technologies and their widespread commercial adoption. Historically, it has played a significant role in supporting the development of various energy technologies, from nuclear to energy storage. DOER should continue to monitor federal activity and seek to participate in programs, as they arise, that are well suited to supporting large-scale energy projects in Maine and mitigating project risks that might otherwise render them "unbankable".

Establish a Large Clean Energy Project Finance Working Group

By taking steps outlined above to attract additional funding, DOER could steer human and capital resources toward partnerships that may become instrumental in supporting large-scale energy and transmission projects. Partnerships may be expanded with entities

[102] https://www.nga.org/publications/green-banks-an-overview-for-governors/

[103] https://www.nga.org/publications/green-banks-an-overview-for-governors/

[104] Note that the One Big Beautiful Bill Act significantly defunds and refocuses the DOE's Title 17 loan programs that previously offered significant support for large clean energy projects.

around the state tasked with deploying capital solutions such as Efficiency Maine Trust (EMT) and those with existing bonding authority such as the Finance Authority of Maine (FAME), and new public-private partnership models may be explored. Additional efforts to expand existing partnerships in-state and across the region could include:

- The Maine Community Resilience Partnership (CRP)[105], a collaboration with the Governor's Office of Policy Innovation and the Future (GOPIF) that offers grant funding. DOER could encourage pairing grants with blended finance to leverage new forms of capital for resiliency projects. One example is the Montgomery County (MD) Green Bank's innovative "Protecting the Path to Net Zero" initiative, where they seek to "promote multi-benefit investments to enhance clean energy, climate resilience, water management and community wellbeing and health improvements."[106]
- Incorporate project finance concepts, including blended finance and new forms of public finance, into MECERP[107], a collaboration with the Maine Department of Economic and Community Development (DECD) that provides technical assistance to communities to help them revitalize current and former industrial sites with excess electrical capacity to create jobs, grow local economies, and accelerate the clean energy transition.
- Incorporate project finance concepts, including blended finance and new forms of public finance, into community planning and implementation assistance such as that available through MOCA.
- Continue to pursue regional or multi-state efforts in support of existing grid modernization efforts (e.g., New England States Transmission Initiative[108]) and new energy projects (e.g., multi-state hydrogen hubs[109] or the Connecticut, Massachusetts, and Rhode Island regional offshore wind coordination[110]).

Initiate Discovery of Large-Scale Project Opportunities with Unique Risk Profiles
Multiple mechanisms offer a path to discovering market needs on the path to attracting private-sector capital to Maine. This activity entails calculated engagement with parties experienced in planning and funding for large-scale project opportunities.

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[105] https://www.maine.gov/future/climate/community-resilience-partnership

[106] https://mcgreenbank.org/ppnz/

[107] https://www.maine.gov/energy/initiatives/mecerp

[108] https://portal.ct.gov/DEEP/News-Releases/News-Releases---2023/CT-ME-MA-NH-RI-and-VT-Working-Together-on-Multi-State-Transmission-Infrastructure

[109] https://www.nga.org/publications/advanced-grid-technologies-governor-leadership-to-spur-innovation-and-adoption/

[110] https://www.nga.org/publications/advanced-grid-technologies-governor-leadership-to-spur-innovation-and-adoption/

Under existing authority, DOER and MPUC use RFIs to discover market needs pertaining to project opportunities and technical questions necessary to bring projects to fruition. By adding questions pertaining to off-market risks for energy projects of high public interest, capital market failures, and conditions under which the private sector would find opportunities more attractive, DOER can obtain participant feedback with which to guide subsequent actions.

Similar logic applies to regional energy project engagement and preparing to apply for new federal funding, such as Title 17. Example regional processes include Independent System Operator — New England (ISO-NE) transmission planning and clean energy procurements that require regional[111] and/or federal participants. DOER could follow a commonly used playbook to issue an RFI (e.g., MassDevelopment[112]), discover large project opportunities, and inform negotiations with the federal government to secure program-aligned financial assistance.

Potential Actions

Expand DOER's capacity for discovering large-scale clean energy project market needs:
As an initial step, DOER could establish a working group to focus on large clean energy projects risks that may be solved through new finance solutions. The working group may be tasked with conducting a number of activities:

- Consider the appropriateness and efficiency of capital to ensure alignment with public interest. Assess project risks, financing solutions type and purpose, and fund size. Examine the full scope of infrastructure financing tools including loan guarantees, debt products, and equity stakes for DOER or another public entity in Maine.
- Evaluate the need for new revenue bonding authorities linked to energy projects at an existing state-level entity. Engage with in-state and regional agencies with experience in bonds.
- Assess federal funding opportunities for use in support of large-scale energy projects. DOER and its partners could play a role, on behalf of Maine residents and businesses, in helping to identify candidate projects and connecting proponents to

[111] https://www.mass.gov/news/massachusetts-and-rhode-island-announce-largest-offshore-wind-selection-in-new-england-history

[112] https://www.massdevelopment.com/assets/document/meeting-notices/2024/lpo-rfei.pdf

capital providers.

- Establish a preference for repeatable and scalable solutions. Ensure capabilities are designed to respond in a timely fashion to new funding opportunities and adapt if existing funding sources become unavailable.
- Run a public RFI process soliciting information on the needs of large-scale clean energy projects in Maine from developers, municipalities, large institutions like hospitals or universities, and other interested stakeholders.

Promoting capital solutions for large clean energy projects with challenging risk profiles can unlock a broader array of projects in Maine, including ones that may align with the public interest but not fit the risk profile of traditional capital providers. DOER's exploration of market needs and the landscape for new capital providers with higher and more diverse risk tolerances than traditional capital markets could lead to:

- **Discovery of project opportunities with challenging risk profiles** that struggle to obtain traditional forms of capital but would serve the public interest if built.
- **Expanded partnerships** via participation in the large-scale clean energy project finance working group and data sharing to properly allocate or mitigate risks across multiple risk categories.
- **Broader ecosystem for capital** including finance products from non-traditional sources, enabling greater resiliency to policy reversals.

S7: Address Workforce Gaps Through Programs

Project Stage	Risk	Mitigation Measures From Solution
Construction	**Labor**	Availability of labor pool with appropriate skill sets for construction activities.

Proposed Solutions

Building on current initiatives with construction labor risk in mind, Maine can consider focusing deployment of capital on EPC workforce development efforts and operations post-construction. Implementing some of the existing plans that Maine has set forth is important: for instance, like growing the reach of the Maine Clean Energy Jobs Network[113], a new online training directory and job board, to reach employers and jobseekers with the Maine Department of Labor's Career Centers and other partners.

[113] www.mainecleanenergyjobs.com

Potential Actions

Shaping Future Maine Clean Energy Partnership Workforce Programs

When evaluating the next round of awardees of the Maine Clean Energy Partnership, DOER can consider building off some of the good work done in previous rounds of grants, but focus on some of the areas that were articulated by developers interviewed for this study:

- **EPC and Trade Positions Preparation:** Focus specifically on training construction positions for installation of energy projects, including the skilled trades necessary, like electrical workers, project managers, construction managers, and other laborers.
- **Interstate Programs to Address Regional Gaps:** Fund the development of interstate programs to address the construction labor gap[114].

Increasing Coordination with Other State Energy Offices on Workforce Gaps

Even in the absence of funding available to create new workforce programs, there can be an effort to create interstate workforce coordination, particularly on temporary construction jobs for installation of energy projects. By creating and participating in working groups and seeking coordinating between state energy offices, there may be ways to share best practices and create opportunities for information sharing on addressing the skills gap for construction.

[114] One example is the Interstate Renewable Energy Council's National Clean Energy Workforce Alliance program, which operates at the national level (https://irecusa.org/programs/the-national-clean-energy-workforce-alliance/).

Summary of Solutions

This report presents seven key solutions that support four objectives to induce private capital for clean energy projects: increasing awareness and engagement, expediting project timelines, increasing deal certainty, and expanding capital and workforce ecosystems (Figure 6). Furthermore, to support the seven solutions, the research team identified 17 specific actions with the potential to address various project risks.

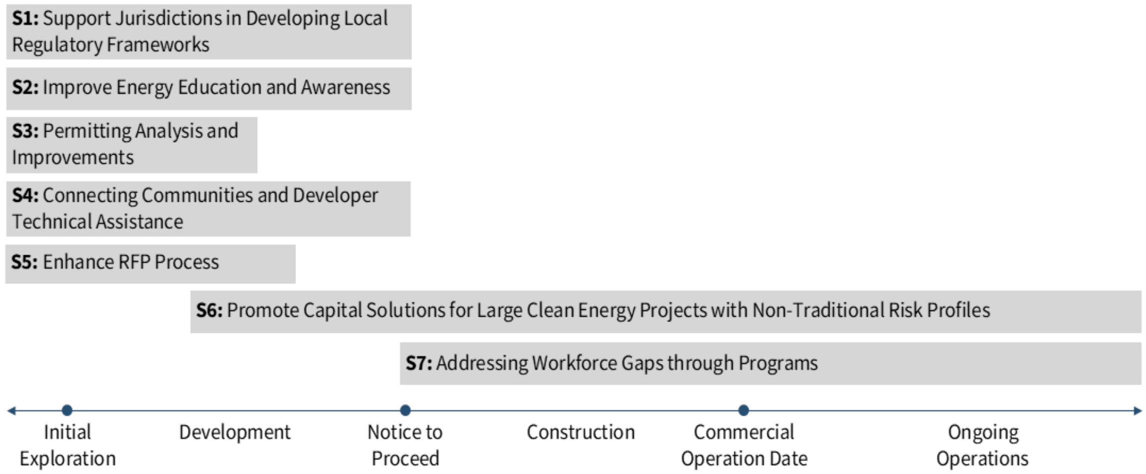
The majority of solutions identified serve to mitigate development risk prior to notice to proceed (NTP). This reflects the variety of project development risks inherent in siting, permitting, and grid access and interconnection, and the breadth of potential solutions and interventions which can increase the early-stage project funnel. Note that this subset involves two primary mechanisms for intervention: enhancing the procurement process and improving conditions in which developers, communities, and permitting authorities interact.

Several other solutions comprise actions or highlight research from other states that use the procurement process as a potential mechanism for change. For example, increasing transparency and engagement prior to the release of an RFP can drive engagement and reduce some of the risks inherent in running a procurement process, while adding long-term price considerations would entail introducing new contract terms and potentially engaging new contracting parties to support these obligations.

Solutions which impacted the majority of a project lifecycle involve deployment of capital and addressing workforce needs. This report recommends establishing a working group to explore the financing needs of large clean energy projects, including those with less proven risk profiles that may be unable to attract traditional forms of private capital. This includes both first of a kind projects and solutions-oriented procurements to unlock a broader range of project opportunities that may be in the public interest.

Finally, enhancing access to fact-based information tailored to the needs of multiple stakeholders can help build understanding of, and support for, projects that lead to benefits to communities and ratepayers.

Figure 6: Proposed Solutions Mapped to Project Lifecycle



S# = Solution Number

Conclusion

The state aims to diversify its electricity resources and shift towards a more clean, abundant, and affordable energy portfolio, with targets to achieve 80% clean electricity by 2030 and 100% clean electricity by 2040[115]. This report identifies strategic actions that can accelerate clean energy development and facilitate economic development in Maine. The state's clean energy targets require a substantial infrastructure buildout and significant capital resources to achieve. Maine already embraces clean energy deployment. Most of the in-state electricity generation comes from clean sources today, however realizing the state's 2040 energy ambitions will require additional measures to speed up deployment.

Creating the environment for accelerated clean energy financing in Maine can be achieved by focusing on four objectives:

1. Increasing awareness and engagement
2. Expedite project timelines through engagement and analysis
3. Increasing project certainty
4. Expanding capital and workforce ecosystems

This report came to the above conclusion after extensive research, in-depth stakeholder interviews, and independent analysis. By analyzing the existing clean energy financing landscape and potential mechanisms to accelerate affordable energy deployment in Maine, the solutions proposed here seek to highlight potential pathways to attract and deploy capital more effectively.

Each action proposed in the report would address key risk factors that currently limit development and drive up project costs, and the study team recommends pursuing all solutions over time, in alignment with evolving legislative, budgetary, and strategic priorities. This study should be formally reviewed and updated on a regular basis to ensure its recommendations remain aligned with Maine's evolving energy and climate goals. Furthermore, the study team proposes the state view these actions through two primary

[115] https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/energyplan2040

lenses to balance the interests of stakeholders in Maine and, ultimately, benefit ratepayers in Maine:

Prioritize actions designed to support local communities, and developers engaging with local communities, through technical assistance, state policy, and leadership (S1-S4). Key actions include enhancement of model ordinances to cover multiple technologies, provision of property tax guidance for municipalities, streamlining the permitting process, and establishing a dedicated program that offers technical assistance and direct grant funding to communities during early-stage project development. Given Maine's tradition of home rule, where local jurisdictions have significant authority over land use, permitting, and taxation, developers face a complex landscape. To succeed, projects must prioritize community engagement with the goal to accelerate project development and reduce administrative burdens while maintaining environmental and community safeguards. Maine communities building large clean energy projects realize substantial benefits, including reduced energy costs, job creation, increased local tax revenue, and improved public health through cleaner air, all while fostering greater energy independence and resilience. These recommended actions would enable local governments to proactively establish balanced frameworks for clean energy project development and meaningfully engage with developers, thereby reducing project attrition and ensuring local priorities remain central to the energy transition.

Prioritize enhancements to procurement processes and energy programs that entice private sector engagement and promote competition (S5-S7). The report identifies five distinct actions to streamline the procurement process that would expedite project timelines and increase deal certainty, one to explore new capital solutions for projects with non-traditional risk profiles, and two to help address clean energy workforce gaps. Most of the procurement process improvements can be implemented in the near term, e.g., defining standard contract terms with RFPs and clearly identifying negotiable elements to reduce contracting time and costs, while a longer term opportunity includes establishing a multi-year procurement schedule with clear timelines, milestones, and consequences to provide greater certainty for developers and stakeholders. Developing a procurement framework that appropriately distributes risks among developers, utilities, and ratepayers could yield benefits such as encouraging broader developer engagement, increasing speed to deployment, and decreasing project cost. Promoting capital solutions for large clean energy projects with non-traditional risk profiles aims to expand the capital ecosystem and help Maine capture the public benefits of projects traditional private capital might overlook. Promoting workforce solutions entails developing and expanding training programs, apprenticeships, and vocational education specifically tailored to the needs of the clean energy sector, thereby helping to ensure that Maine has a robust and qualified workforce to support the state's clean energy transition. By supporting the market ecosystem in these ways, Maine can increase certainty and expand solutions to capital and workforce challenges, thereby enticing private sector interest, promoting competition, and lowering the cost of delivered energy to the Maine market.

Taken in concert, implementing these recommendations can empower Maine to decrease execution timelines, create a more attractive environment for energy investment, and reduce costs to build infrastructure. This strategic approach aligns with the state's aggressive clean energy targets, balances private sector and ratepayer interests, generates economic benefits for host communities, and ultimately delivers affordable energy to all Maine ratepayers.

Figure 7: Technical Assistance, State Policy and Leadership Solutions

<table>
<tr><th>Objective</th><th>Solution</th><th>Recommended Actions</th></tr>
<tr><td rowspan="5">O1: Increase Awareness and Energy Information</td><td rowspan="4">S1: Support Jurisdictions in Developing Local Regulatory Frameworks</td><td>Model Ordinance and Guidance</td></tr>
<tr><td>Enhance Property Tax Best Practices</td></tr>
<tr><td>Conduct Outreach, Engagement, and Capacity Building</td></tr>
<tr><td>Establish Knowledge Sharing Platform</td></tr>
<tr><td>S2: Improve Energy Education and Awareness Through Fact-Based Information Resources</td><td>Enhance Access to Fact-Based Information Resources</td></tr>
<tr><td rowspan="4">O2: Expedite Project Timelines through Engagement and Analysis</td><td rowspan="3">S3: Evaluate Permitting and Siting Processes and Explore Opportunities</td><td>Add Technology Solutions</td></tr>
<tr><td>Commission a Permitting and Siting Study</td></tr>
<tr><td>Evaluate Existing Efforts and Ongoing Coordination</td></tr>
<tr><td>S4: Connecting Communities and Developers Through Technical Assistance</td><td>Establish Program to Provide Technical Assistance and Grant Funding for Project Development</td></tr>
</table>

Figure 8: Energy Procurement & Energy Program Solutions

<table>
<tr><th>Objective</th><th>Solution</th><th>Recommended Actions</th></tr>
<tr><td rowspan="5">O3: Increase Project Certainty</td><td rowspan="5">S5: Enhance Procurement Processes and Contracting</td><td>Increase Transparency and Planning</td></tr>
<tr><td>Provide Additional Contract Detail</td></tr>
<tr><td>Digitize Processes</td></tr>
<tr><td>Add Flexibility to Price Guarantees in Long Term Contracts</td></tr>
<tr><td>Reduce Post-Selection Timelines</td></tr>
<tr><td rowspan="3">O4: Expand Capital and Workforce Ecosystems</td><td>S6: Promote Capital Solutions for Large Clean Energy Projects with Non-Traditional Risk Profiles</td><td>Establish a Large Clean Energy Project Finance Working Group</td></tr>
<tr><td rowspan="2">S7: Address Workforce Gaps Through Programs</td><td>Shape the Next Maine Clean Energy Partnerships Workforce Program</td></tr>
<tr><td>Increase Coordination with Other State Energy Offices on Workforce Gaps</td></tr>
</table>

List of Appendices

Appendix 1: Complementary and Exemplary Federal Programs

The federal government has historically developed several programs that support clean energy research, development, demonstration, and deployment. These have included non-dilutive (i.e., no requirement to surrender equity) funding mechanisms, mostly in the form of grants and technical assistance, as well as dilutive loan programs.[116] The funding has ranged across a number of agencies, including the DOE, Department of Agriculture (USDA), Department of the Interior (DOI), Department of Transportation (DOT), and Environmental Protection Agency (EPA), among others.

Historically, these have served as force multipliers for state funding, complementing efforts at other levels of government. These programs encompass a variety of mechanisms that can be utilized in Maine to support clean energy projects in rural and remote communities. The following sections contain information about the programs that have been administered that could be viewed as a) complementary to state-level efforts and/or b) models for potential implementation of state-level programs.

Federal Funding Programs[117]

The federal government has historically provided funding through various mechanisms to support FTM projects. This includes non-dilutive funding mechanisms, mostly in the form of grants and Technical Assistance (TA), as well as dilutive loan programs. The funding has ranged across a number of agencies, including the Department of Energy (DOE), U.S. Department of Agriculture (USDA), Department of Interior (DOI), Department of Transportation (DOT) and the Environmental Protection Agency (EPA), among others. This section details statutory programs that are administered by agencies that could complement state-level funding.

Maine should continue to monitor any new programs released by the federal government, as well as maintain an active catalogue of federal funding already provided to support

[116] https://www.energy.gov/sites/default/files/2023-10/OCED_Rural-Remote%20Fed%20Overview.pdf

[117] This is not a full comprehensive assessment of all of the federal funding programs that could support local and state-level energy infrastructure deployment.

project implementation, like it does with its Bipartisan Infrastructure Law dashboard[118]. The programs also encompass a variety of mechanisms that can be utilized in Maine to support energy projects in rural and remote communities, which may be focused on distributed energy for smaller-scale systems rather than projects over 5 MW.

Grants and Technical Assistance Programs
The federal government administers both grants and technical assistance in support of energy infrastructure. There are several agencies that have statutorily mandated programs that provide grants and technical assistance for project development, site assessments, and workforce development.

For grant programs, these typically provide funding for a minimum three-year period of performance. Funding often requires a cost share match on behalf of the recipient, as well as federally-required reporting and documentation of results. There are generally no federal restrictions on combining federal funding with non-federal funding, including state programs, philanthropic donations, or private capital. This provides leverage for federal funds to combine under cost share to augment any private or state capital brought to projects.

Grant-supported projects can still access federal energy tax credits as applicable. A project is generally eligible for the full value of federal clean energy tax credits, such as the investment tax credit, as long as any federal grants received are taxable. Untaxed grants must be subtracted from total project costs before calculating the value of the investment tax credit.

This source of funding can take time to process, as a typical federal grant program can take anywhere from 12-18 months to proceed from application to securing of funding. Certain federal programs, including most prizes, loans, and technical assistance programs do not require cost share. In other cases, applicants can apply for a cost share waiver.

The following are examples of statutorily supported federal programs that could be used to augment state and private resources for the purposes of energy development.

- **Project Development and Site Preparation:** The Environmental Protection Agency (EPA) has administered several grant programs focused on brownfields

118 https://www.maine.gov/bil/

development. The EPA Brownfields and Land Revitalization Program supports states, Tribal Nations, communities, and other stakeholders in working together to prevent, assess, and remediate brownfield sites. A brownfield site is defined as one being impacted by the presence or potential presence of a hazardous substance, pollutant, or contaminant. The program was formally established by the Small Business Liability Relief and Brownfields Revitalization Act of 2002, which was later amended by the Brownfields Utilization, Investment, and Local Development (BUILD) Act of 2018, and expanded through IIJA. The program offers competitive Assessment, Cleanup, Multipurpose, Revolving Loan Fund, and Job Training Grants, as well as non-competitive funding for State and Tribal Response Programs. Additionally, EPA through the Brownfields program has a Jobs Training Grants that provides environmental training for residents impacted by brownfield sites in their communities.

- **Project Installation and Construction:** The USDA Rural Energy for America Program (REAP) program provides grants and loans to small rural businesses and agricultural producers for renewable energy and energy-efficiency investments. In Maine, this program could be used to support the installation of solar panels on farms or the construction of small-scale wind turbines. Maine has received significant funding through REAP; this includes $7 million in April 2024 distributed across 10 farms and small businesses located in the state’s second district and $1.2 million in November 2024 distributed across 13 small businesses in the state’s first and second districts, primarily for the installation of roof-mounted solar power systems.
- **Workforce Development:** DOE, USDA, and the Department of Commerce’s Economic Development Administration (EDA) have all historically administered workforce development programs in support of energy infrastructure. These programs have varied greatly depending upon Administration priorities. In particular, over the last decade, EDA has administered significant funding through economic assistance administration funding that has created workforce development opportunities. It is important to note that the EDA's funding priorities and the specific programs through which it provides funding can evolve over time. In December 2024, EDA was reauthorized for the first time in 20 years and has a specifically statutorily required mandate to support workforce development. In alignment with Administration priorities - including energy abundance – it is anticipated that EDA will provide grant opportunities dedicated toward developing and strengthening the energy workforce.

Technical Assistance Programs

There are a number of mechanisms that allow companies and places to leverage the expertise and resources of the national laboratories, private-sector laboratories, and other consultants. The provision of services could be delivered through direct technical assistance or through voucher programs that leverage a broader network of experts, allowing developers and communities to access support for a wide range of technical questions. These programs provide free services for companies and places that could complement planning for projects or implementation once funds are received. Select US Department of Energy (DOE) programs include:

- **Energy to Communities:** The DOE Energy to Communities program connects communities with national lab experts to receive customized support for energy projects. Maine communities could leverage this program to receive expert advice on the design and implementation of energy projects. The program is delivered through various technical assistance programs, ranging from a more comprehensive assessment leveraging high performance computing computational support, to expert matches with relevant technical subject matter experts across the national laboratory complex. Applications vary from rolling (via expert match) to annual (for comprehensive support). This program could be used in support of design of a state-driven RFP process or leveraged for technical support in project siting and permitting.
- **Energy Transitions Initiative Partnership Project:** This DOE program supports remote and island communities in advancing their resilience through clean energy technologies. Maine's island communities could benefit from this program by receiving assistance with the development of microgrids or other clean energy projects that can help them to become more self-sufficient. Since 2021, the Island Institute has served as the Northeast regional partner for this program, working with the National Renewable Energy Laboratory (NREL) to provide technical assistance to island and coastal communities developing clean energy strategies and projects.

Loan Programs

In contrast to grants and technical assistance programs at the federal level, most federal loan programs operate on a rolling basis. Loan officers work with applicants to understand whether a federal loan is a viable option for a given project and can help prepare loan applications. The underwriting process for loans varies from six months to a year or longer.

Federal loan programs related to energy project development are primarily administered through the DOE's Loan Program Office (LPO), whereas the USDA administers other loan programs for rural utilities and cooperatives. These programs offer loan guarantees, direct loans, and grants to support innovative energy technologies and investments in energy infrastructure. Funding is typically awarded through competitive application processes, with eligible entities including states and local governments, private businesses, and tribal entities. Financing mechanisms include fixed low-interest loans, partial loan forgiveness, and credit enhancements to encourage private-sector participation.

Loan programs across the federal government have included everything from small project development (i.e., through USDA) to very strict contractual requirements and large programs (i.e., through DOE's LPO). While these programs provide funding for larger projects, LPO loans do require a significant minimum scale — typically $100 million — along with an investment of time and resources.

Appendix 2: Research into State and National Programs that Informed Solutions

S1: Support Jurisdictions in Developing Local Regulatory Frameworks

Several other states have taken proactive approaches to support municipalities in managing clean energy development. A recent review found that 23 states offer model ordinances for both wind and solar, seven offer guidance for only wind projects, and five offer guidance for only solar projects.[119]

The New York State Energy Research and Development Authority (NYSERDA) has developed guidebooks for solar[120], wind[121], and storage[122] projects, which provide information and resources that support local governments managing energy project development in their communities. The guidebooks discuss environmental considerations, community impacts, permitting, economic impact, and other key aspects of development. Model local laws are available for both solar[123] and storage projects,[124] in both PDF and editable Word formats. Because projects above 25 MW are not subject to local permitting in New York, no model local law is provided for wind energy projects.

Public universities in Michigan have developed resources for local governments related to wind[125] and solar siting.[126] These resources include model ordinance language. In November 2024, a new law went into effect in the state, which grants permitting authority to the Michigan Public Service Commission for large-scale wind, solar, and storage projects unless local jurisdictions adopt "Compatible Renewable Energy Ordinances" (CREOs). Details about the policy change, including annotated wind and solar zoning templates and

[119] https://eta-publications.lbl.gov/sites/default/files/rap-enterline-valainis-laws-order-inventory-state-renewable-energy-siting-policies-2024-june.pdf

[120] https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting-Resources/Solar-Guidebook

[121] https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting-Resources/Wind-Guidebook

[122] https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting-Resources/Battery-Energy-Storage-Guidebook

[123] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/NY-Sun/2023-Model-Solar-Energy-Local-Law.pdf

[124] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Siting/model-law.pdf

[125] https://www.canr.msu.edu/outreach/uploads/files/wind%20sample%20zoning%2010062020_FINAL.pdf

[126] https://www.canr.msu.edu/planning/uploads/files/SES-Sample-Ordinance-final-20211011-single.pdf

sample CREO language, are available from the University of Michigan.[127] Additionally, the Department of Environment, Great Lakes, and Energy maintains a Renewable Energy Academy resource, creating a one-stop shop for large-scale renewable energy in Michigan.[128]

NREL maintains databases of siting regulation and zoning ordinances for both wind[129] and solar[130], creating a resource that can be used to determine current ordinances and compare across jurisdictions. Local jurisdictions could use this tool to identify policies in place in peer communities.

Additionally, nonprofit organizations representing both energy developers[131] and rural communities[132] have developed model ordinances for clean energy projects at the national level. However, these model ordinances lack specificity for Maine's unique environment and may be perceived as biased in favor of the publishing stakeholder's interests.

Across these examples, development of any model ordinance language benefits from a strong stakeholder engagement process that brings together local jurisdictions with successful project development experience, municipalities considering proactive ordinance development, representatives from the developer community, and credible voices who can speak to community benefits, with the goal of creating model ordinances that are balanced in their treatment of involved parties.

Providing developers with opportunities to engage early on in the development of draft ordinances, as well as the property tax guidance outlined below, helps ensure that final recommendations are feasible and implementable by industry stakeholders. This input should be balanced with input from local communities, and the emphasis should be on developing balanced proposals that are not overly biased towards any particular party.

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[127] https://graham.umich.edu/project/MI-energy-siting

[128] https://www.michigan.gov/egle/about/organization/materials-management/energy/renewable-energy/renewable-energy-academy

[129] https://data.openei.org/submissions/5733

[130] https://data.openei.org/submissions/5734

[131] https://cleanpower.org/resources/model-ordinance-utility-scale-solar-energy-systems

[132] https://www.cfra.org/model-clean-energy-ordinances

S2: Improve Energy Education and Awareness Through Fact-Based Information Resources

Both the federal government and several states have implemented successful programs to enhance public awareness and perception of clean energy, offering valuable models for Maine. Below are a few examples. Additional examples can be found in Appendix 1.

Targeted Public Awareness Initiatives

These programs focus on directly communicating the benefits of specific clean energy technologies or practices to the public through strategic messaging and diverse channels.

Oregon's Energy Resource & Technology Reviews:[133] As part of its comprehensive Biennial Energy Report, the Oregon Department of Energy includes detailed reviews of various energy resources and technologies. These reviews provide in-depth, factual information about both traditional and innovative energy sources relevant to Oregon, including renewable energy technologies like solar, wind, geothermal, and emerging options. This section of the report[134] typically includes:

- Detailed descriptions of how different energy technologies work.
- Analysis of the current status and potential for each resource in Oregon.
- Discussion of technological advancements and potential future applications.
- Consideration of environmental and economic factors associated with each resource.

DOE's Solar Energy Technologies Office (SETO) Communication Guidance:[135] SETO provides resources to help solar professionals communicate effectively about solar energy. These guides feature practical worksheets to help stakeholders develop communication plans, offer tips for media engagement—including messaging strategies and visual communication—and highlight successful case studies to illustrate effective approaches.

Creative Engagement and Community Connection

These programs leverage the power of artistic expression and community involvement to build positive associations with clean energy and make it more culturally relevant.

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133 https://energyinfo.oregon.gov/ber-energy-resource-technology-reviews-2024

134 https://www.oregon.gov/energy/Data-and-Reports/Documents/2024-BER-ERTRs.pdf

135 https://www.energy.gov/sites/default/files/2024-09/SETO%20Communications%20Quick%20Start%20Guide.pdf

DOE's Energy Efficiency and Renewable Energy (EERE) Public Outreach:[136] EERE aims to educate the public about clean energy by providing online resources, fact sheets, and publications on clean energy technologies and their benefits. Additionally, EERE supports educational programs for schools and communities and facilitates public engagement in energy policy discussions.

S3: Enhance Procurement Processes and Contracting

Several state and national agencies have developed programs to identify areas of improvement, provide resources to stakeholders, increase coordination across various levels of government, and develop technology to support more streamlined permitting processes. Below are several examples.

Virginia Permitting Evaluation and Enhancement Program (PEEP)

PEEP is a streamlined platform through which Virginia's Department of Environmental Quality (DEQ) handles permitting. It houses every DEQ permit type in a single, user-friendly system that tracks permits from submission to final decision. PEEP offers a public-facing online dashboard where anyone can check the status of a permit, see when it was received, where it is in the review chain (including coordination points with agencies like the U.S. Army Corps of Engineers), and how actual review times compare to expected benchmarks. According to the site, PEEP's mission is to boost "transparency, collaboration and efficiency" in DEQ's permitting process.

After four months of internal testing, PEEP officially launched on Dec. 1, 2022, starting with a pilot focused on Virginia Water Protection Permits, which cover things like wetland and stream impacts. DEQ has been working closely with the Norfolk District of the U.S. Army Corps of Engineers to make sure the system complements, rather than duplicates, existing federal tracking efforts. In October 2024, Governor Glenn Youngkin released a new executive order[137] to streamline permitting. In the executive order, the governor stated that as a result of this PEEP platform, DEQ had managed to improve permit processing time by 70% and saved Virginia citizens an estimated $40 million.

Massachusetts Commission on Energy Infrastructure Siting and Permitting

To streamline renewable energy siting between local governments and the state, Massachusetts established the Commission on Energy Infrastructure Siting and

[136] https://www.energy.gov/eere/office-energy-efficiency-and-renewable-energy

[137] https://www.governor.virginia.gov/newsroom/news-releases/2024/october/name-1035453-en.html

Permitting[138]. The recommendations from the commission include:

- Clarity around local and state project review.
- Permit consolidation at the municipal and state levels.
- A timely process to reach permit decisions.
- Streamlined appeals to a single justice at the Supreme Judicial Court with a strict timeline.[139]

These recommendations seek to strengthen communities and local government's role in energy siting, including intervenor status for communities, mandatory community engagement and community benefits, and a robust pre-filing engagement process between developers, local governments, and state officials. The Massachusetts State Legislature acted to codify many of the recommendations put forward by the commission after the end of the 2024 session, leaving stakeholders with a promising, regionally applicable framework for reforms, and meaningful new processes to improve siting and community engagement in Massachusetts.[140]

NREL Regulatory and Permitting Information Desktop (RAPID) Toolkit

There have been various efforts to develop toolkits and permitting efficiencies at the federal level. One example is the RAPID Toolkit developed by NREL, which provides information about permits and regulations that affect renewable energy and bulk transmission projects[141]. At present, RAPID does not have Maine's data, but working with NREL, more information on Maine could be added to allow for a national-level tool for developers.

DOE Hydropower Licensing and Federal Authorization Process Study

In 2021, DOE's Water Power Technologies Office released a study evaluating the timelines and costs associated with hydropower licensing and re-licensing[142]. This report covered hydropower licensing and federal authorization processes, including quantitative and qualitative analyses of licensing and approval timelines, project attributes that may

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[138] https://acadiacenter.org/resource/the-energy-is-about-to-shift/

[139] https://acadiacenter.org/resource/the-energy-is-about-to-shift/

[140] https://acadiacenter.org/resource/the-energy-is-about-to-shift/

[141] https://openei.org/wiki/RAPID

[142] Levine, Aaron, Brenda Pracheil, Taylor Curtis, Ligia Smith, Jesse Cruce, Matt Aldrovandi, Christa Brelsford, Heather Buchanan, Emily Fekete, Esther Parish, Rocio Uria-Martinez, Megan Johnson, and Debjani Singh. An Examination of the Hydropower Licensing and Federal Authorization Process. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-79242. https://www.nrel.gov/docs/fy22osti/79242.pdf

influence those timelines, and their combined effect on costs and risks to developers. This study was written with the intent of supporting policymakers and regulators at the federal and state levels as well as other hydropower industry stakeholders (e.g., utilities, developers, consultants, trade associations, non-governmental organizations) by informing discussions helpful to individual license proceedings and policies affecting efficiencies within the hydropower licensing and federal authorization process. This report did not propose any specific recommendations to alter the current hydropower licensing and authorization process. Instead, it provided an evaluation of the current federal regulatory process to allow decision makers to identify areas that need reform.

As a result of the report, regulators, stakeholders, and policymakers have used the data to identify policy changes needed to address the length and burden of existing regulations. Shortly after this report, the U.S. Senate held its first public hearing on hydropower in nearly a decade, citing the report's findings to articulate a need for permitting and licensing reform.[143]

According to a recent study by Sargent & Lundy[144] for the U.S. Energy Information Administration, "Owner's Services" (comprising costs associated with project development, studies, permitting, legal, owner's project management, owner's engineering, and owner's participation in startup and commissioning) can range from 4% to 16% of total capital cost. The study detailed the following nationalized costs associated with owner's costs in the table below:

Owner's Services as a Percentage of Total Capital Costs

Technology Description	Owner's Services ($)	Total Capital Cost ($)	Owner's Services % of Total Capital Costs
Aeroderivative Combustion Turbines (CTs) – Simple Cycle	$35,136,000	$338,953,000	10.37%
CTs – Simple Cycle	$36,103,000	$350,088,000	10.31%
Combined-Cycle (CC) 2x2x1	$86,422,000	$1,064,548,000	8.12%
CC 1x1x1, Single Shaft, with 95% Carbon Capture	$104,490,000	$1,284,445,000	8.14%

143 https://www.energy.senate.gov/hearings/2022/1/full-committee-hydropower-hearing

144 https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2025.pdf

Biomass – Bubbling Fluidized Bed (BFB) with 95% Carbon Capture	$40,575,000	$631,553,000	6.42%
Advanced Nuclear Plant (Brownfield), 2 x AP1000 Units	$2,768,269,000	$16,948,167,000	16.33%
Small Modular Reactor Nuclear Power Plant, 6 x 80 MW Units	$296,383,000	$4,289,165,000	6.91%
Geothermal	$20,243,000	$198,147,000	10.22%
Hydroelectric Plant	$45,935,000	$707,254,000	6.49%
Onshore Wind – Large Plant Footprint	$19,250,000	$297,752,000	6.47%
Onshore Wind – Repowering/Retrofit	$18,814,000	$207,894,000	9.05%
Offshore Wind: Fixed-Bottom Monopile Foundations	$299,907,000	$3,319,969,000	9.03%
Offshore Wind: Floating Foundations	$10,554,000	$225,348,000	4.68%
Solar Photovoltaic (PV) – Fixed Tilt	$15,339,000	$326,297,000	4.70%
Solar PV with Single-Axis Tracking and Battery Storage	$18,077,000	$384,081,000	4.71%
Battery Energy Storage System (BESS)	$9,926,000	$261,666,000	3.79%

As evidenced in the table, there are significant costs to the development and permitting of projects. If addressed in a more efficient manner, this can lower the cost of delivered power.

S4: Connecting Communities and Developers Through Technical Assistance

There are numerous state and federal programs that provide technical assistance and grants to help support energy planning. Maine could build off of these programs as it pursues its own specific support for project development. Additional examples can be found in Appendix 1.

Oregon's Community Renewable Energy Grant Program

The Community Renewable Energy Grant Program, administered by the Oregon Department of Energy, is open to Oregon Tribes, public bodies, and consumer-owned utilities. Public bodies include counties, municipalities, and special government bodies such as ports and irrigation districts. The grants are awarded on a competitive basis, and priority will be given to projects that support program equity goals, demonstrate community energy resilience, and include energy efficiency and demand response.[145] Planning awards to support community renewable energy projects are capped at $100,000, but these grants provide the full funding for that project with no cost share. As the project moves into construction, Oregon also provides funding with a total eligible cost of $1 million, albeit with certain cost shares depending on projects. Eligible projects include renewable energy generation systems like solar or wind as well as energy storage systems. Eligible applicants are encouraged to partner with community groups, non-profits, private businesses, and others on potential projects.

New York's Climate Smart Communities

Climate Smart Communities (CSC)[146] is a New York interagency program that helps local governments take action to address energy issues, including greenhouse gas emissions. CSC provides a combination of technical assistance and grant funding on behalf of the state. Communities can receive free technical assistance from regional CSC coordinators for clean energy and climate initiatives. There are two separate offerings: The first supports implementation projects related to the reduction of greenhouse gas emissions (mainly outside the power sector) and climate change adaptation. The second supports planning and assessment projects aligned with CSC certification actions[147]. Communities in the program are also provided with networking opportunities with like-minded community leaders at CSC events and workshops.

Energy Transitions Initiative Partnership Project

The Energy Transitions Initiative Partnership Project (ETIPP)[148] is a DOE program designed to help remote, island, coastal, and islanded communities build resilient, clean, and reliable energy systems that reflect local priorities. ETIPP connects selected communities with expert support from DOE's national laboratories and regional partners to provide free, customized technical assistance. The goal is to help communities evaluate energy challenges, develop actionable strategies, and build local capacity to implement long-term clean energy transitions.

[145] https://www.oregon.gov/energy/Incentives/Pages/CREP.aspx
[146] https://climatesmart.ny.gov/about/
[147] https://climatesmart.ny.gov/actions-certification/actions/
[148] https://www2.nrel.gov/state-local-tribal/energy-technology-innovation-partnership-project

Communities define their own energy goals, such as improving resilience, reducing costs, or transitioning to renewables. Each selected community is paired with national lab experts who provide technical analysis, modeling, and strategic planning over a 12- to 18-month period. The technical support is funded by the DOE. For the first time, in 2024, DOE announced it would provide direct funding to the fourth cohort. The 25 communities will each receive $50,000 in direct funding to support capacity for engagement on their ETIPP project.[149] The projects selected over the last four years include microgrid design, grid reliability improvements, energy-efficiency planning, and renewable integration. This program also relies on and supports community-trusted intermediaries. Pertinent to Maine, this includes the Island Institute, which serves as both the regional partner for New England to help communities apply into the program and a trusted partner during the administration of the technical assistance. Communities selected in Maine in 2024 included Brooklin, Chebeague Island, Cranberry Isles, Passamaquoddy Tribe at the Pleasant Point Reservation, and Washington County.

Renewable Energy Siting through Technical Engagement and Planning (R-STEP™)[150]

By supporting state-level programs that serve as a resource to local jurisdictions, R-STEP helps communities better plan for and meaningfully engage in the development of large-scale renewable energy and energy storage projects. This effort out of DOE accelerates renewable energy deployment by supporting the establishment of more predictable, community-oriented, and science-based siting processes for renewable energy developers and permitting authorities. To support improved siting processes, R-STEP provides competitive funding and technical assistance, opportunities for state-to-state engagement, and informational resources like best practices.

S6: Promote Capital Solutions for Large Clean Energy Projects with Non-Traditional Risk Profiles

Several state entities outside of Maine have successfully utilized revenue bonds to fund energy projects, demonstrating the feasibility of this approach. However, it's crucial to acknowledge that the legislative, regulatory, and market landscapes in these examples diverge from Maine's. Therefore, for GEO and its partners to implement a similar revenue bonding strategy, a thorough examination of existing and new legislative and authoritative powers within Maine would be required, and the goal would be to unlock and specialize state funding for large energy projects. Here are a few examples:

[149] https://www.energy.gov/eere/articles/doe-partners-25-new-coastal-remote-and-island-communities-advance-local-energy
[150] https://www.energy.gov/eere/renewable-energy-siting-through-technical-engagement-and-planning-r-steptm

Massachusetts Municipal Wholesale Electric Company (MMWEC) used approximately $15 million in green bonds to complete the long-term financing of the MMWEC/Master Sergeant Alexander Cotton Memorial Solar Project[151] in Ludlow, Mass., in 2023. The bonds were issued to finance the 6.9-MW solar array located on a 35-acre parcel of MMWEC's Ludlow campus. At the time, bond proceeds were expected to "provide long-term financing for the project, repay a short-term construction loan issued in anticipation of the issuance of bonds, fund required reserve accounts, pay capitalized interest, and pay costs of issuance."[152] MMWEC also obtained a federal tax credit to support the project[153].

New York Power Authority (NYPA) developed the New York Power Authority Green Bond and Green Commercial Paper Notes Framework in September 2024. "Under this framework, it intends to issue green bonds and commercial paper notes, and use the proceeds to finance or refinance, in whole or in part, existing and future projects that generate, transmit, and support clean energy and enhance energy efficiency in its power transmission systems and buildings. The Framework defines eligibility criteria in three areas: renewable energy, energy efficiency, and green buildings."[154]

Connecticut Green Bank (CTGB) established a Green Bonds Framework[155] and may only invest in programs and activities that further the deployment of energy generated from solar, wind, fuel cells, landfill methane gas capture, ocean thermal power, wave or tidal power, hydropower, sustainable biomass facilities, energy efficiency, or alternative fueled vehicles. The framework was verified by an independent third party[156]. CTGB has had nine consecutive offerings that raised, in total, more than $3 million from Connecticut citizens and nationwide investors. To date, investments are steered toward utility small business programs. However, green bond eligibility criteria include using proceeds to support production and transmission of renewable energy. Furthermore, the integrity of green bonds hinges on ensuring that the funded projects deliver the promised environmental benefits. As such, best practice is to follow standard frameworks, like those provided by the Climate Bonds Initiative (CBI) or the International Capital Market Association (ICMA) and

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[151] https://www.mmwec.org/mmwec-cotton-solar/

[152] https://www.publicpower.org/periodical/article/mmwec-completes-green-bond-issuance-finance-solar-project#:~:text=MMWEC%20Completes%20Green%20Bond%20Issuance,Project%20%7C%20American%20Public%20Power%20Association

[153] https://www.mmwec.org/wp-content/uploads/Cotton-Solar-IRA-Payment-Release-1-6-25.pdf

[154] https://www.nypa.gov/-/media/nypa/documents/document-library/financials/nypa-green-bond-framework-spo.pdf

[155] https://www.ctgreenbank.com/wp-content/uploads/2020/04/CGB_Green-Bond-Framework_final-4-22-2020.pdf

[156] https://www.ctgreenbank.com/wp-content/uploads/2020/04/Kestrel-Verifers-Second-Party-Opinion-Framework.pdf

use third-party verifiers to ensure the integrity of bond frameworks, build investor confidence, and drive impactful environmental outcomes. Additional information on types of green bonds is available from the CBI[157].

S7: Address Workforce Gaps Through Programs

New York State Programs

As a part of its new renewable energy procurement program, NYPA will invest up to $25 million annually[158] in workforce training in collaboration with the New York State Department of Labor (DOL). This builds on efforts from NYSERDA, which has committed over $180 million through 2025 to support clean energy workforce development. This initiative aims to prepare the current and future workforce to meet the demands of clean energy jobs with a focus on disadvantaged communities. Funding opportunities are available for businesses, training providers, and job seekers to facilitate education and training in energy efficiency, renewable energy, and other clean technologies.

157 https://www.climatebonds.net/market/explaining-green-bonds

158 https://nypa.gov/workforce-development

Appendix 3: Additional Information on Clean Energy Project Risk Factors

Project Development Risk

Project development risks focus on the activities that occur from initial site identification through notice to proceed (NTP) to construction. Developers need to identify a viable site, establish site control, apply for interconnection, and navigate permitting while engaging with the local community. Many project development risks are binary risks: if site control cannot be established, or the necessary permits cannot be obtained, the project will not move forward.

Siting

Siting risks center around a developer's ability to obtain site control and engage effectively with the local community. Locating sites with good resource availability, development-oriented communities, appropriate land-use designations, and appropriate grid infrastructure are the first steps in developing a successful project.[159]

Developers can mitigate siting risk by developing screening strategies and tools that quickly identify non-viable locations and by engaging in community outreach early in the development process. Policymakers can mitigate siting risk by providing clear guidance about appropriate sites for renewables development, including by creating interactive maps that overlay various considerations for development, including grid infrastructure, land-use restriction and wind or solar resource quality. Investors typically do not directly mitigate siting risk but may choose not to invest in a project that they believe has not adequately addressed siting risk.[160]

Permitting

Permitting risks relate to the ability of a project to obtain the permits required for project development. Renewable energy projects often require permits at the federal, state, and local levels. Long permitting timelines and high costs add to the overall cost of renewable

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[159] https://www.energy.gov/eere/siting-large-scale-renewable-energy-projects

[160] https://www.energy.gov/eere/siting-large-scale-renewable-energy-projects

energy projects. Local permitting authorities may impose time-bound moratoriums on all project development to determine their communities' desired approach to renewable energy development. Incorporating energy storage can also complicate permitting timelines because jurisdictions may not have established guidelines for the technology.

Developers can mitigate permitting risk through community engagement. Policymakers can mitigate permitting risk by providing clear guidelines regarding the required permits. Policymakers or other stakeholders interested in supporting renewable energy development can also produce materials highlighting the benefits to local communities associated with hosting renewable energy projects and assist local jurisdictions in developing their permitting policies.

Grid Access and Interconnection

In order to deliver clean energy, developers must secure an interconnection agreement with the grid operator. If the grid infrastructure is not able to support the proposed clean energy project, developers typically either pay for system upgrades or adjust the size of their proposed project downwards to avoid upgrades. Interconnection queues have grown significantly[161] across the country, creating long timelines for review. In ISO-NE, the queue tripled in size from 2014 to 2023.[162]

If those studies yield high interconnection costs, clean energy projects often drop out of development all together (binary risk). For example, a 2023 study by Lawrence Berkeley National Lab found that in ISO-NE, projects studied from 2018-2021 that withdrew from the interconnection queue faced a median interconnection cost of $455/kW compared to $104/kW for projects studied in that period that have achieved COD and $126/kW for projects still under development.[163] Other risks related to interconnection include long timelines for feasibility assessment and system impact studies, adding pre-NTP costs to the project that must be recovered in the final project price, and changes to interconnection costs after project construction has begun.

To address interconnection challenges, Maine can implement strategies to streamline grid access, reduce interconnection costs, and increase grid capacity. One approach is enhancing grid planning coordination between developers, utilities, and regulators to identify high-priority transmission upgrades proactively. For example, ISO-NE has

[161] https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_1.pdf

[162] https://emp.lbl.gov/news/webinar-us-interconnection-costs

[163] https://eta-publications.lbl.gov/sites/default/files/iso-ne_interconnection_costs_vfinal.pdf

implemented a clustering methodology to analyze multiple interconnection requests simultaneously, allowing for shared costs among projects and improving process efficiency.[164]

Additionally, states such as California and Texas have used proactive transmission planning reforms to designate clean energy zones, reducing uncertainty and costs for developers.[165] The DOE's *Distributed Energy Resource Interconnection Roadmap* highlights several strategies states can adopt to mitigate interconnection challenges, including cost-sharing models for grid upgrades, state-backed loan programs and tax incentives to reduce financial barriers for developers. Maine could implement similar measures to alleviate the cost burden of interconnection while also improving project viability. Additionally, the roadmap emphasizes the importance of standardizing interconnection timelines and enhancing transparency in upgrade costs to reduce project attrition due to unpredictable expenses.[166] Maine is engaged in several grid[167] and transmission[168] related planning and modernization initiatives, refer to the GEO website for more information.

Construction Risk

After the development phase, a project moves into construction. Risks during this stage are related to execution, supply chain, and workforce factors that can have an impact on the clean energy project's schedule and budget.

Supply Chain Disruptions, Loss or Damage

Clean energy supply chains are often global, and the industry experienced significant delays during the COVID-19 pandemic due to manufacturing and shipping disruptions. U.S. tariffs have also influenced the availability of solar panels in recent years. Delays in the delivery of key pieces of equipment increases development timelines, adding costs and creating greater market price risk. Price fluctuations of raw materials also pose a threat to the industry, both in the form of higher prices for end products and profitability risk for manufacturers who locked in long-term fixed-price supply agreements before the cost of

[164] https://www.iso-ne.com/static-assets/documents/2016/09/2016_09_27_tca06_iso_presentation.pdf

[165] https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_1.pdf

[166] https://www.energy.gov/sites/default/files/2025-01/i2X%20DER%20Interconnection%20Roadmap.pdf

[167] https://www.maine.gov/energy/initiatives/transmission-planning/grid-planning

[168] https://www.maine.gov/energy/initiatives/transmission-planning#:~:text=To%20that%20end%2C%20the%20Maine,officials%2C%20industry%2C%20nonprofits%2C%20and

raw materials rose.[169] Large players such as Ørsted have turned towards vertical integration to secure their supply chains.[170]

Furthermore, equipment may be lost, stolen, or damaged during delivery and construction. In addition to the expense associated with replacing parts, supply chain disruptions have contributed to extended wait times for critical components such as wind turbine blades and transformers, increasing project delays and costs. Damage can also occur during installation due to worker error. Developers generally mitigate this risk through insurance, training and site security.

Investors play a crucial role in mitigating these risks by conducting thorough due diligence on supply chain resilience and structuring financing terms to account for potential delays. They often prioritize projects with diversified supplier agreements and established procurement strategies to reduce exposure to material shortages.[171] Additionally, insurance solutions, such as tax insurance programs, can provide protection against financial uncertainties, ensuring that projects remain financially viable despite delays.[172]

States may play a role with policy responses designed to mitigate negative impacts stemming from supply chain disruptions and loss or damage events in construction. Examples include establishing clear liability frameworks for different types of loss or damage during construction, creating state-level contingency funds or financial mechanisms to support recovery from significant loss or damage events, developing streamlined permitting processes that include a thorough assessment of potential risks and mitigation plans. Maine could leverage existing frameworks (e.g., for permitting and resilience planning) that provide a foundation for developing policies to directly address disruptions, loss, or damage during construction.

Labor

Constructing utility-scale clean energy projects requires a significant amount of skilled labor. On average, utility-scale solar projects require approximately 11 job-years per MW,

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[169] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains

[170] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains

[171] https://www.res-group.com/us/resources/blog/maximising-value-in-renewable-energy-projects-four-strategies-to-optimise-your-supply-chain/.

[172] https://www.marsh.com/en/industries/energy-and-power/expertise/powering-renewable-energy-projects-tax-insurance.html

while onshore wind projects require around 4 job-years per MW.[173] Given the scale of clean energy deployment needed to meet state and federal clean energy targets, demand for construction labor — including electricians, specialized technicians, and general contractors — is expected to grow significantly.

However, a persistent labor shortage poses a challenge to clean energy project development. Nationally, the electrician workforce is not growing fast enough to meet demand: Approximately 10,000 electricians retire each year, while only 7,000 new electricians enter the field.[174] This shortfall is particularly concerning given projections that employment in the electrical trades will need to expand by at least 6% annually to keep pace with electrification trends, including demand from the clean energy sector. The impact of this labor shortage is compounded in remote locations, where projects may struggle to attract and house a sufficient workforce for the construction phase, which typically only lasts 1-2 years.

Several workforce development and training programs have been implemented to address these labor challenges, namely GEO's Clean Energy Partnership[175] program. Federal and state policies, such as the IRA and Maine's Revised Statute Title 26 §3502 Apprenticeship in Energy Facility Construction, include apprenticeship and prevailing wage requirements designed to strengthen the clean energy workforce pipeline.[176] Under these programs, developers who hire registered apprentices and meet certain labor standards can access additional tax incentives and financial benefits, making it more attractive to invest in workforce training.

Construction and Startup Delays

Construction timelines can stretch longer than expected due to weather conditions, supply chain delays, or unforeseen site conditions, among other factors. Additionally, utility construction of required grid infrastructure upgrades must be completed in parallel with the construction of the generating asset. Issues can also emerge during equipment testing. Delays for utility-scale solar peaked in 2022, with an average of 23% of planned U.S. capacity pushing back their planned online date by at least one month.[177] Mitigation

[173] https://www.energy.gov/sites/prod/files/2019/05/f63/gagne-rule-thumb-ppt.pdf

[174] https://www.laccd.edu/news/americas-demand-skilled-electricians-entering-boom-cycle

[175] https://www.maine.gov/energy/initiatives/cep

[176] https://www.maine.gov/labor/labor_laws/efc/index.shtml

[177] https://www.eia.gov/todayinenergy/detail.php?id=62003

measures largely focus on proactive project management and risk identification by the project developer.

To mitigate these risks, stakeholders employ several strategies:

- **Contractual Agreements:** Utilizing fixed-price, date-certain EPC (or construction provider) contracts with reputable firms helps contain costs and reduce schedule uncertainty. Such contracts allocate risks appropriately among parties, ensuring that each risk is managed by the entity best equipped to handle it.[178] However, the industry has seen increasing competition for EPC services, limiting the leverage that developers have to negotiate these contracts.[179]
- **Insurance and Risk Transfer:** Implementing comprehensive insurance policies, such as builder's risk insurance and performance bonds, protects against potential financial losses from unforeseen events like equipment failures or natural disasters. These measures transfer specific risks to insurers, providing a safety net for investors.[180]
- **Financial Structuring:** Ensuring that clean energy projects have adequate contingency reserves is essential for managing unexpected costs and mitigating financial risk. Contingency reserves provide a buffer against unforeseen expenses that could otherwise disrupt project financing or delay completion. Without sufficient reserves, projects may struggle to secure financing or face cost overruns that threaten their viability.[181]
- **Workforce Training and Development Programs**: Developers or states may invest in workforce training and development programs to help ensure availability of skilled labor and alleviate shortages. These programs can have long lead times due to the skilled nature of many clean energy roles, so may not directly influence capital availability for a specific project but can contribute to creating an overall perception that Maine is an attractive place to build clean energy projects.

Pricing Risk

Offtake agreements for clean energy projects are often structured using a fixed price that is set well before power delivery begins. Contracts generally include a timeline for

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[178] https://energy.gov/sites/prod/files/2013/10/f3/large-scaleguide.pdf

[179] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains

[180] https://betterbuildingssolutioncenter.energy.gov/sites/default/files/65286.pdf

[181] https://www.energy.gov/sites/prod/files/2015/07/f25/Financing_Basics_Renewables_Briefing.pdf

development- related milestones, along with financial penalties for failing to achieve those milestones. When either project development costs or wholesale power market costs fluctuate significantly in the time between PPA signing and COD, parties may be tempted to renegotiate the agreement. Additionally, significant changes in project economics can harm the availability of project finance.

Counterparty Risk

Counterparty risk, the possibility that an offtaker or developer may default on contractual obligations, is a significant concern in clean energy projects. One effective mitigation strategy is engaging offtakers and developers with investment-grade credit ratings. Traditionally, most utility offtakers in the U.S. are considered acceptable credit risks, with investor-owned utilities typically rated in the “BBB” category and municipal utilities rated “A” or higher.

Project Delays

Delays significantly impact the financial viability of clean energy projects. Large-scale clean energy projects, such as wind and solar farms, typically take several years to develop and build. Delays may be caused by multiple parties including government and regulatory bodies (e.g., via permitting and environmental reviews), utilities and grid operators (e.g., interconnection studies), project developers and contractors (e.g., labor shortages or technical issues), and local communities and stakeholders (e.g., community opposition). Prolonged timelines from initial exploration to NTP and from NTP to COD escalate costs, as extended development periods require additional financing and increase exposure to market fluctuations. Pre-NTP expenses, typically borne by early-stage developers, add to the required project margins, while post-NTP costs necessitate construction loans and other financial instruments. Delays can lead to increased costs and, in some cases, cause projects to become unviable.[182]

Moreover, delays introduce risks associated with shifting market power prices. As project timelines extend, the uncertainty in forecasting future revenues grows, potentially undermining project economics. To mitigate this, developers often evaluate multiple market price scenarios rather than relying on a single forecast. Engaging in fixed-price offtake agreements, such as PPAs, can provide revenue certainty and minimize market risk. However, these agreements may lead to perceptions of forgone potential profits if market prices rise unexpectedly. Diversifying risk exposures by incorporating flexible assets, such

[182] https://www.leylinecapital.com/news/the-growing-impact-of-delays-on-solar-development-costs-across-different-regions

as battery storage, can also help manage price fluctuations and enhance portfolio efficiency.[183]

Overall, faster project development timelines generally result in lower project costs, helping keep clean energy developments cost-competitive and profitable. While a detailed list of interventions is beyond the scope of this study, Maine can look for opportunities to minimize delays through close inspection of existing regulatory and procurement processes.

Policy Changes

Policy changes, both prospective and retroactive, pose significant challenges to the stability and growth of clean energy investments. Prospective policy changes, such as the potential elimination of tax incentives, can disrupt ongoing developments and deter future projects. While retroactive policy changes are particularly detrimental, as they undermine the reliability of established policies, leading developers to question the stability of the investment environment.

Cost Overruns

Cost overruns present significant challenges to the economic viability of clean energy projects. Unexpected increases in expenses can render projects uneconomical, leading developers to abandon projects, renegotiate offtake agreements, or absorb financial losses, which may deter future investments in the market.

Interconnection costs are a notable area of concern, as they make up an increasing portion of overall project costs. When high interconnection costs are known in advance, they can be planned for during project development, as discussed in the Project Development Risk section of this report. However, interconnection upgrades are typically constructed by utilities or grid operators, giving project developers little control over their execution. In some instances, those entities are not required to honor their cost estimates and may pass along any cost overruns to the project after the fact. These unexpected expenses can represent a major challenge to project profitability. While it is important that these costs be covered, there is variation in what portion of that overrun is passed on to project developers versus borne by ratepayers or utility shareholders. The allocation of these costs

[183] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/managing-risk-in-renewable-energy-portfolios-the-role-of-flexible-assets

varies; they may be passed on to the project developers or ratepayers, or absorbed by utility shareholders, depending on regulatory frameworks and specific agreements.[184]

Operating Risk

Operational risk in utility-scale clean energy projects encompasses challenges that impact project performance, financial stability and long-term reliability after reaching COD. These risks arise from extreme weather events, equipment performance and maintenance, forecasting inaccuracies, and grid-related curtailment, all of which can disrupt revenue generation and increase costs. Understanding these risks and integrating mitigation strategies is critical to ensuring project bankability and long-term success.

Extreme Weather and Market Volatility

Extreme weather events, including hurricanes, wildfires, winter storms, and prolonged droughts, pose risks to both physical infrastructure and financial stability. Winter storms in Maine in December 2023 and January 2024 caused catastrophic inland and coastal flooding, resulting in at least $90 million in damage to public infrastructure.[185] These kinds of events have become more frequent and severe across the country due to climate change, resulting in increased variability in energy generation and transmission disruptions. For example, Winter Storm Uri in 2021 caused widespread power outages and led to sustained wholesale electricity price spikes in Texas. The extreme volatility in the energy market following the storm highlighted the need for improved financial risk management strategies (e.g., developing contingency plans to manage potential impacts), including enhanced hedging mechanisms and insurance products to mitigate losses from weather-driven fluctuations in power generation and pricing.[186]

To mitigate these risks, clean energy developers and financiers increasingly use weather derivatives and parametric insurance, which provide payouts based on predefined weather conditions, ensuring revenue stability in extreme weather scenarios.[187] There is a wealth of information on climate and extreme weather impacts in Maine, for example, there's the Maine Won't Wait Plan for Climate Action[188] and the University of Maine's Climate Office

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[184] Subject matter expert interviews conducted by Banyan Infrastructure team

[185] https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/Maine%20Infrastructure%20Resilience%20Plan_May2025.pdf

[186] https://www.eia.gov/todayinenergy/detail.php?id=61563

[187] https://www.swissre.com/risk-knowledge/mitigating-climate-risk/parametric-insurance-accelerate-solar-investment.html

[188] https://www.maine.gov/climateplan/sites/maine.gov.climateplan/files/2024-11/MWW_2024_Book_112124.pdf

hosts a repository of reports and research[189] with additional information on extreme weather in Maine.

[189] https://mco.umaine.edu/pubs/reports/

Appendix 4: Overview of Maine Permitting Entities & Responsibilities

S4: Permitting Analysis and Improvement

Table A2: State Entities and Permitting Responsibilities			
Agency	**Primary Responsibilities**	**Relevant Permits / Statutes**	**Project Types Covered**
Maine Department of Environmental Protection (DEP)	Environmental regulation and permitting for major energy projects	- Site Location of Development Act (Site Law) - Natural Resources Protection Act (NRPA) - Clean Water Act 401 Certification - Stormwater permitting	Wind farms, solar farms, transmission lines, pipelines, hydropower
Maine Department of Agriculture, Conservation and Forestry (DACF)	Permitting for solar developments on agricultural lands; forest land use	- Title 38, §3202 Solar Development Permit - Agricultural protection rules	Solar energy (esp. on >5 acres of high-value farmland)
Maine Public Utilities Commission (PUC)	Regulation of utilities, electricity and gas transmission and distribution	- Certificate of Public Convenience and Necessity (CPCN) - Standard Offer & Net Energy Billing approvals	Transmission projects, energy infrastructure upgrades, utility-scale connections
Maine Land Use Planning Commission (LUPC)	Permitting in Unorganized Territories (UTs), expedited wind permitting	- Land Use Districts and Standards - Expedited Wind Energy Development Act	Wind energy, solar, transmission in UTs
Maine Department of Energy Resources (DOER)	Policy coordination, interagency energy planning, project facilitation	- No direct permits, but manages streamlined permitting initiatives and inter-agency coordination	Cross-sector energy planning, federal engagement, offshore wind support
Maine Historic Preservation Commission (MHPC)	Reviews energy projects for impacts on historical and archaeological sites	- Section 106 Reviews (under NRPA and federal laws)	Any energy project affecting historic resources
Maine Coastal Program (part of DEP)	Oversees coastal energy development consistency with Coastal Zone Management Act (CZMA)	- Federal consistency reviews - Coastal habitat permits	Offshore wind, tidal, port-based infrastructure
Maine Department of Inland Fisheries and Wildlife (MDIFW)	Environmental reviews for impacts on protected species and habitat	- Wildlife Impact Reviews (as part of NRPA and Site Law)	Projects near sensitive wildlife areas

Some of the parameters the state has control over include:

Site Location of Development Act (Site Law)

- Applies to projects ≥20 acres or with significant environmental impact
- Requires assessments of scenic character, stormwater, wildlife, soil erosion, etc.

Natural Resources Protection Act (NRPA)

- Regulates activity in, on, or near protected natural resources (e.g., wetlands, rivers, streams, wildlife habitats)
- Required for most solar, wind, and transmission projects near sensitive areas

Solar Energy Development Permit

- Needed for solar projects ≥5 acres on high-value agricultural land
- Includes requirements to minimize loss of agricultural productivity

Certificate of Public Convenience and Necessity (CPCN)

- Required by PUC for new transmission lines or utility-scale infrastructure
- Ensures the project is necessary and in the public interest

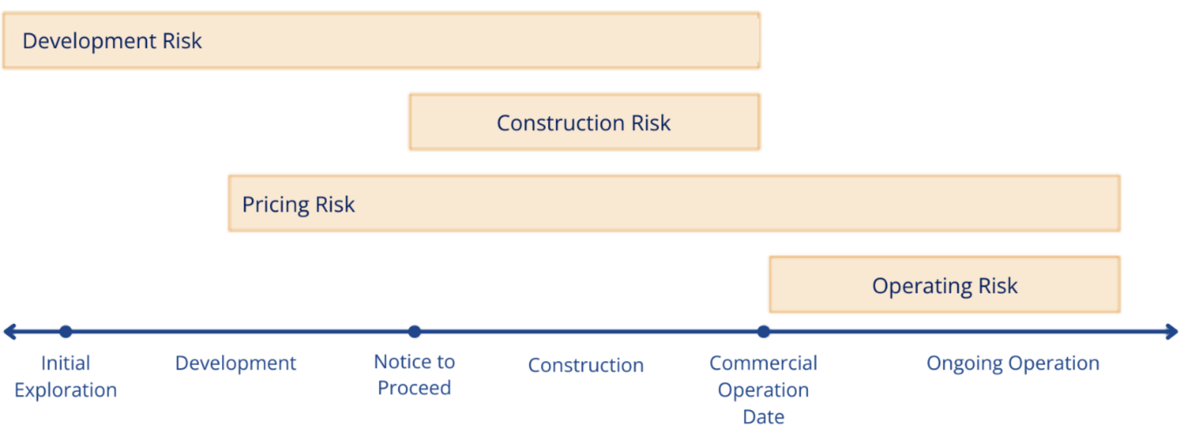
Land Use Planning Commission (LUPC) and Unorganized Territories (UTs)

- If a project is in one of Maine's UTs — about half the state by land area — LUPC becomes the lead permitting agency
- Expedited wind permitting is possible in certain zones
- LUPC also reviews zoning petitions if the development area is not zoned for energy use

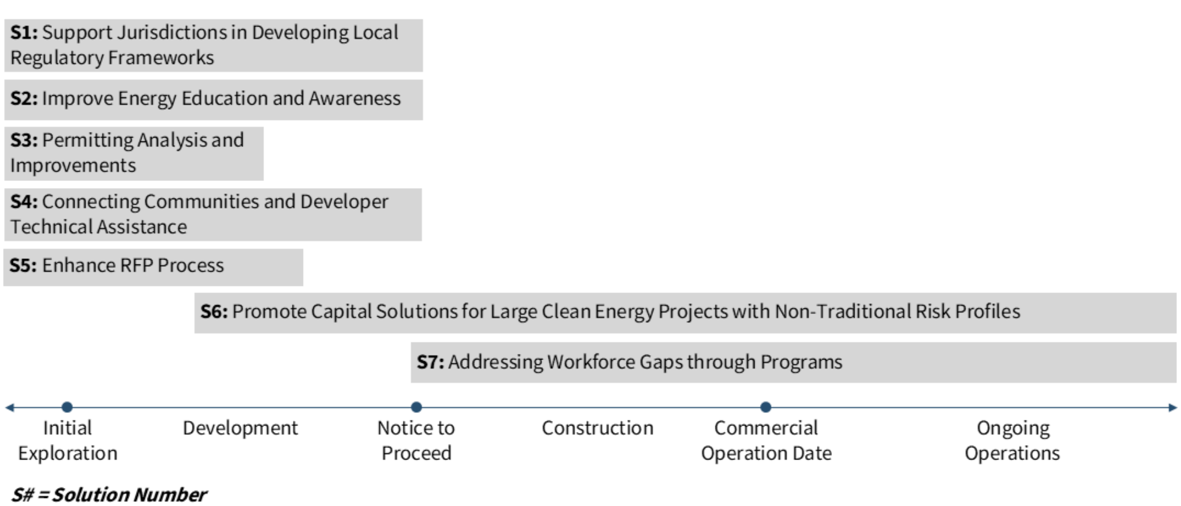
Appendix 5: Comparison of Risk Factors & Solutions Over Project Lifecycle

This appendix shows two charts, the "Project Risk Factors" chart and "Solutions Mapped to Project Lifecycle" chart, to facilitate identification of what risk factors may be mitigated by the recommended solutions in the context of a project's lifecycle.

Project Risk Factors



Solutions Mapped to Project Lifecycle



Appendix 6: Investing in Existing Asset Modernization

This study focused on inducing capital investment for new large-scale clean energy projects, but there are additional opportunities to attract capital for modernizing existing energy assets across the state.

The Large-Scale Resources portfolio relies primarily on large-scale renewables procurements, maintains existing nuclear generation, and procures 42 GW of incremental hydropower generation. If market-based energy and REC prices do not sum to a new facility's revenue requirement prior to completion, it will be unable to secure financing and complete construction. However, larger investments in equipment replacement, refurbishment, or repowering with a multi-year payback period may be challenging to justify without sufficient revenue and/or political/regulatory certainty. As the per-unit cost of investment may be lower than that of new generation, investment in extending the life of (or reusing the site of) a legacy generator may not require the same degree of support — in terms of duration or type of product hedges — as required for attracting investment to new renewable generation projects.[190]

Because Maine has a material fleet of legacy renewable generation, Maine's policymakers may wish to study the prospects, needs, and investments required for continuation of the legacy renewable energy supply, and consider whether, as the fleet grows and ages, alternative or supplemental means to support continued operation and/or repowering of such generation would be merited, beyond Chapter 311 refurbishment/operating beyond useful life eligibility provisions. If such study supports a procurement policy, Maine may wish to consider pilot programs structured as either head-to-head with new supply, or existing-only procurements.

[190] An Assessment of Maine's Renewable Portfolio Standard

Appendix 7: Study Team & Acknowledgements

Study Team

Banyan Infrastructure (www.banyaninfrastructure.com) was selected via competitive process to conduct this study in support of the Maine Department of Energy Resources.

- About: Banyan Infrastructure is a crucial partner for navigating the complex landscape of sustainable infrastructure finance. Our Advisory Services team bridges the divide between public initiatives and private capital, providing strategic advice, best practices, and actionable frameworks to operationalize, digitize, and scale market activity. Our partners and customers include governments, green banks, CDFIs, private sustainable investment funds, and more. With deep subject matter expertise in clean energy programs, project development, project finance, capital markets, and software development, our study team empowers clients to shape markets and deploy capital effectively toward a more sustainable future.
- Banyan Infrastructure Leadership and Staff
    - Amanda Li, Co-Founder and Chief Operating Officer
    - Scott Dicke, Head of Advisory
    - Lindsey Arita, Head of Operations
- Additional Study Team Members
    - Michael Barg, Principal, Summit Advisory
    - Jennifer Garson, Director, Aquila Innovation Strategies
    - Therese Miranda-Blackney, Grid Future Strategies

Acknowledgements

The Maine Department of Energy Resources and Banyan Infrastructure extend their sincere appreciation to the individuals and organizations that generously provided data and guidance in the development of this report: Finance Authority of Maine, Maine Department of Economic and Community Development, Maine Department of Environmental Protection, Maine Governor's Office of Policy Innovation and the Future, Maine Technology Institute, ISO New England, private sector interviewees (developers, sponsors, financial institutions, capital providers, utilities), and non-governmental organizations and advocacy groups. Their contributions were invaluable in developing the findings and solutions presented in this report.