




Milford Renewable Energy Feasibility Study

Rutgers University
Edward J. Bloustein School of Planning and Public Policy
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View from top of "Borough Farm" site, Milford, New Jersey (photo credit: Daya Bill)

Executive Summary

Demand for renewable energy is growing in the United States, particularly New Jersey. This demand is driven by a combination of factors, including:

1) technological improvements that have increased efficiency and reduced costs in renewable energy generation,
2) federal and state legislation designed to both *encourage* the use of renewable energy technologies and *require* the use of energy from renewable sources,
3) a growing desire among policy-makers to increase electricity reliability through diversified supply sources and in-state generation, and
4) an increasing environmental consciousness of the general public.

As a result, small-scale private installations of renewable energy technologies—primarily solar photovoltaics—have proliferated in New Jersey, as have larger renewable technology installations financed by corporations and universities keen to reduce their carbon emissions and burnish their "green" reputation. A handful of municipalities throughout the state have moved forward with "behind the meter" renewable projects as well. Private developers are currently pursuing utility-scale renewable projects throughout the state, again, primarily for solar. Municipalities can welcome this type of project as a relatively benign industrial use with potential net fiscal benefits as well as added marketing value of serving as a host to a renewable energy facility.

It is within this context that we present this report to the Borough of Milford, of Hunterdon County, New Jersey. This study analyzes the feasibility of utility-scale biomass, wind, and solar energy installations on two sites in the borough: the former Curtis Mill site and the "Borough Farm." We examine the availability of each renewable resource, the strengths and weaknesses of both the Curtis Mill site and the "Borough Farm" as a potential host of renewable projects, the technical practicality of select projects, the policy framework within which these projects operate, and their financial viability. Graduate students of City and Regional Planning at the Edward J. Bloustein School of Planning and Public Policy at Rutgers, the State University of New Jersey were the primary investigators for this study, completed by request of Milford's Planning Board. The findings of this study were presented to Milford's Planning Board on November 17, 2010 and to the Borough Council on December 6, 2010.

Key Findings

- *New Jersey is one of the best places in the United States for the development of solar energy projects.* Although solar, wind, and biomass resources in New Jersey are not ideal for energy generation, the state has set up a variety of programs to incentivize the construction of renewable energy generation facilities, as it is one of the major goals of the state's Energy Master Plan. Of these incentives, the Solar Renewable Energy Certificates (SRECs) are expected to provide a majority of a solar project's revenue stream. Combined with recent federal incentives, this favorable policy environment has been the impetus for the proliferation of small-scale solar projects (roof-top installations) and a flurry of speculative activity among solar developers throughout the state. As of this writing, New Jersey had the second highest installed solar capacity base in the country, behind only California.

- *The development of a solar facility on the "Borough Farm" is the most viable option for a utility-scale renewable energy installation in Milford.* Through our technical analysis, the project team has found that the "Borough Farm" is sufficiently large, open, and flat to support a solar installation. However, in order to confirm this finding, an in-depth analysis of the site must be conducted by a professional developer. Local government ownership of the site, combined with Milford's expressed interest in hosting a renewable energy project, provides a welcoming environment for developers, offering the process of expedited approval and permitting processes. Further, we believe that a solar installation would be most compatible with the intimate character of Milford. These two characteristics of the site would remove one of the major hurdles of solar development: local opposition (see next bullet).

- *There are no existing solar installations in New Jersey comparable to the proposed project on the "Borough Farm."* Despite the aforementioned flurry of speculative activity among solar developers in New Jersey, large-scale facilities that sell their energy to the grid have not yet been constructed. There are two primary reasons for this.

- *Financing.* Solar farms are risky investments and require substantial upfront capital. The revenue stream derived by selling energy produced by solar panels is not sufficient to sustain a utility-scale solar venture. The most significant potential revenue streams of a solar facility are a result of New Jersey state policy and therefore subject to a degree of uncertainty. Without guaranteed cash-flows over the term of the project, especially in these difficult economic conditions, lenders are reluctant to offer the necessary long-term loans to make utility-scale installations financially viable. State policymakers are aware of this problem and there is proposed legislation that would remove this significant hurdle.

- *Local Opposition.* Many solar developers are in the permitting and approval stages of their projects, though generally speaking, community opposition to solar installations remains strong. There are several factors contributing to this opposition—some reasonable and others based on misinformation—which are discussed more thoroughly in the full report.

- *As owners of the "Borough Farm," Milford cannot collect taxes on the improved value of the land.* Any income to the borough will likely be derived through a lease agreement with a renewable energy developer. Solar developers typically own the land on which they want to build. It is unlikely that a developer would begin making lease payments to the borough until the necessary capital has been secured. Given the difficulty of financing utility-scale solar projects, the time-frame until which Milford can expect to receive payments is uncertain.

- *The amount of money Milford can expect from a lease agreement is unclear.* One measure to derive a minimum value of a lease agreement is to determine what property taxes *would be* if Milford did not own the "Borough Farm." We derive this value based on: 1) the projected improvement value of a proposed solar project in Mannington, New Jersey and 2) the capacity of our solar installation model for the "Borough Farm" (see Synthesis of Technical Assessment below for more details on this model). We calculate a *minimum* annual lease range of $70,000 to $140,000. Although solar projects in New Jersey have the potential to be quite profitable, the primary determinant of an annual lease payment will be the real-estate market. However, there may be some additional value to the developer provided by a municipality that offers a streamlined approval and permitting process. We cannot determine this value. See the full report for other considerations.

- *Biomass for energy generation is neither readily available nor accessible in sufficient quantities to support a biomass facility in Milford.* Biomass power plants are most feasible co-located with a fuel source, much like the Curtis Mill when it was in operation. Without nearby fuel inputs, the transportation costs will severely limit the potential of profitability. Further, refuse that can serve as fuel for a biomass power plant is typically not separated from refuse ill-suited for energy production. Lastly, some biomass energy inputs have a higher value in other markets.

- Wind resources in Milford are not sufficient to support a wind turbine installation. The average wind speed in Milford is about 10 mph. Current utility-scale wind turbines require average wind speeds of at least 15-17 miles per hour to generate sufficient levels of energy to remain cost competitive. Wind resources at this level in New Jersey are only available on the Atlantic Coast and the Delaware Bay.

Key Recommendations

Should the borough decide to pursue large-scale renewable energy development, a number of immediate and longer term actions can be taken to move the process forward:

- *The Borough Council should pass the Solar Energy Ordinance that has been drafted and considered by the borough's Planning Board.* The stipulations contained in the proposed ordinance are important for promoting an environment conducive to solar energy generation. Not only does the ordinance provide protections to your community, but also lets a developer know that the borough is serious about hosting large and small-scale solar projects.

- *Follow state and federal incentives and regulatory requirements for solar facilities.* Doing so will be important in determining a development and ownership model that is most beneficial to the borough. While this report presents a portrait of the current policy environment, the standards and legislation are constantly changing.

- *Lobby the New Jersey State Legislature (perhaps through the League of Municipalities) to support the passage of policies to improve the financing of utility-scale installations.* There are a number of legislative proposals that would impact the financing possibilities for solar projects in New Jersey. For example, Senate Bill 2371 could make SREC-based solar financing more viable and Assembly Bill 3142 could open future possibilities for county and municipally-owned solar projects.

- *Hire professional services to further evaluate the economic, legal, and technical feasibility of a solar facility.* Professional services should be sought to review and supplement this report and provide advice and assistance to the borough moving forward. Assuming a solar facility is found to be financially viable and is desirable to the people of Milford, consultants should assist the borough in drafting, releasing, and evaluating responses to a request for proposals for a turn-key solar installation.

- *Finally, if the environment for utility-scale solar projects improves and Milford is certain of the viability of the "Borough Farm" as a host site, we recommend that Milford develop a long-term economic development plan for the Curtis Mill site that capitalizes on the prospect, and ultimately the installation, of a large solar facility on an adjacent parcel.* Current state policy prohibits non-utility energy generators from selling their energy to a customer across town; they are only allowed to sell their energy to a customer on-site, on an

adjacent site, or to the grid. The "Borough Farm" is adjacent to the Curtis Mill site. Having a potential customer on an adjacent site would not only reduce the costs of transmission to a developer, but would guarantee a more favorable price for electricity.

Synthesis of Technical Assessment

The following portion of this executive summary presents a synthesis of the technical portion of our analysis, the full details of which can be found in the forthcoming full report.

Site Assessments for Wind and Solar on the Former Curtis Mill and the "Borough Farm"

The Curtis Mill site and the "Borough Farm" have distinct strengths and weaknesses pertaining to the viability of either a wind or solar installation.

The Curtis Mill site is located in the southern corner of Milford along the Delaware River. A majority of the site is in the 100 year floodplain and is easily accessible by a county road. The site is approximately 74 contiguous acres, with about 56 of those acres currently occupied by the former Curtis Paper Mill, the remains of a cogeneration power plant, and an unused wastewater treatment facility. The property was abandoned in 2003 following the bankruptcy of the Curtis Paper Company and has since been designated as a Superfund site by the U.S. Environmental Protection Agency due to the presence of toxic industrial waste. The improvement value of the property has since been reassessed from about $6.75 million when the mill was operational to just under $600,000 today—a significant loss of property tax income to Milford. The site is jointly owned by International Paper and Georgia Pacific, who are cooperating to finance the remediation of the site. As of this writing, the extent of the contamination was being assessed.

Clearly, any development on the Curtis Mill site faces several challenges. The viability of a renewable energy installation on this site would depend upon a host of factors beyond the control of Milford.

As a Superfund site, any potential development is contingent upon the completion of the pollution remediation. A timeframe has not yet been established for the Curtis Mill site cleanup, but a typical duration for Superfund remediation is 3 to 7 years. Further, it is not yet known how the site will be used when the remediation is complete. Additionally, flooding is a potential issue, though not insuperable. The site would simply require extra engineering and insurance coverage to protect the renewable energy installation from flood damage.

By contrast, the "Borough Farm" site has few upfront issues. It is adjacent to the Curtis Mill site, separated by Frenchtown Road and an 80 foot cliff. Once used for agriculture, this 65 acre site was purchased by the Borough of Milford to use for the benefit of the community. This outright ownership of the site by Milford may increase the influence

the borough has during negotiations with a renewable energy developer and simplify the permitting and approval process. The site has been previously cleared for agricultural use, making it somewhat prepared for construction efforts, and does not have any contamination or flood related issues. The large size of the lot and its overall flatness make it attractive as an installation site for a renewable energy facility. On the other hand, site access is limited to two small residential roads.

There are two key considerations for the viability of any energy installation. The first is project capacity. Generally speaking, projects of about 10MW capacity are most attractive to developers as they are large enough to achieve economies of scale and represent an ideal size for grid interconnection. Second is the proximity of a site to an electric utility substation. The cable to connect an installation to the electrical grid costs about $400,000 per mile. We believe the closest operating substation to both sites is approximately 2.2 miles away on the northern edge of Frenchtown. Three miles is generally the furthest developers will be willing to go for projects of similar scale to those analyzed in this study.

Technical Scenarios: Wind and Solar

In light of the above conclusions, we modeled hypothetical wind and solar installations on the Curtis Mill site and on the "Borough Farm." The site layout is an important stage in the process of estimating power generation potential, as it provides key information on the number of possible wind turbines or solar panels which can fit on a site—a key variable in the calculation of power output which ultimately drives the financial feasibility of any project.

Wind

As stated above, the project team modeled three wind turbine sizes—small, medium, and large—on each of the two sites. Based on factors such as front and side clearances, each site was populated with an appropriate number of turbines. Each size turbine has its own advantages, such as minimizing aesthetic impact or maximizing generation potential, and disadvantages, such as obtrusiveness. Measured to their hub height (i.e., the point where the blades converge), the heights of the wind turbines range from about 100 feet to about 260 feet.

The potential number of turbines and resultant power output for each scenario on both the Curtis Mill Site and the "Borough Farm" are as follows:

Summary Table 1:

Wind Installation Scenarios and Projected+ vs. Optimal Energy Output* on the Curtis Mill Site and the "Borough Farm"

	Turbine Size	Number of Turbines	Installation Capacity	Projected Energy Output+ (million kWh/year)	Optimal Energy Output* (million kWh/year)
Curtis Mill Site	Small	23	2.3 MW	1.8 – 3.6	20.2
	Medium	4	2.0 MW	1.6 – 3.2	17.5
	Large	2	3.0 MW	2.6 – 4.8	26.3
"Borough Farm"	Small	26	2.6 MW	2.1 – 4.0	22.8
	Medium	6	3.0 MW	2.4 – 4.8	26.3
	Large	2	3.0 MW	2.6 – 4.8	26.3

+ Projected energy output refers to the output of the modeled installations based on our calculations.
*Optimal energy output is calculated using the manufacturer's specifications as to the optimal performance of a particular wind turbine.

As can be seen in the above table, the power capacity of all six scenarios is well below the ideal installation capacity of about 10 MW. The highest estimated installation capacity is less than a third of that ideal. Further, as demonstrated by comparing the projected energy output with the optimal energy output, the wind resources in Milford are not sufficient to realize the potential of these turbines. These two issues render wind development highly unlikely.

Solar

The project team modeled a solar installation layout for each of the two sites and calculated the energy generation potential for each site using two kinds of panels: the SunTech STP280 Vd and the SunPower E18 400. The SunPower E18 400 has the highest efficiency rating of any panel currently available on the market, but it also costly. The SunTech STP280 Vd is a more moderately priced option, but has a lower efficiency rating. By calculating the output from these two panel types, we aim to provide a range of potential energy output representative of the variation among solar panels currently on the market. Summary Table 2 shows the results of our calculations.

Table 2:

Solar Installation Scenarios and Projected Output on the Curtis Mill Site and the "Borough Farm"

	Solar Panel Type	**Number of Panels**	**Installation Capacity** (MW)	**Projected Energy Output+** (million kWh/year)
Curtis Mill Site	SunTech 280W	20,448	5.73	6.75
	SunPower 400W	18,403	7.36	8.68
"Borough Farm"	SunTech 280W	23,796	6.66	7.86
	SunPower 400W	21,416	8.57	10.1

+ Projected energy output refers to the output of the modeled installations based on calculations using PVWATTS.

As with the wind, Summary Table 2 shows that none of the proposed scenarios reaches the ideal 10 MW capacity figure. In conversation with developers, we found that this margin of difference is not insurmountable. However, as stated above, the project size is only one of the factors affecting the viability of a solar project.