Solar Project Best Practices and Policies for Tioga County Municipalities

Prepared by:

MRB group

May 2022

About This Report

In 2022, MRB Group was commissioned by the Tioga County Economic Development & Planning Department to undertake a number of analyses and make policy recommendations related to renewable energy projects in the County. Towns within Tioga County had been seeing an uptick in inquiries and applications from solar developers interested in leveraging New York State incentives to build mostly small-scale solar facilities. While New York State does provide some guidance and requirements about how to manage these requests at the local level generally, the details are left to the local municipalities. As such, there has been some confusion and lack of consistency since these projects can be complex and require some level of expertise to understand and facilitate effectively while also protecting the interests of the local community.

This report is intended to provide recommendations and considerations to assist Tioga County municipalities in developing consistent and effective local laws, processes, and standards for future solar projects locating within Tioga County, as well as negotiating and structuring Payment In Lieu of Tax agreements (PILOTs) and Host Community Agreements (HCAs). This report is supplemented by a series of tools and templates to further inform and prepare Towns as they undertake this work, including GIS mapping that helps to identify areas most likely to see future solar development.

The recommendations in this report are based on a variety of information, including literature review; state guidance; local, regional, and national trends; and our team's experience assisting communities across New York State with precisely this kind of work. This work was guided and reviewed by Tioga County Planning Department staff and a steering committee made up of county stakeholders and experts.

Project Steering Committee

Elaine Jardine, Tioga County Economic Development & Planning Department
Ellen Pratt, Tioga County Economic Development & Planning Department
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Wendy Walsh, Tioga County Soil and Water Conservation District

Contents

Executive Summary

Tioga County is currently experiencing in uptick in solar facility development due to attractive state incentives and an assortment of viable, developable sites. As such, Tioga County and its component towns need to ensure that they have clear and consistent standards, laws, and procedures in place that reflect the local community's level of desire to protect agricultural production and community character. This desire may be different from town to town, so there is not a "one-size-fits-all" approach. However, there are best practices and key considerations that can guide towns through setting up appropriate regulations and processes to ensure that proposed solar projects are required to meet minimum expectations and standards.

The chapters of this report provide detailed recommendations and information about the local context in Tioga County, mechanisms to define the review and development of solar projects, and the structuring PILOT agreements. Furthermore, the appendices also offer additional background on the difference between and use of PILOTs and HCAs and what agrivoltaic opportunities exist to support both solar and agricultural production. For ease of use, below is a summary of key findings from each chapter and appendix of this report.

Chapter 1: The Solar Landscape

- Given conditions like tree cover, wetlands, slope, etc., the most likely areas for future solar development stretch along the southern and eastern portions of the county.
- Towns should be careful to protect prime soils and active farmland. Areas identified as the highest priority for agricultural preservation tend to exist in and near the flat valleys throughout the county, although not exclusively. A map of preservation priority areas is available on page 42 of the Tioga County Agricultural and Farmland Protection Plan Update, which can be accessed at this link: https://www.tiogacountyny.gov/media/1940/tioga-county-afpp-final_all-adopted-5_12_2015.pdf.

Chapter 2: Regulating Solar Development

- Towns should be proactive about establishing the regulations and processes necessary to require and enforce minimum standards for solar development. This will ensure that solar is established in a way that advances community goals and preserves community character. Such mechanisms include:
    - Solar and Battery Storage Laws/Ordinances
    - Special Use Permits (or site plan review processes where there is no zoning)
    - Operation and Maintenance Plans
    - Decommissioning Plans and Agreements

Chapter 3: PILOT Structuring

- PILOTs may not be necessary for all projects under the new real property tax assessment guidelines, so it is important to ensure that minimum standards and land use considerations are appropriately covered by other local mechanism (i.e. laws, ordinances, zoning, etc.).
- PILOT procedures and offerings should be clearly defined and consistent.
- Start PILOTs from a base level of $7,000-$8,000 per MWac, and engage a financial professional to review project financial data should a developer want to negotiate a lower payment.
- While PILOT negotiations can start early in the process, PILOT agreements should not be approved until all other local reviews and approvals are in place.

Chapter 4: Tools & Resources

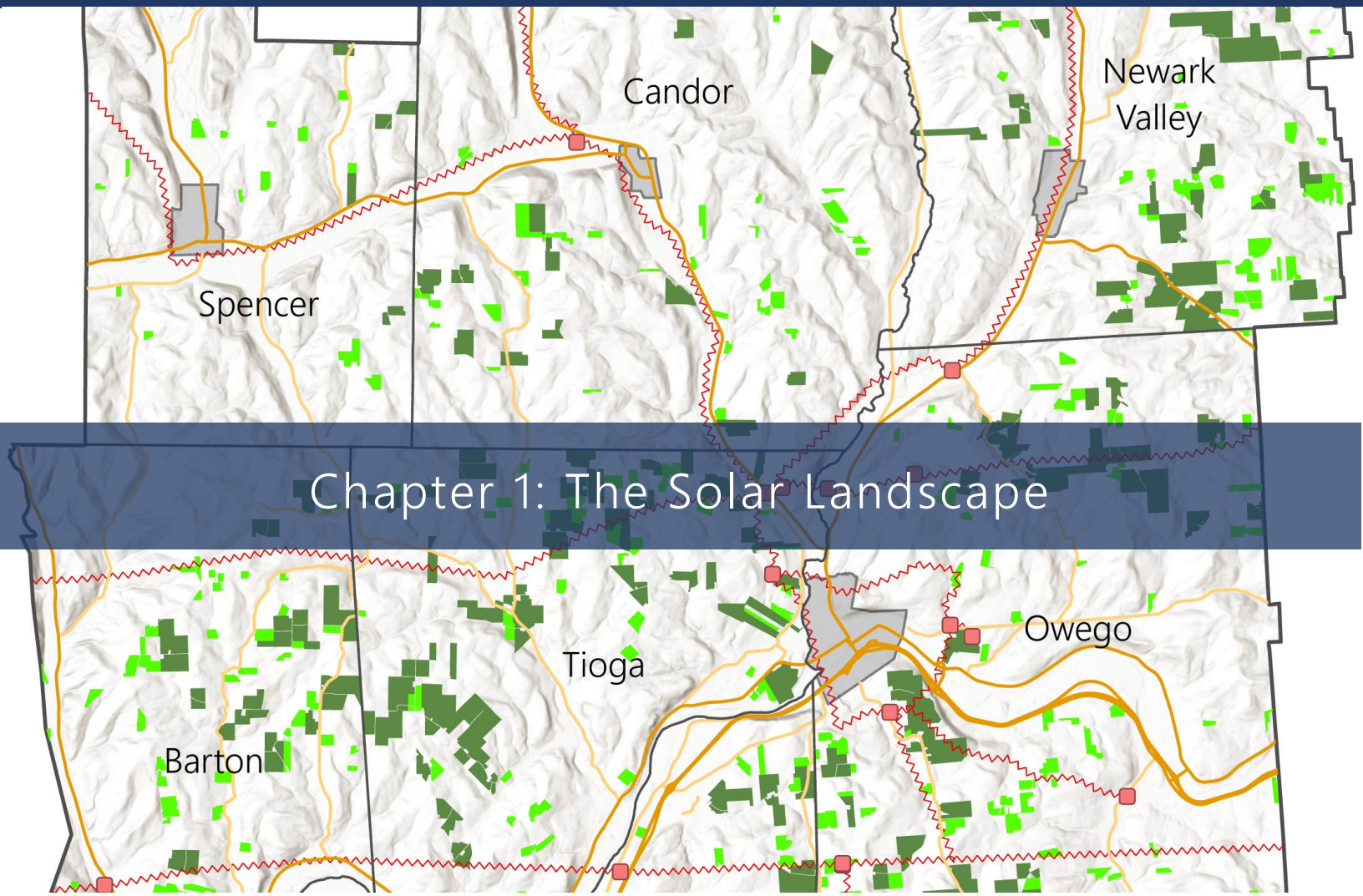
- This chapter lists an array of tools and resources available for more information and to assist with implementation of local laws and procedures.

Appendix A: About PILOTs & HCAs

- PILOTs address the property tax liability of the array, while HCAs direct additional resources to the hosting Town.
- HCAs are most common and necessary when a PILOT is distributed pro rata. If the PILOT is not distributed pro rata, which is the case for a number of the existing Tioga solar projects, an HCA is probably not necessary.
- HCAs typically offset the amount of the PILOT payment.

Appendix B: The State of Agrivoltaics

- Agrivoltaic technologies, which provide for the dual-use of land for agricultural and solar production, are still evolving and being studied.
- Agrivoltaic crop production is best suited to areas and crops that experience ongoing or seasonal water pressure, and/or crops without a high light-tolerance threshold (e.g. peppers, lettuces, herbs, etc.). Corn and wheat are not currently the best fit for agrivoltaics.
- Sheep and cattle grazing within solar facilities could be a good dual-use model for Tioga County.
- Landscaping that involves native plants and pollinators is the easiest way to support agricultural ecosystems where other dual-use options are not available.



Chapter 1: The Solar Landscape

Prepared by:

MRB | group

This mapping analysis was undertaken with the intention of better understanding what areas of the county are most likely to see future interest in solar development[1]. This helps to identify which towns will need to be most proactive and comprehensive with their solar planning and processes. The analysis looked at parcel size, then used a series of restricting factors to eliminate parcels that would not be favorable for solar development. After an initial elimination of parcels, a series of three scenarios was used to identify parcels that are the least restrictive, average restrictive, and most strictive for solar development. The details of this analysis are outlined below.

Parcels initially included:

- Parcels over 50 acres
- Parcels 10-50 acres

Restricting Factors:

- Ownership
- Area covered by FEMA floodway/floodplain
- Area covered by NWI or DEC Wetlands or DEC Wetland buffers
- Area with slopes of greater than 10% and 15% (no consideration of slope direction)
- Tree density/forested area based on NLCD Tree Canopy data
- Area that is identified by the county as high priority for preservation[2]

Parcels initially eliminated:

- Owned by government or schools
- Uses other than industrial, commercial, vacant, residential, or agricultural

Scenarios:

- Most Restrictive Criteria – least barriers to solar development
    - 25% or less Forested, 25% or less Wetlands, 25% or less Floodplain, 20% or less covered by a slope of 10% or greater, 25% or less designated as high priority for agricultural preservation
- Average Restriction Criteria
    - 50% or less Forested, 25% or less Wetlands, 25% or less Floodplain, 50% or less covered by a slope of 10% or greater, 25% or less designated as high priority for agricultural preservation
- Less Restrictive Criteria – parcels with challenges for solar development, although not insurmountable

[1] The model for the mapping analysis was based on that of the report "Planning for Offsite Solar Energy Projects" by the New York State Tug Hill Commission (February 2021), and then adjusted to reflect the contexts and priorities in Tioga County. The Tug Hill report can be accessed here: https://www.lewiscounty.org/media/Planning/Solar/Planning%20for%20Offsite%20Solar_vFeb%202021.pdf.

[2] Per the Tioga County Agricultural and Farmland Protection Plan Update, which can be accessed at this link: https://www.tiogacountyny.gov/media/1940/tioga-county-afpp-final_all-adopted-5_12_2015.pdf.

- 80% or less Forested, 25% or less Wetlands, 25% or less Floodplain, 80% or less covered by a slope of 10% or greater, 25% or less designated as high priority for agricultural preservation

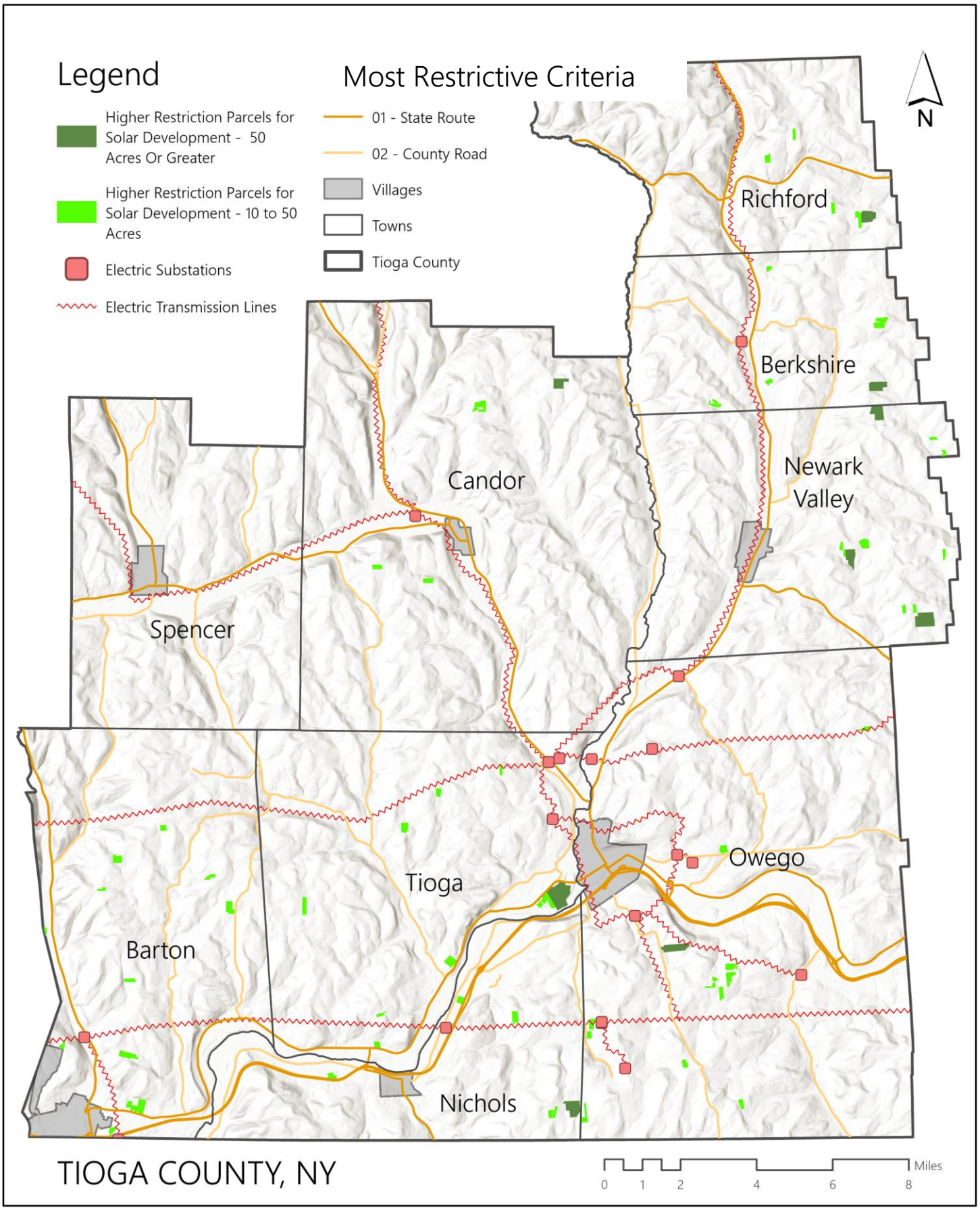
Findings & Additional Considerations:

- Agricultural preservation priority level was included in this analysis as a community driven priority. Given the economic and community character contributions of farming in Tioga County, it is critical for municipalities to carefully consider preservation of prime soils and active farmland in the development of solar policies.
- Parcels within 3 miles of a substation are most favorable due to relatively easy and inexpensive connection to the grid, particularly for community scale solar.
- Parcels within 1000 feet of a major transmission line are also attractive, but require the installation of a substation for the project.
- Some of the existing solar projects within Tioga County are developed on parcels that do not appear within the scenarios above.
  - Tree density in particular does not seem to be a critical factor, and some projects were on parcels with 50% or more floodplains or wetlands.
  - This may also occur in situations where very large parcels have large areas of a restrictive factor and thus were eliminated in the analysis, but the parcel still has enough suitable acreage for a small solar array (for example, a 200-acre parcel with 60% floodplain coverage still has 80 acres of area that is usable for solar).
  - Some existing projects in Tioga County have been developed on land with slopes greater than 10%. Based on this local experience, it is clear that some sloped areas are a viable alternative to development on flat, active farmland. The picture to the right shows an existing solar project on State Route 96 in the Town of Tioga.

Image Source: John Lacey

- The analysis also did not account for adjacent parcels with common ownership. There may be multiple adjacent parcels that would add up to an eligible parcel if combined and are in reality controlled by the same owner(s), but individually do not meet the criteria above. This means the analysis may be missing some legitimate areas for development, or it may classify parcels as 10-50 acres when the common ownership boundary would make an area of more than 50 acres. Despite this, the analysis should still identify general areas with high potential for development.

Maps showing the identified parcels for each of the three scenarios are on the following pages. The interactive mapping of this analysis is available through Tioga County's online GIS system and can be accessed here: Potential Solar Project Site Mapping.


Legend
Higher Restriction Parcels for Solar Development - 50 Acres Or Greater
Higher Restriction Parcels for Solar Development - 10 to 50 Acres
Electric Substations
Electric Transmission Lines
Most Restrictive Criteria
01 - State Route
02 - County Road
Villages
Towns
Tioga County
N
Richford
Berkshire
Newark Valley
Candor
Spencer
Owego
Tioga
Barton
Nichols
TIOGA COUNTY, NY
Miles
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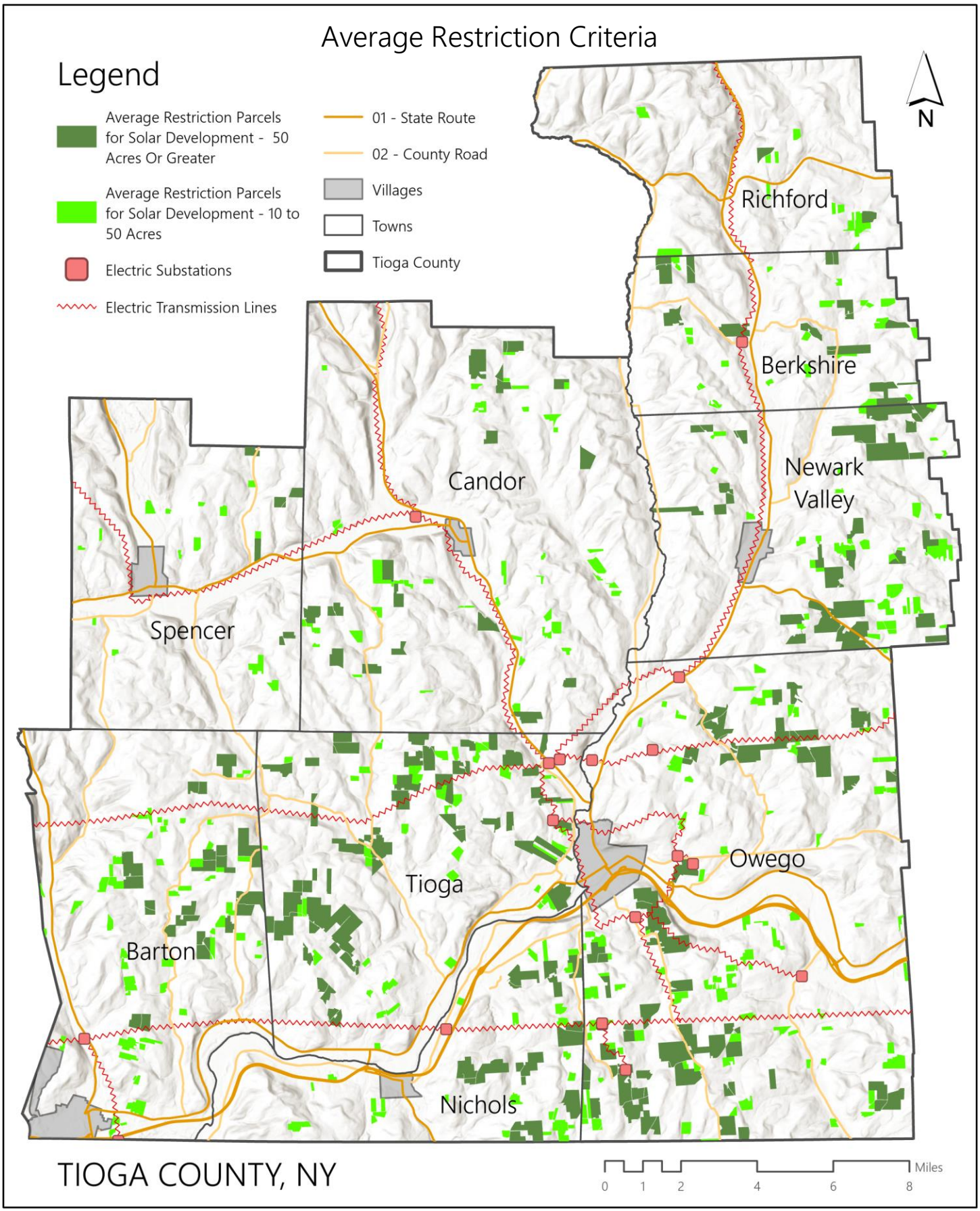
Average Restriction Criteria
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Miles
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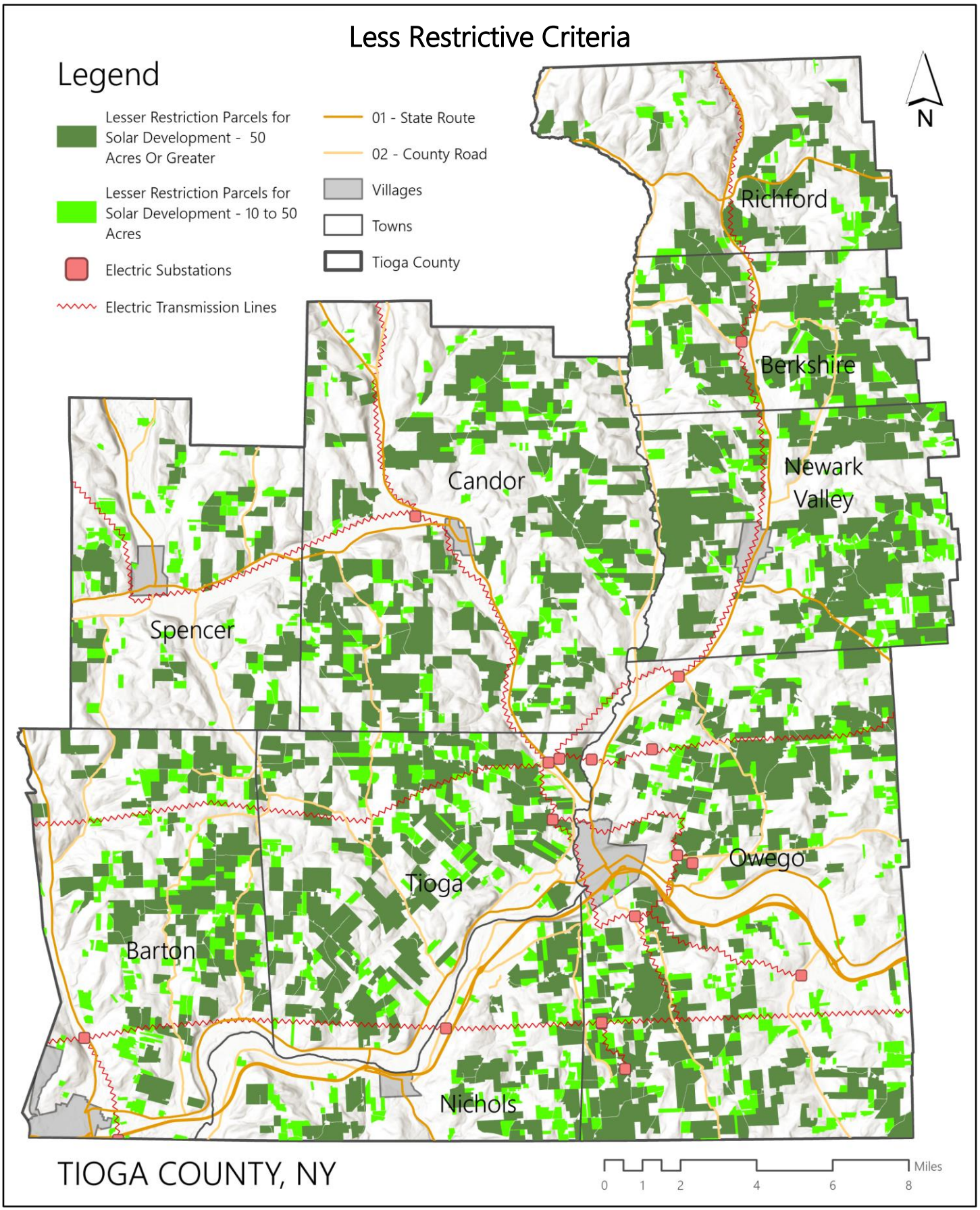
Less Restrictive Criteria
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Lesser Restriction Parcels for Solar Development - 10 to 50 Acres
Electric Substations
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01 - State Route
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Candor
Spencer
Owego
Tioga
Barton
Nichols
TIOGA COUNTY, NY
Miles
0 1 2 4 6 8

Chapter 2: Regulating Solar Development

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New York State incentives have led to extensive solar development across the state, particularly in rural communities with an abundance of flat, cleared land traditionally used for farming. While solar development is not inherently bad for communities, it is important to proactively prepare for and regulate this type of development to ensure that community interests are protected. Without establishing the proper ordinances, requirements, and processes, towns could find themselves without the tools needed to enforce preferred minimum standards. This chapter outlines some of the key mechanisms that towns can use to define standards and protect their interests in the solar development process. More detailed guidance, tools, and templates are available in the topical packets supplementing this report, as described in Chapter 4.

Solar & Battery Storage Laws: Solar and battery storage laws and ordinances can be adopted to specifically outline the minimum standards and requirements for solar development. Such ordinances should be particularly comprehensive in the absence of zoning codes. These laws should include things like permitting requirements, identification of where development can/cannot occur, safety, decommissioning, operation and maintenance, and any specific requirements the town may want to enforce (e.g. road use management, soil sampling, buffers, etc.).

Solar Locations & Development Considerations: Both developers and municipalities have ideas for the most ideal solar development locations, and those may or may not directly align. Developers are looking for uncomplicated sites that are generally flat and clear. They typically look for sites that are easily accessible, have willing land owners, are close to substations or major transmission lines, and are not encumbered by critical environmental factors (such as wetlands, flood plains, or endangered species). Meanwhile, towns will want to consider the existing land use on and around the proposed parcel, buffers from structures, site lines, highest and best use of the land, etc. Agricultural communities in particular will want to consider if and to what extent to include the preservation of active farmland and prime soils in their laws. Some towns have restricted the percentage of developed area that can be made up of prime soils and/or ag land of state-wide importance.

The American Farmland Trust has engaged with partners throughout the North East and New York on Smart Solar Siting initiatives to define opportunities for solar siting beyond prime soils and active farmland. Such efforts involve identifying and steering solar projects toward "least conflict" land, such as brownfields, industrial zones, municipal landfills, and marginal agricultural lands[3].

Special Use Permit: Special Use Permits are a mechanism to review and regulate a specific land use within zoning districts. Communities without zoning can still subject solar projects to a site plan review. As such, it is important that whatever mechanism a town uses to review projects is properly set up to review and regulate solar projects. This review, Special Use Permit or otherwise, should include consideration for a series of factors that will ensure that the development is appropriate for the area and properly maintained over time. These factors include, but are not limited to, existing

[3] American Farmland Trust. "Expanding Smart Solar Siting While Protecting Farmland." https://s30428.pcdn.co/wp-content/uploads/sites/2/2020/08/Solar-Siting-background-and-overview.pdf, accessed May 2022.

site conditions, construction schedule, drainage mitigation, technology specifications, decommissioning, operation and maintenance plans, road use, site design, and financial mechanisms. A thorough review of the project plans will ensure that the town understands the project and the responsibilities of all parties in the development, operation, and removal of the solar facility.

Operation & Maintenance Plans: Individual projects will differ from one another, but it is important for the host municipality to have a good understanding of who and how the array will be maintained throughout operation. Operation and maintenance plans help to clarify this for the town, but are also important to the operator as they outline the activities that will ensure optimal operation of system over time. While there are not standardized practices for these plans, they should address various components from maintenance of equipment and mechanicals to emergency procedures and the role of local authorities and stakeholders.

Abandonment & Decommissioning Plans: The decommissioning plan outlines the required steps to remove the system, dispose of or recycle its components, and remediate and re-establish the land to its original state. This goes beyond just the removal of panels, and could include the removal of landscaping, fencing, footers, roadways, etc. Decommissioning plans should also include a decommissioning agreement between all stakeholders that defines roles and responsibilities, a detailed cost estimate, and identification of financial security. The agreement should be reviewed periodically to update the cost estimates and financial security mechanisms.

Critically, cost estimates should reflect the full cost of decommissioning, without consideration for any salvage value the materials may possess. The agreement can also outline circumstances that may trigger action on the decommissioning plan, such as foreclosure or bankruptcy of any of the involved parties. This will ensure that the town is fully protected and authorized to act should it need to decommission an abandoned facility.

Chapter 3: PILOT Structuring

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Executive Summary

MRB Group was commissioned by the Tioga County Planning Department to undertake a number of analyses and make policy recommendations related to renewable energy projects in the County. This section of the report concerns our recommendations and guidance to towns about how to approach the granting of PILOT abatements for such projects.

Based on our research and analysis, our recommendations are as follows:

1. Start PILOTs from a base level of $7,000 - $8,000 per MW ac of installed capacity (lower end for community solar of 1-5MW, higher end for larger projects), or engage a consultant[4] to use the NYSERDA Calculator Two (or a similar tool) for each project to base payments on the actual project financials. In either case, have a financial professional identified and available[1] to review project financial data should a developer want to negotiate a lower payment.
2. Use a 15-year term with 2% annual escalator.
3. If using the PILOT to incentivize or disincentivize certain activities/factors, be sure that such conditions are readily verifiable and that monitoring processes are defined and in place for any activities/factors that could change over time.
4. Continue negotiating multi-jurisdictional PILOTs at the town level if that is working for all of the involved parties. Involve the IDA only when there is a distinct need for a PILOT greater than 15 years in length, but leverage the IDA as a resource as needed.
5. Continue structuring PILOTs in a non-pro rata fashion that is agreeable to all affected taxing jurisdictions.
6. Do not use PILOTs to define minimum standards or areas of concern. For example, if site lines are a concern to the town, incorporate the appropriate studies and review of sight lines into the site plan approval or permitting process.
7. Avoid HCAs where possible to minimize deal complexity. Since taxing jurisdictions are already open to non-pro rata distribution, attempt to direct resources as needed within the PILOT distribution formula.[5]
8. Do not approve PILOT agreements until the project has obtained local approvals to avoid inconsistencies or contradictions between these processes.
9. An annual administrative fee of $1500 could be charged. Note that the developer may request that the total PILOT payment be reduced by the amount of this fee, which would reduce the amount disbursed to each affected taxing jurisdiction.
10. For projects that are less than 1 MW of installed capacity, consider a total exemption, as the costs of negotiating an exemption and concluding the agreement are likely to exceed the value of future tax revenue entirely.

We also note a number of additional recommendations in the section entitled, "Best Practices & Additional Considerations When Negotiating a PILOT", including the need for consistency using regulatory mechanisms to set minimum land use standards.

[4] The costs of such a consultant is typically charged back to the project sponsor.

[5] If the taxing jurisdictions cannot agree on a distribution formula, default to a pro rata distribution and use an HCA as needed to direct additional revenue to the Town. The amount of the HCA payment will likely offset the amount of the PILOT payment dollar-for-dollar.

Introduction

Financial incentives are key to the economic viability of renewable energy projects in New York State. While the State provides some incentives via NYSERDA grants and/or tax credits, Payment in Lieu of Tax (PILOT) agreements are also generally necessary at the local level to abate property taxes for the project. Under Real Property Tax Law 487 (RPTL 487), municipalities that have not opted out of the law are empowered to negotiate PILOTs up to 15 years in length.[6] However, RPTL 487 provides no additional requirements and guidance regarding the structure of PILOTs. The following report outlines relevant background information, resources, and recommendations for negotiating and structuring PILOTs at the local level.[7]

NYSERDA Guidance & Resources

The New York State Solar Guidebook offers guidance to municipalities on various topics related to large-scale solar development. The guidebook includes a section on PILOTs, the primary narrative chapter of which is currently being updated to reflect the newly-finalized standard appraisal methodology. The section also includes templates for a Solar PILOT Law and two solar PILOT Agreements (one for a single jurisdiction and one for multiple jurisdictions). All of this can be located under the "Solar Payment-in-Lieu-of-Taxes (PILOT)" section of this page: https://www.nyserda.ny.gov/solarguidebook, including the updated narrative chapter that is being updated when it is available.

NYSERDA also offers a PILOT calculator to provide guidance on the per MW charge that solar projects are likely to be able to afford. A link to most recent calculator (Version 2.0) is available in the Resources section of this chapter, but an updated version will likely be added to the solar guidebook when it is available. Currently, the calculator recommends PILOT payments starting at between $1,700 and $5,000 for the NYSEG load zone, but we believe that this calculation is outdated and is intended to be used for regional/county-level guidance as opposed to project specific decision making. Based on more recent research of PILOT programs in surrounding counties, we believe that municipalities can request higher PILOT amounts as long as there is willingness and a process in place to negotiate should the amount be a detriment to the project. This process should include a professional review of the project financials and projections, at cost to the developer, to determine a PILOT amount that would result in a reasonable rate of return. Municipalities should check for updated guidance from NYSERDA regularly, especially as the new appraisal methodology becomes adopted. This resource also includes a spreadsheet that helps to calculate a more specific PILOT payment based on an individual project's financials ("Calculator Two").

Model Output - PILOT Estimates		
% of Compensation	PILOT ($/MW)	Total System PILOT
1.0%	$1,700	$8,500
1.5%	$2,500	$12,500
2.0%	$3,300	$16,500
2.5%	$4,100	$20,500
3.0%	$5,000	$25,000
3.5%	$5,800	$29,000
4.0%	$6,600	$33,000
4.5%	$7,400	$37,000
5.0%	$8,200	$41,000

Source: NYSERDA PILOT Calculator tool

[6] See the "Appendix A: About PILOTs and HCAs" of this report for additional background information on PILOTs and RPTL 487.

[7] None of the content in this report is intended to constitute legal or financial advice. Any users of this information should still work with a qualified and licensed legal and/or financial professional to implement any laws, policies, procedures, etc.

Using Project Financials to Determine a PILOT Payment

A project's capital stack and pro forma financial statements can be used to determine the level of PILOT payment that the project will be able to afford during the operation of the solar facility. However, these financials tend to be complex and the negotiating parties need to be well informed on how to read and understand them. We believe that most towns are not equipped to undertake this analysis without the help of an informed consultant or financial professional and that the cost of such a consultant could be recoverable from the applicant. Therefore, if a town were to take this approach, we strongly recommend using a consultant.

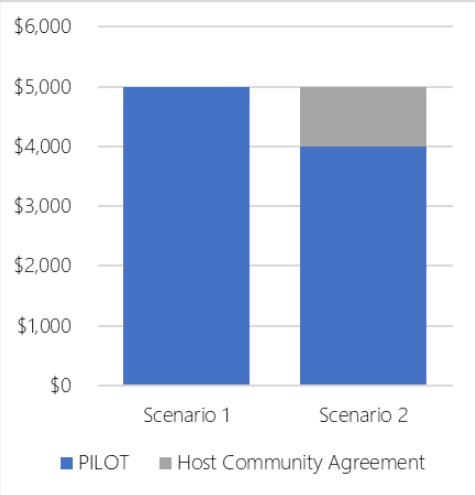
With that caveat, NYSERDA's "Calculator Two" allows a user to enter key figures related to project financials, including the build cost, site lease, O&M costs, assumed property tax rates, revenues, assumed internal rate of return, etc. Once all of the variables are entered into this calculator, it provides a specific PILOT amount based on these inputs. If a municipality would like to use this tool to determine PILOT payments, it may be helpful to create a worksheet for projects to fill out as part of the PILOT application process to ensure that all of these figures are available and easily identifiable. Note that this calculator is only intended for projects between 1 and 5 MW, but could be helpful for slightly larger projects as well. The tables to the right and below show the input and output sections of the calculator.

Model Output - PILOT Estimates		
PILOT Calculation		
Investor NPV Pre-PILOT	[$]	$223,884
Investor Target Pre-tax IRR	[%]	3.25%
Annual PILOT Budget @ Target IRR	**[$]**	**$19,095**
Implied Annual PILOT ($/MW AC)	**[$/MW]**	**$3,819**
Implied Annual PILOT ($/MWh)	**[$/MWh]**	**$1.81**
Post-PILOT Pre-Tax IRR	**[%]**	**3.25%**

Project Assumptions - YELLOW REQUIRES INPUT			
Region Specific Assumptions		***User Input***	***Escalator***
VDER Rate	[$/kWh]	$0.09	
System Build Cost	[$/$W_{DC}$]	$1.60	
Site Lease Payment	[$/$MW_{DC}$]	$6,000.00	2.0%
O&M Cost	[$/kW $_{DC}$], 2% escalator	$22.00	2.0%
Insurance	[$/kW]	$2.00	
CDG Annual Administrative and Subscriber Management Costs	[$/kW]	$10.00	
Other Annual Operating Expense	[$/MWDC]	$0.0	2.0%
Year 1 Specific Yield Forecast	[kWh/kW]	1,450	
Key Non-Regional Variables		***User Input***	
Target Pre-Tax Investor IRR	[%]	3.25%	
Energy Discount Required to Incentivize Customer	[%]	10.0%	
Implied Year 1 PPA Rate	*[$/kWh]*	*$0.083*	
PPA Term	[years]	25	
PPA or Utility Rate Annual Escalator	[%]	2.00%	
Total NYSERDA Incentive	[$]	$1,232,500	
General Project Assumptions		***User Input***	
AC System Size (Alternating Current)	[MW_{AC}]	5.00	
DC System Size (Direct Current)	[MW_{DC}]	*7.250*	
Production Degradation	[%]	0.50%	
Project Start Year	[YYYY]	2023	

Source: NYSERDA PILOT Calculator Two Input and Output

It is helpful to keep in mind that financials vary for different types of solar developments. Community solar projects are under 5 MW and market their power to the local community directly. These projects tend to have higher operational costs and lack economies of scale. In comparison, larger projects that sell power into the grid or to one set customer via a Power Purchase Agreement (PPA) tend to have lower costs and can generally afford higher PILOT payments. If relying on a set standard payment (instead of basing payments on project financials), it is worth considering different baseline standards for these two types of developments.



Calculating a PILOT payment also needs to take any Host Community Agreement (HCA) payments into account. Our research has found that any dollar of HCA provided to a community reduces, dollar-for-dollar, the amount of payments made through a PILOT agreement[8]. If using the calculator, the HCA could be included in the "Other Annual Operating Expenses", or could be reduced directly from the recommended PILOT amount at the end.

Furthermore, a full exemption under RPTL-487 for projects that produce less than 1 MW is recommended. Even if charged at the same level as other projects (which may not be viable), the annual payments are often so small that municipalities end up spending more money and time negotiating, implementing, and monitoring the PILOT than they can ever recover from the PILOT. Such an exemption would also automatically exempt any small scale residential and commercial installations, which is generally agreeable to municipal leaders as it is a benefit to their constituents.

New Tax Assessment Regulation

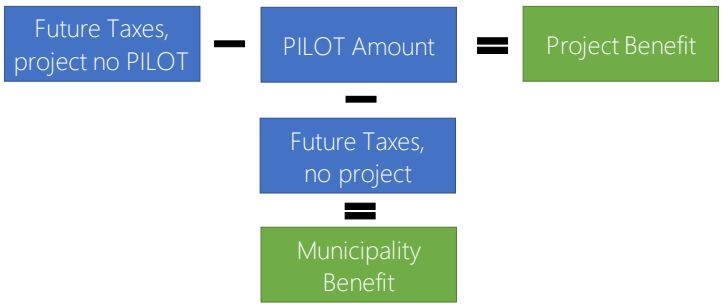
In recent months, New York State has finalized new regulations that require assessors to use the specified methodology to assess renewable energy facilities here-forward. The updated regulations require that assessors use a discounted cash flow approach for wind and solar facilities effective as of the 2022 assessment rolls. The NYS Department of Taxation and Finance has provided guidance on this methodology, including the discount rates to be used based on the type and size of the system. The discount rates, a model spreadsheet to assist assessors in appraising these installations, and instructions are all available on the NYS Department of Tax and Finance website here: https://www.tax.ny.gov/research/property/renewable-appraisal.htm. This methodology will likely yield lower assessments than a typical cost or income approach that many assessors were using previously, and thus will lower the estimated abatement or even potentially shift the need for PILOTs all together. For the next few projects, it would be worthwhile to work with assessors to closely examine the potential assessment and tax liability of a project as part of the PILOT negotiation process.

[8] In other words, if the maximum payment a project can make is, say, $5,000 per MW, an HCA payment of $1,000 per MW would reduce the PILOT payment to $4,000 per MW.

Cost Benefit Analysis

It is important to understand the costs and benefits of any project that is seeking financial incentives to ensure that incentives are not provided at the detriment of the community. A cost benefit analysis should, at a minimum, include the following components:

1) The amount of the investment being made;
2) The projected amount of future property taxes without the project (status quo), being sure to account for any relevant agricultural exemptions;
3) The proposed amount to be paid in a PILOT;
4) A projection of future property taxes if the project were to move forward without a PILOT, being sure to account for the removal of agricultural exemptions where relevant;
5) The number of permanent jobs and wages that will be created as a result of the project[9].



The benefit to the project sponsor would be the difference between numbers 4 and 3 above, and the benefit to the affected taxing jurisdiction(s) is the difference between 3 and 2 above. While a PILOT does mean that the jurisdiction(s) is foregoing some property tax revenue, it is important to keep in mind that, up to this point, these projects have not moved forward without the PILOT. As such the property would remain undeveloped and taxes would realistically continue as projected in number 2 above.

In addition to the baseline analysis described above, a cost benefit analysis could also include:

1) The ongoing economic impacts of the wages created by new permanent jobs, if any;
2) The amount of the construction budget that will be spent with local contractors and suppliers, and subsequently
    a. the amount of sales tax that will be captured locally[10], and
    b. the amount of economic impact created by the local construction spending;
3) Whether the operator will use local contractors for ongoing upkeep and maintenance of the array and site, and if so the economic impacts of that local procurement;
4) Whether and to what extent the project contributes to New York State's renewable energy goals and emission reduction targets.[11]

[9] Solar developments of less than 10MW often do no create any permanent, full-times jobs locally, but may procure ongoing maintenance services from local contractors.

[10] If the IDA is negotiating a PILOT, it is likely that the project will also receive a sales tax exemption on the construction costs. As such, this is only relevant in cases where the jurisdictions are initiating the PILOT.

[11] Considering the contribution of the project to New York State's renewable energy goals is now required as part of cost benefit analyses for IDAs. While this does not directly apply to local municipalities negotiating PILOTs, they may want to consider this element as well.

5) Any other quantitative or qualitative impacts of the project (e.g. project investment in local infrastructure, if low cost power will be available to residents and businesses, costs the municipality must incur to host the project, etc.).

Many solar development projects are occurring on farmland because the ideal conditions for farming are similar to the ideal conditions for solar. As such, it is not uncommon for farming operations to be displaced by solar arrays. While this has benefits to the farmer/landowner in the form of a land lease, communities should consider how this displacement can impact the broader local economy.

Image Source: Tioga County Cornell Cooperative Extension, credit Sandy Repp

According to Emsi economic modeling data, the Animal Production industry in Tioga County had sales of $89.8m in 2021 and the Crop Production industry had sales of $2.3m. Between these two industries, there were $92.1m of agricultural sales in 2021. These sales are very clearly tied to active crop and pastureland throughout the county, and as such each acre of active farmland has a value in terms of revenue generation potential[12] and related economic activity. For every acre of active farmland converted to solar there is a shift in how that land impacts the local economy, except in circumstances where production is continued in part or fully through agrivoltaics[13] or production is transitioned to other previously unused land. While the land lease rental payments and reduced production costs may be sufficient to offset the agricultural revenue loss to the landowner/farmer, there are other local economic impacts to consider, such as how those reduced sales impact local suppliers and related businesses. Economic data shows that these industries purchased approximately $10 million of goods and services from within the county in 2021. Concentrated solar development, to the extent it replaces farming operations, reduces the level of aggregate purchasing by farming operations without replacing it with comparable purchases.

The actual economic impacts for a particular project would depend upon the quality and current productivity of the proposed land. This ripple effect of reduced production should be a consideration when looking at the broader community impacts of solar and farmland conversion, particularly for larger arrays. If enough farmland is converted in aggregate, other businesses and industries in Tioga County will see those impacts and it will result in reduced jobs and earnings for the community.

[12] Revenue potential will vary from site to site and can shift based on environmental factors from year to year.

[13] See "Appendix B: The State of Agrivoltaics" for an overview agrivoltaic options, opportunities and trends based on currently available technology.

Summary of Renewable Energy PILOTs in Tioga to Date

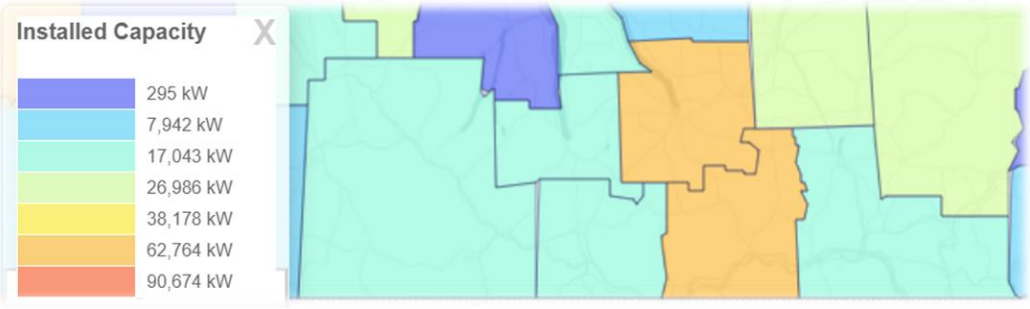
To date, there have been nine renewable energy PILOTs formalized in Tioga County and five others are in process. All but two of those have been/are being negotiated by local taxing jurisdictions. Five of the eight formalized PILOTs negotiated with municipalities have been $3,500 per MW for a 15 year term, but three have annual escalators of 1.5% and the other two have escalators of 2%. The other three municipal PILOTs all had terms of 15 years and escalators of 2%, but had per MW charges of $1,305, $2,000 and $4,000. The lowest of those also had an HCA. All of the projects negotiated(ing) with municipalities are 8 MW or less.

The one finalized IDA PILOT had terms of $5,600 per MW, 30 years, and 2% escalation and is the largest project in Tioga County to date at 16 MW of installed capacity. The project currently being negotiated by the IDA is a proposed 20 MW project. It is likely that larger projects will continue to seek IDA assistance rather than negotiating with the local municipalities because an IDA PILOT can have a term longer than 15 years and the IDA can also provide a sales and use tax exemption on material and construction costs. At the level of investment these larger projects are making, these additional incentives can have a substantial impact on the project's upfront and long-term cost structures.

There are also two projects under 1 MW that do not have associated PILOTs in Tioga County.

County-Level Renewable Energy PILOT Standards in Nearby Counties

To better understand practices in areas around Tioga County, research was conducted to identify what laws and standards surrounding counties are using for renewable energy PILOTs. The following only applies to county level policy on renewable energy PILOTs, and the situation at the town level may vary from that of the county. For instance, if a county has opted out of RPTL 487, towns within that county may still be participating, and vice versa.



Source: www.nysolarmap.com

Broome County – No information was found to indicate that Broome County has a specific solar PILOT law, but they have also not opted out of RPTL 487.

Chemung County – Chemung County has opted out of RPTL 487, so any PILOT that includes the County would need to be negotiated through the IDA.

Cortland County – Cortland County passed a local law establishing PILOT terms for renewable energy projects over 1 MW for PILOTs entered directly with the County. The policy dictates a 15-year term, $7,000/MW, and a 1.5% annual escalator. It seems that many projects in Cortland are still going to the IDA rather than entering a PILOT with the County directly, and the debate about the "right" amount is ongoing[14].

Steuben County – Steuben County has opted out of RPTL 487, so any PILOT that includes the County would need to be negotiated through the IDA.

Tompkins County – Tompkins County does not appear to have a law specific to renewable energy PILOTs. It is common for projects to seek PILOTs through the IDA.

Other - A number of other counties rely on their IDAs to negotiate the majority or all of their renewable energy PILOTs, including Genesee, Lewis, Schuyler, St Lawrence, Oswego and Cayuga. However, there are also counties where IDAs do not entertain any PILOT applications for renewable energy, like Saratoga and Dutchess.

IDA Renewable Energy PILOTs in Nearby Counties

Additional research was conducted to collect the terms of IDA negotiated renewable energy PILOTs in surrounding counties. This research included a review of existing PILOTs and relevant IDA policies. These documents do not show whether HCAs were also in place for projects, which may explain some variation that exists in some counties.

Broome County – The Broome County IDA has discussed solar energy policies, but to date no policy specifically addresses these projects. There are also no solar projects listed on their website or in their PARIS reporting.

Chemung County – The Chemung County IDA has a set guideline within their Uniform Tax Exemption Policy (UTEP) that dictates solar PILOTs to be $8,000 per MW with an annual 2% escalator for a maximum of 20 years (at the IDA's discretion). All of their existing PILOT agreements match this structure. Similar to Tioga County, the IDA reports that the geography/topography makes smaller projects more viable in their communities. As such, all of the projects in the county are under 5 MW, and most are around 2 MW. The IDA reports that the projects questioned this cost structure, but all of the projects have ultimately agreed to it. To date, they are not aware of any projects that did not move forward as a result of this policy. The IDA is, however, willing to negotiate a lower cost structure should the developer provide financial information that confirms the project would make less than a reasonable rate of return for the industry at this level. In this case, the IDA consults a financial professional to provide an opinion.

[14] Kevin Conlon. "Towns to seek solidarity on solar proposal", Cortland Standard, January 11, 2022. https://cortlandstandard.net/2022/01/11/towns-to-seek-solidarity-on-solar-proposal/

Chenango County – The Chenango County IDA had two active solar PILOTs. Both PILOTs had 30 year terms. The 20MW project had payments of $2,000/MW with an escalator of 10% every 5 years. The 15MW project had an payment of $4,500/MW with an 11.99% escalator every 5 years.

Cortland County – The Cortland County IDA does not have a set policy. Five active solar PILOTs were reviewed, and all but one included an annual 2% escalator. Three of the projects were 5MW or less. The two 5MW projects had payments of $4,500/MW for 25 years. A 3MW project had payments of $5,500/MW for 15 years. The other two projects were 15 and 20 MWs, with payments of $3,000/MW and $1,500/MW respectively. Both had 30 year terms.

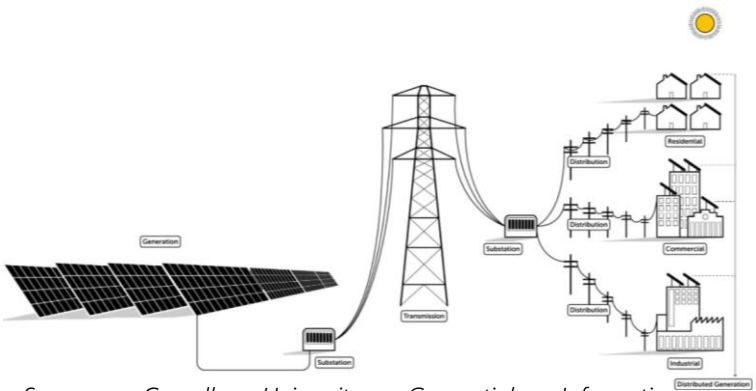
Steuben County – Steuben County had four active solar projects and two active wind projects. All of the PILOTs had 20 year terms and annual 2% escalators. The solar projects were all 5 MW or less, and all had payments of $5,500/MW. The two wind projects were both over 200MW and had payments of $5,300/MW.

Tompkins County – The Tompkins County IDA's policy for solar development is a payment of $4,200-4,800 per MW with an annual 2% escalator for 20 years. TCIDA has done multiple projects under this policy.

Other - When researching a similar question in the Genesee Finger Lakes Region, we found that renewable energy PILOTs ranged from $3,500 to $5,500 per MW, but most were in the $4,000-$5,000 range. A 2% annual escalator was fairly standard across the region. Most PILOTs were 15-20 years, but some did stretch up to 30 years. When HCAs and PILOTs were used together, the total amount of both was in the described ranges. That means that the addition of an HCA did not typically increase the total amount being paid to municipalities. Rather, PILOTs were reduced by the amount of the HCA and thus the same amount was just distributed differently.

Best Practices & Additional Considerations When Negotiating a PILOT

Consistency - Not all PILOTs must be the same, but it is best to have a standard set of guidelines to aid in decision making and negotiation. If towns are taking on the bulk of PILOT negotiations, then each town should consider what is important to them in assigning PILOT values. This can help to protect the town from claims of arbitrary and capricious behavior. More specific recommendations about PILOT agreements are included in the Model PILOT Agreements section of this report.



Source: Cornell University Geospatial Information

Capacity Measurement - The PILOT should be based on the nameplate capacity of the array, which is the number of watts it can produce at peak functionality. Nameplate capacity is also referred to as installed capacity, rated capacity, or nominal capacity. The guidance available recommends basing the PILOT payment on a per MWac value. Developers know that they will rarely

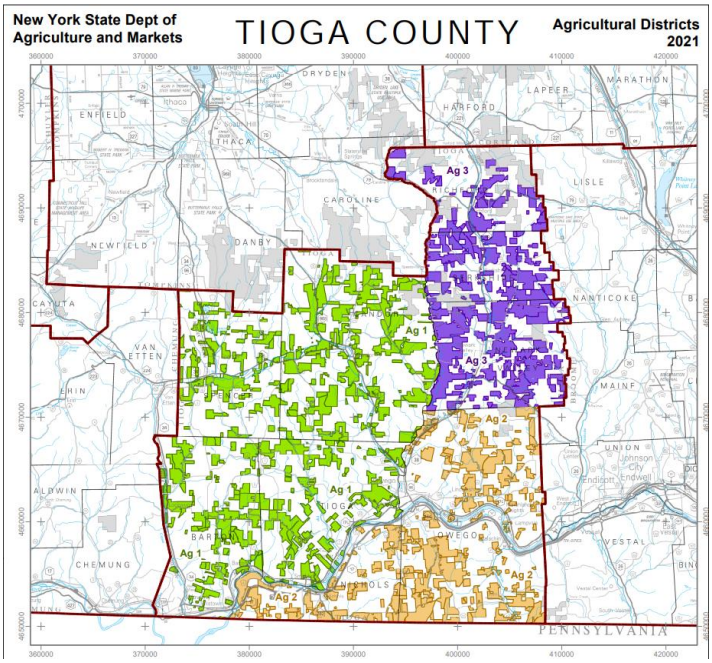
ever produce at this level due to any number of factors, so may ask to base the PILOT on the actual production capacity that they have modeled based on local conditions. The nameplate capacity is preferable for PILOT calculations because it is the only truly known production measurement at the time of installation and does not vary based on uncontrollable factors like the weather.

Communication with the Developer - It is important to have upfront and transparent conversation with the developers of renewable energy projects. Despite all terms and conditions being in writing in the form of legal documents and agreements, the nuances of PILOT deals can sometimes get lost or overlooked. During PILOT negotiations, it is important to cover the following topics with the developer:

1) Taxes and fees for special districts are not included in the PILOT. The project will be taxed for any special districts at the full assessment value. These should be properly accounted for in the negotiation process.
2) Clearly outline any monitoring, certification, or verification that the developer and/or operator will need to comply with over the term of the PILOT. Include the process and expected standards for compliance.
3) Discuss what kinds of activities will require notifications and/or approvals in the future, such as transferring ownership of the array.

It is not unusual for solar arrays to transfer ownership from a developer to an operator at the start of the project. Additional sales may occur throughout the lifespan of the array. It is important to review these points with any new ownership as transfers occur if the new owners intend to maintain the PILOT agreement.

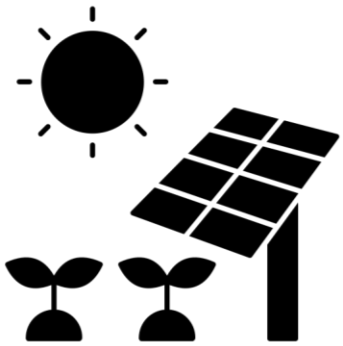
Local Codes vs. PILOTs - PILOTs are not the appropriate way to regulate what a town requires from renewable energy developments. Zoning, land use, and permitting laws and ordinances are a more appropriate way to address minimum requirements, and should be the primary way of avoiding or disallowing development that is not acceptable to the town. There is a chapter in the NYESRDA Solar Guidebook that covers how to use special use permits and site plan regulations to guide solar development on farmland. A link to that chapter is listed in the Resources section at the end of this report. PILOTs should not be used as a method to shut down a project that does not meet a town's standards. This is especially true if/when the IDA is involved in PILOT negotiation as the IDA has no jurisdiction over land use, zoning, or permitting. There is another section of the project addressing



Source: Cornell University Geospatial Information Repository

siting issues, but some topics that should be addressed through regulatory mechanisms rather than PILOTs are:

a. Site requirements like setbacks, visual barriers, zoning districts/surround land use, etc.
b. Impact on site lines and visual impact studies.
c. Minimum standards for protecting farmland.



Using PILOTs to incentivize/disincentivize activities - While land use, zoning, permitting, and other regulatory mechanisms should be used to set minimum requirements for projects, PILOTs could be used to incentivize desirable activities that advance the goals and priorities of the town or disincentivize allowable but not ideal practices. For the sake of consistency, it is important to define these practices and how they will affect payments. Ideally, these factors should be tied to the development of the project and should be verifiable. This will allow the town to verify that the developer has done what they said and implement the PILOT as negotiated without any additional action. There may be factors that are ongoing activities, like if a town wants to incentivize agrivoltaics or planting of pollinators. In this case, the town should only consider activities that can reasonably be monitored over time, and the process for monitoring should be outlined in writing and provided to the developer upfront. The PILOT agreement should also stipulate how the PILOT will be affected should the monitoring uncover that the increased incentive or disincentive is no longer warranted. In doing this, make sure not to create a financial incentive for conditions to worsen. For example, if you increase the PILOT payment to disincentivize building on high quality soil, don't allow a reduction in the payment if the quality of the soil deteriorates over time. While it is never advisable to assume that a party will intentionally negatively impact the conditions, it also isn't advisable to provide an incentive to do so. Instead, it may be better to reduce the PILOT payment to incentivize building on substandard soils to start, or make the disincentive permanent so that the PILOT is not affected by soil conditions changing. Towns should consider the long-term administrative requirements of implementation and monitoring a PILOT that is used in this way. If the town is not realistically able to take on additional tasks related to these incentives/disincentives, it is best to avoid long-term factors that will complicate the ongoing administration.

The role of the IDA - Many Industrial Development Agencies (IDAs) across New York State have been involved in PILOT negotiations for renewable energy PILOTs. While the PILOT structure is often very similar – a per MW charge with annual escalator – there are some differences between how IDAs and local municipalities handle these PILOTs. First, IDAs are regulated under a different section of New York State Law, so must comply with some specific processes, reporting, and requirements that do not apply to towns. Second, IDAs have jurisdiction across municipalities, meaning that they are able to negotiate a PILOT for all affected taxing jurisdictions within their service area without approvals or signoffs from each municipality[15]. Third, IDAs are able to offer PILOTs of any length, whereas RPTL 487 limits local municipalities to offering a maximum of 15 years. Finally, IDAs are able to offer additional tax incentives beyond the PILOT. IDAs routinely offer mortgage recording tax

[15] Approval is required by each affected taxing jurisdiction only if the PILOT will not be distributed on a pro rata basis.

abatements and sales and use tax exemptions that create additional upfront savings during project development. Effectively, these additional incentives help to offset the administrative fees that IDAs generally charge and/or provide leverage for IDAs to seek higher PILOT amounts.

Local municipalities and the IDA should decide when and how the IDA gets involved in these projects to, again, maintain consistency. Some communities send all developments to the IDA, but it seems that Tioga County has primarily been negotiating at the local level unless the developer is requesting a term of greater than 15 years. There should be clear communication and agreement about how this process works, what taxing jurisdictions expect from the IDA, and how the IDA should handle inquiries that come to them directly. Furthermore, it should be clearly understood that the IDA's role is solely to address tax incentives, and as such should not be expected to make any decisions or determinations related to land use, siting, or permitting.

Timing of PILOT Approval - Regardless of what entity is negotiating and approving the PILOT, timing is an important factor. While negotiations and processes can start prior, it is best for the final PILOT approval to occur after the site plan, permitting, decommissioning, and other local approvals and agreements are in place. This ensures that there are no inconsistencies between the siting and PILOT agreements, and that the project meets local standards before incentives are provided. It also ensures that the PILOT amounts do not need to be renegotiated after approval based on additional investments or costs required to obtain local approval.

Adjusting PILOT for depreciating assets - Some developers will ask to for PILOTs to reflect the depreciating value and production capacity of the array over time. In our research, this is not standard practice and should not be necessary. If using the PILOT calculator from NYSERDA, production degradation is already accounted for in the formula. Also, other kinds of PILOTs do not tie directly to the depreciation of assets such as buildings. Lastly, inflation in the US is projected to be above 2% for at least the next 10 years, so there is an inherent discount built into a PILOT with an escalation of 2% or less.

Administrative fees - When IDAs negotiate PILOTs (renewable energy or otherwise), they charge administrative fees upfront and/or annually to cover the costs of administration, reporting, and monitoring related to the PILOT. Unlike municipalities, IDAs do not get any portion of PILOT payment revenue, so most IDAs rely on these administrative fees as a primary source of income to fund their operations. As mentioned above, IDAs also offer additional incentives that can offset these fees. While municipalities should certainly require projects to cover any related legal or professional fees incurred in the PILOT process, charging an additional administrative fee is optional. As with HCAs, it should be expected that any additional annual fee will reduce the PILOT payment dollar-for-dollar. In this way, the fee would be redirecting resources away from the PILOT payment to the host community (typically the town).

Recommendations

Based on our research and analysis, our recommendations are as follows:

1. Start PILOTs from a base level of $7,000 - $8,000 per MW ac of installed capacity (lower end for community solar of 1-5MW, higher end for larger projects), or engage a consultant[16] to use the NYSERDA Calculator Two (or a similar tool) for each project to base payments on the actual project financials. In either case, have a financial professional identified and available[12] to review project financial data should a developer want to negotiate a lower payment.
2. Use a 15-year term with 2% annual escalator.
3. If using the PILOT to incentivize or disincentivize certain activities/factors, be sure that such conditions are readily verifiable and that monitoring processes are defined and in place for any activities/factors that could change over time.
4. Continue negotiating multi-jurisdictional PILOTs at the town level if that is working for all of the involved parties. Involve the IDA only when there is a distinct need for a PILOT greater than 15 years in length, but leverage the IDA as a resource as needed.
5. Continue structuring PILOTs in a non-pro rata fashion that is agreeable to all affected taxing jurisdictions.
6. Do not use PILOTs to define minimum standards or areas of concern. For example, if site lines are a concern to the town, incorporate the appropriate studies and review of sight lines into the site plan approval or permitting process.
7. Avoid HCAs where possible to minimize deal complexity. Since taxing jurisdictions are already open to non-pro rata distribution, attempt to direct resources as needed within the PILOT distribution formula.[17]
8. Do not approve PILOT agreements until the project has obtained local approvals to avoid inconsistencies or contradictions between these processes.
9. An annual administrative fee of $1500 could be charged. Note that the developer may request that the total PILOT payment be reduced by the amount of this fee, which would reduce the amount disbursed to each affected taxing jurisdiction.
10. For projects that are less than 1 MW of installed capacity, consider a total exemption, as the costs of negotiating an exemption and concluding the agreement are likely to exceed the value of future tax revenue entirely.

[16] The costs of such a consultant is typically charged back to the project sponsor.

[17] If the taxing jurisdictions cannot agree on a distribution formula, default to a pro rata distribution and use an HCA as needed to direct additional revenue to the Town. The amount of the HCA payment will likely offset the amount of the PILOT payment dollar-for-dollar.

Chapter 4: Tools & Resources

Prepared by:

MRB | group

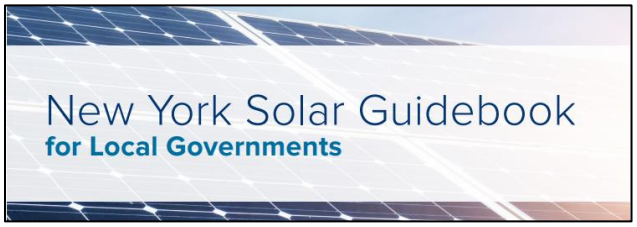
The content of this report is supported and can be supplemented by a variety of resources and tools, including state guidance, templates, presentations, research resources, and calculators.

Topical packages

The following packages were developed and/or compiled specifically for this project to assist and guide Tioga County towns in preparing for solar development projects. Printable versions of these packages are available at the links listed below. Editable copies of the templates and tools, as well as presentation videos, are available upon request from the Tioga County Office of Economic Development & Planning.

- Local laws and procedures - https://www.tiogacountyny.gov/media/05xgol3x/tioga-county-solar_local-laws-and-procedures-full-package_for-print_not-editable.pdf
    - Solar Locations & Development Considerations overview
    - Solar & Battery Storage Law overview
    - Special Use Permits overview
    - Local Law templates
        - Solar Law Template
        - Battery Storage Law Template
        - Unified Permit Guidance from NYS
    - Local Laws and Processes presentation slides and video
        - Local Government Roles and Regulatory Framework
        - Pre-construction requirements and considerations
- Project plans and agreements - https://www.tiogacountyny.gov/media/0ylmo5oi/tioga-county-solar_project-plans-and-agreements-full-package_for-print_not-editable.pdf
    - Abandonment & Decommissioning Plan overview
    - Decommissioning Plan and Agreement presentation slides and video
    - Decommissioning Agreement Template
    - Operation & Maintenance Plan Overview
    - Operation & Maintenance Plan presentation slides and video
- PILOTs & HCAs - https://www.tiogacountyny.gov/media/hqqc2dq1/tioga-county-solar_pilots-hcas-full-package_for-print_not-editable.pdf
    - Solar PILOT Calculation Tool – spreadsheet to project estimated PILOT schedule and disbursements
    - PILOT Agreement Templates (multiple and single jurisdiction) – updated versions of the NYS templates
    - Host Community Agreement Templates (annual and lump sum)

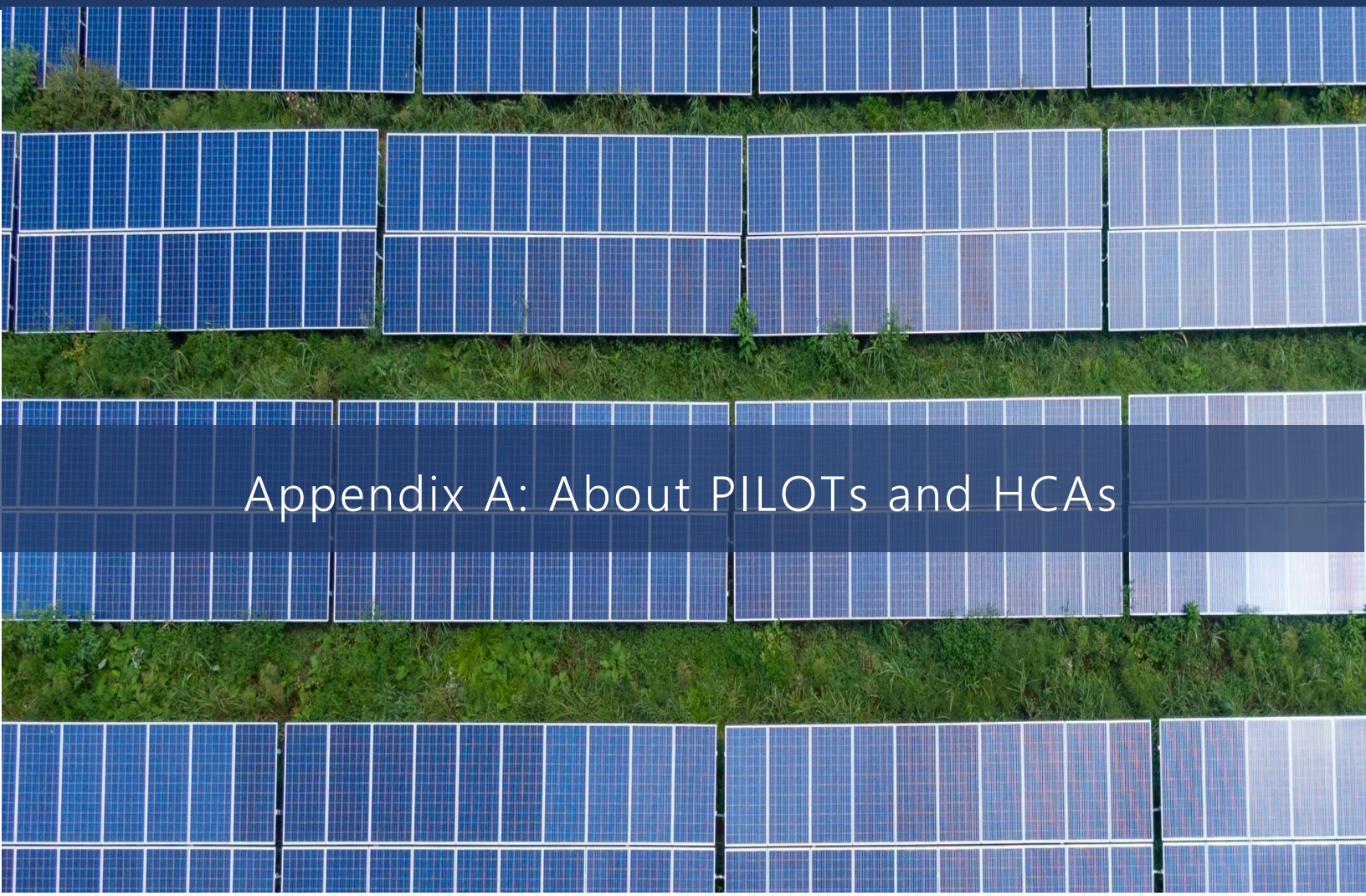
Other Resources



The following resources are available from NYS and other sources for reference and guidance in the development solar projects.

- General
  - NYSERDA Solar Guidebook: https://www.nyserda.ny.gov/solarguidebook
    - Select Chapters: Solar permitting and inspecting; SEQR for Solar; RPTL 487; Solar PILOT; Using Special Use Permits and Site Plan Regulations to Allow Large-Scale Solar Installations While Protecting Farmland; Solar installations in agricultural districts; Decommissioning solar panel systems; Model solar energy local law; Municipal solar procurement toolkit
  - New York State Technical Assistance and Workshops for municipalities: https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting/Technical-Assistance-and-workshops
    - Free workshops available: Understanding Solar PV Permitting and Inspecting in NYS, Overview of the Model Solar Energy Law, Overview of the Model Battery Energy Storage Law, Battery Energy Storage for First Responders
  - American Planning Association Solar@Scale: A Local Government Guidebook for Improving Large-Scale Solar Development Outcomes:
    - Guidebook: https://www.planning.org/publications/document/9222548/
    - Webinar series: https://icma.org/events/solarscale-webinar-series
  - NYS Batter Energy Storage System Guidebook: https://www.nyserda.ny.gov/Energy-Storage-Guidebook
    - Chapters: Model Law, Model Permit, Electrical Checklist for field inspections, Uniform Fire Prevention and Building
  - NYS Wind Energy Guidebook: https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting/Wind-Guidebook
- Siting and agricultural considerations
  - American Farmland Trust Smart Solar Siting on Farmland report: https://farmlandinfo.org/publications/smart-solar-siting-in-new-york-report/
    - Webinar recording: https://farmlandinfo.org/media/smart-solar-siting-in-new-york-webinar/
  - Cornell review with sampling of ideal site characteristics, considerations, and State policies (published February 2021, pages 6-9): https://solargrazing.org/wp-content/uploads/2021/02/Cornell-Large-Scale-Solar-Info-and-Research-Needs.pdf
  - Farmer's Guide to Going Solar, US Department of Energy: https://www.energy.gov/eere/solar/farmers-guide-going-solar
- PILOTs
  - NYSERDA PILOT Calculator (you must download to utilize): https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.nyserda.ny.gov%2F-%2Fmedia%2FFiles%2FPrograms%2FNYSun%2FPILOT-Calculator.xlsm&wdOrigin=BROWSELINK

    - NYS Department of Taxation and Finance Appraisal methodology for solar and wind energy projects: https://www.tax.ny.gov/research/property/renewable-appraisal.htm
- Grazing and Solar (additional Agrivoltaic resources available within the Appendix B)
    - American Solar Grazing Association (GSGA): https://solargrazing.org/
    - Cornell Sheep Program: https://blogs.cornell.edu/newsheep/
- USDA Sheep Production and Marketing Grant Program: https://www.ams.usda.gov/services/grants/spmgp



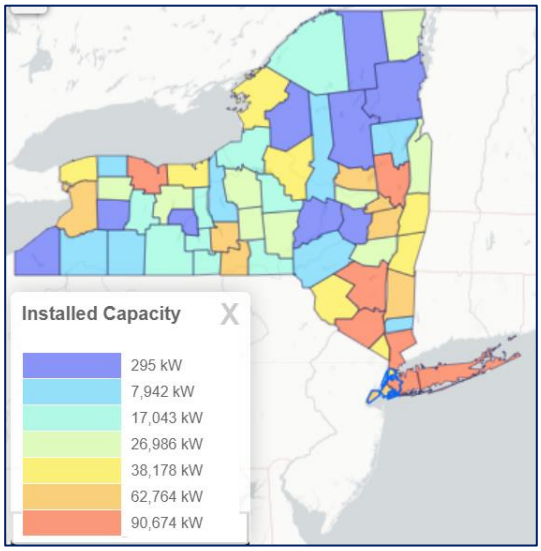
Appendix A: About PILOTs and HCAs

Prepared by:

MRB | group

Introduction

Renewable energy projects being developed in New York State require various incentives to achieve feasibility. These projects are capital intensive and long-term revenues are uncertain, making the projects' economics tenuous. Local level incentives can be particularly difficult for a number of reasons, including the fact that there are not consistent standards, they can be unpopular with the developments' future neighbors, and local leaders are generally not experienced in these kinds of negotiations. Therefore, the purpose of this document is to inform local leaders on the terms, conditions and ways that incentives can be used to assist both the community and the presumed renewable energy development.



Source: www.nysolarmap.com

There are two local financial arrangements that are often used with renewable energy developments: Payment in Lieu of Tax agreements (PILOTs) and Host Community Agreements (HCAs). These two tools do different things:

- PILOTs abate property taxes, which reduces the project's the long-term tax costs, while
- HCAs direct revenue from a project owner to a particular municipality.

The following report summarizes PILOTs and HCAs, their uses, and relevant considerations.[18]

PILOT Definition

When it comes to renewable energy projects and property taxes, there are three options:

1) Do not provide any exemption – this option requires the facility to pay full property taxes throughout the life of the project/array. This has historically been a non-starter for these projects, and would typically result in the project not moving forward.[19]
2) Provide a full exemption – this option exempts the development from all property taxes. This is sometimes seen as a reasonable option for very small installations (under 1 MW)[20]. However, for larger installations, this is generally not ideal for communities or necessary to make a project move forward.
3) Negotiate a PILOT – this option provides a more balanced approach that creates benefit to all parties. However, it can be complicated and requires time and attention to do correctly.

[18] None of the content in this report is intended to constitute legal or financial advice. Any users of this information should consult with a qualified and licensed legal and/or financial professional to implement any laws, policies, procedures, etc.
[19] As explained below, under the new tax assessment guidance from New York State, this dynamic will change.
[20] The rationale for this situation is that, for such small installations, the legal costs of negotiating the actual PILOT is more than the future revenues from the PILOT.

Payment in Lieu of Tax (PILOT) agreements are negotiated in order to reduce the long-term property tax liability of the development. This reduces the ongoing operational costs, and thus makes the project more feasible. Under RPTL 487, which applies to renewable energy projects specifically, PILOTs can be negotiated and implemented by the affected taxing jurisdictions. Alternatively, a developer could request a single PILOT through the local Industrial Development Agency (IDA)[21] that would abate taxes for the relevant municipalities (but not for any special districts).

Under RPTL 487, energy developers must notify each affected taxing jurisdiction of their intent to develop a project and request to negotiate a PILOT. Recent updates to the law dictate that this notice must be made via a hard copy letter addressed to the highest ranking official. If a jurisdiction does not respond to this notice within 60 days, the project will automatically be fully exempt from property taxes in that jurisdiction. Jurisdictions can opt out of RPTL 487 by passing a resolution or local law. Those that opt out are not subject to the 60-day notice (and potential full exemption triggered by a lack of response), but also cannot negotiate PILOTs for any renewable energy projects regardless of type or size. In this case, the project will pay property taxes on the full assessment unless a PILOT is negotiated through the IDA instead.

In general, PILOTs require a project to make one or more payments each year that are then distributed to the affected taxing jurisdictions, typically county, school, city/town, and village (if applicable) where the project is located. This payment replaces the traditional property tax on the project parcel, which is either moved to the tax-exempt portion of the tax rolls or an exemption is applied to the assessed value. In most areas of the state, special district taxes are not impacted by a PILOT, so any water, sewer, fire, etc. districts would still bill and receive taxes based on the full assessment outside of the PILOT.

By default, the disbursement of the PILOT payment is made pro rata to the affected jurisdictions, meaning that it is broken down based on each jurisdiction's percentage of the total tax rate (see example to the right). Sometimes the payment formula is based on actual tax rates, other times it is a lump sum payment allocation.

Example Pro Rata Distribution of $22,000 PILOT Payment

Affected Taxing Jurisdiction	Tax Rate	% of Total Tax Rate	Pro Rata Distribution Amount
Town	1.78	5.89%	$1,295.80
County	8.25	27.31%	$6,008.20
School	20.18	66.80%	$14,696.00
Total	*30.21*	*100%*	*$22,000.00*

Source: MRB

If the community would like to distribute the payment in a different way, all affected jurisdictions must agree and sign off on the distribution formula. This is how most of the renewable energy PILOTs have been handled in Tioga County, with all of the affected taxing jurisdictions signing off on an even split (one-third each for the town, county, and school) of the PILOT distribution.

[21] Why might a renewable project developer use the IDA PILOT instead of RPTL 487? This would make sense, for example, in the case of a project that is located in a community that has opted out of RPTL 487. It could also apply if the developer is seeking a PILOT of a term in excess of 15 years, the maximum PILOT allowed under RPTL 487.

For renewable energy PILOTs in particular, it has become common practice to charge an annual lump sum. This sum typically starts at a defined dollar amount per MW (based on the designed capacity of the installation), and then escalates by a set percentage annually until the end of the PILOT (for example, $5,000 per MW with a 2% annual escalator). The PILOT only applies to the energy facility itself, while full taxes must be paid on the base value of the land beneath the facility. This is accomplished by either including a base payment in the PILOT that is equal to the full tax liability of the land, or by creating an overlay parcel for the facility alone (while the land parcel remains fully taxed on the rolls).

The details of these PILOTs vary widely across the state, including differing dollar amounts per MW of installed capacity, the escalator percentage, and the length of the PILOT. There are a number of factors that impact how much a project will be able to pay in PILOT payments, and the complexity of renewable energy project financials makes PILOT negotiations difficult. NYSERDA offers guidance that "PILOT rates should be negotiable between 1% and 3% of the compensation solar developers receive for the electricity their projects generate." They provide a calculator tool to assist in determining this amount based upon the primary utility provider. In NYSEG territory, the recommended range is $1,700 to $5,000 per MW. The table to the left is the calculator's output for a 5 MW array. The calculator also includes a tool to help understand the financial pro formas of the particular development, and thus the ability to absorb PILOT costs. However, NYSERDA's recommendations are somewhat dated and present a wide range of values. To arrive at the "correct" PILOT payment amounts, it is often helpful to observe renewable energy PILOT agreements in neighboring communities and negotiate from there. An overview of renewable energy PILOT practices in surrounding counties, along with links to NYSERDA's PILOT calculator and templates for a PILOT Law and PILOT Agreements provided by New York State, are included in the PILOT Negotiation component of this project.

Model Output - PILOT Estimates		
% of Compensation	PILOT ($/MW)	Total System PILOT
1.0%	$1,700	$8,500
1.5%	$2,500	$12,500
2.0%	$3,300	$16,500
2.5%	$4,100	$20,500
3.0%	$5,000	$25,000
3.5%	$5,800	$29,000
4.0%	$6,600	$33,000
4.5%	$7,400	$37,000
5.0%	$8,200	$41,000

Source: NYSERDA PILOT Calculator tool

Host Community Agreement Definition

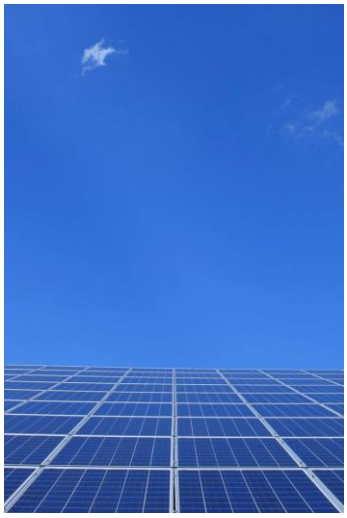
Host Community Agreements (HCAs) are negotiated between an individual municipality (usually a town) and a developer. The HCA could include any number of commitments, but generally involves a series of payments made directly and specifically to that municipality. This payment is in addition to the PILOT or any other type of property tax. Some HCAs are structured as a single upfront payment, but many are structured as annual payments that span a period of time. In the case renewable energy projects, that timeframe could be the life of the proposed renewable energy facility or the same length as the presumed PILOT. These payments are not considered tax revenue (as a PILOT payment would be), so do not impact tax cap formulas. There is not necessarily a standard for these types of agreements either, but payments again are generally based on dollar per MW basis. These payments are not impacted by factors like assessment or tax rates. Note that our research has

found that any dollar of HCA provided to a community reduces, dollar-for-dollar, the amount of payments made through a PILOT agreement[22].

If an HCA payment is desired, the municipality requesting it should consider the ideal structure. Both structures have good reasoning, and the right option may depend on the project.

1) Annual payments offer the municipality ongoing revenue, and for some projects, are easier to manage than an upfront payment (particularly if there are other development costs that make the project more costly). However, with technology and regulations changing regularly, there is some risk to annual payments.
2) Upfront payments provide absolute certainty to the municipality that they will receive the funds, regardless of any regulatory, technological, financial, or company changes. Some developers also prefer this because it can be wrapped into the development costs/financing for the project, and it improves the operational cashflow of the development. This may be particularly attractive to a developer that intends to sell the array to another company for long-term operations. However, not all developments will be able to finance a lump sum payment upfront, and the municipality would have to determine and agree on the highest and best use for this one-time infusion of cash.

Using PILOTs and HCAs



PILOTs are the standard way to address property tax when it comes to renewable energy projects, and are effectively required unless a full exemption is provided. HCAs, on the other hand, are optional and are generally intended to adjust for the shortcomings of PILOT structures. It is worth noting that if both are going to be used, they must both fit into the financial model of the project. As noted above, adding an HCA may reduce the amount that the project can afford to pay toward a PILOT.

HCAs have become popular with renewable energy projects because the town that is actually "hosting" the development often gets the smallest portion of the PILOT payment (assuming a pro rata distribution) despite being the municipality taking on the highest burden in terms of siting, land use, fire protection, decommissioning, disrupted sight lines, etc. Meanwhile, the school district often gets the largest portion of the PILOT, even though there is no inherent risk or burden created for them by the project (since solar and wind facilities do not directly create any new students or require any services or oversight from districts). An HCA is thus used to direct additional resources to the town via an additional payment on top of the PILOT. This in theory ensures that the town is being compensated for any burden or risk they are shouldering. Since Tioga County renewable energy PILOTs have generally been distributed evenly as opposed to pro rata, this misalignment of risk to resource is not as stark. As such, there might not

[22] In other words, if the maximum payment a project can make is, say, $5,000 per MW, an HCA payment of $1,000 per MW would reduce the PILOT payment to $4,000 per MW.

be a need for HCAs in Tioga County, or perhaps a lesser need, as long as municipalities continue to agree to PILOTs that are not distributed pro rata.

While not all PILOTs and HCAs must be the same, there should be some guidelines to ensure consistent decision making and formulation. Assuming that Towns will continue to be the primary negotiators of these mechanisms, as they have been thus far in Tioga County, it is recommended that each Town have a set of criteria that dictates how PILOT and HCA schedules are formulated. This will help to ensure consistency and protect the Town from claims of capricious and arbitrary decision making. PILOT/HCA guidelines are not, however, the appropriate way to regulate what a town requires from these types of developments. Zoning, land use, and permitting laws and ordinances are the appropriate way to address minimum requirements, and should be the mechanisms for avoiding or disallowing development that is not acceptable to the Town. PILOTs and HCAs should not be treated as a tool to "kill" a project that otherwise the Town does not want to see move forward.

PILOT and HCA guidelines could consider any number of factors, including the size of the array, whether it will sell its power at market prices or through a Power Purchase Agreement (PPA, which is typically a higher price than the market's average spot price), what kind of land it is being built on, whether there will be any permanent local jobs associated with the project, etc. In this way, PILOTs and HCAs could be used to incentivize activities that further the Town's priorities, or disincentivize activities that are allowable under zoning and land use regulations but not ideal. It is best to do this for factors that are known upfront and do not change so as not to create additional monitoring or potential changes or termination down the road. For any ongoing activities, Towns should consider whether there is a reasonable and achievable way to check on these activities over the life of the project. Any related monitoring requirements should be included in the written PILOT/HCA documents and communicated to the project developer. More specific guidance and recommendations on siting standards and PILOT negotiation are provided in Chapter 3 of this report.

Conclusion

PILOTs and HCAs can be helpful tools to ensure mutual benefit for a solar development project and the affected taxing jurisdictions. However, both tools may not be necessary to accomplish an appropriate deal. In Tioga County's case, HCAs are probably not necessary in circumstances where the PILOT is split evenly among the taxing jurisdictions. Exceptions may be appropriate in cases where there is a compelling reason for one jurisdiction to receive additional revenue from the project beyond the PILOT. One example would be if one municipality is making an infrastructure or other investment to accommodate the development.

Whatever structures or arrangements are desired in a given Town, there should be some guidelines for consistent decision making. Furthermore, these agreements should not do the job of zoning, permitting, site plan, etc. Towns should consider their priorities and standards for solar development, and then create laws and ordinances to ensure that developments meet at least the minimum standards.

Appendix B: The State of Agrivoltaics

Image Source: University of Arizona

Prepared by:

MRB | group

Introduction

According to the National Renewable Energy Laboratory, up to two million acres of farmland in the United States could be converted into solar use in the next decade. In New York State, reaching CLPA goals of 70% renewable energy by 2030 means farmland will increasingly be a target for development. Dual-use solar/agriculture, or agrivoltaics, presents an option for gaining the benefits of steady revenue streams and clean energy production from solar development projects while continuing to benefit from productive agricultural use. This method can also provide the added benefit of water conservation and improved ecosystems under certain circumstances[i]. A survey or New York farmers revealed that approximately 53% of farmers would be interested in hosting solar, and on average they would be willing to lease 16% of their land for this purpose. Over a third of those farmers indicated dual-use as a motivation behind their interest.[ii] The following report provides a summary of the current agricultural production in Tioga County, as well as an overview of a selection of relevant agrivoltaics research and reporting.

Tioga County Agricultural Production

According to the USDA's 2017 Agricultural Census (the most recent available), Tioga County has 113,182 acres of farmland. Of that, roughly 48% is cropland, 11% is pastureland, 33% is woodland, and the remainder has other characteristics. There are up to 66,777 acres of farmland in Tioga County that could be viable for future solar production, assuming that only cropland and pastureland are potentially viable. It is also important to understand that the 54,327 acres of cropland are primarily used for the production of forage/hay (57.7%), corn for silage and grain (17.3%), and soy beans (2.2%). Much of this cropland is likely supporting animal production, seeing as 70% of agricultural sales in Tioga County are for livestock, poultry, and related products. Furthermore, while not a confirmed fact for Tioga County, it is not an uncommon practice for farmers to rotate these crops to maintain soil nutrients over time. Only 23% of cropland is used for all other crops. As for livestock, as of the most recent Agricultural Census there were 23,339 animals being farmed in Tioga County. Nearly 70% of those were cattle (cows and calves). The next largest industry was sheep, at almost 20% (4,500 sheep).

Top Crops in Acres [d]

Forage (hay/haylage), all	31,339
Corn for silage or greenchop	5,128
Corn for grain	4,255
Soybeans for beans	1,190
Cultivated Christmas trees	795

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	405
Cattle and calves	16,211
Goats	868
Hogs and pigs	308
Horses and ponies	1,004
Layers	2,317
Pullets	391
Sheep and lambs	4,503
Turkeys	211

As discussed in the Cost Benefit Analysis section of this report, the agricultural industry has substantial economic impact in Tioga County, with over $10m of local purchases and over 200 jobs. The industry supports additional indirect employment as well via its suppliers and support businesses. As such, it's important to consider how to offset any losses to agricultural production that could reduce overall economic activity.

Literature Review

To better understand the current state of agrivoltaics, we reviewed a series of research studies and articles on the efficacy of collocating solar panels with agricultural production. Overall, the impacts of agrivoltaics vary based on the existing environmental conditions and the species of plant being cultivated.

There are three main types of agrivoltaics being studied and implemented as animated below: a) traditional, ground mounted solar panels spaced with wider rows to allow for planting in between, b) solar panels installed on top of greenhouses, and c) stilt mounted solar panels that are elevated 10 feet above the ground to allow for planting and the use of typical farm machinery underneath[iii]. One study also looked at stilt mounted installations with alternating glass panels designed to refract and disperse light evenly below the panels, thus mitigating the shading effect (Even-lighting Agrivoltaic Systems, or EAS)[iv]. While the results were promising, no additional study or discussion of EAS specifically was found. For the purpose of this review, we did not look at the second type (greenhouses) as our scope is focused on understanding the potential of agrivoltaics on open cropland.

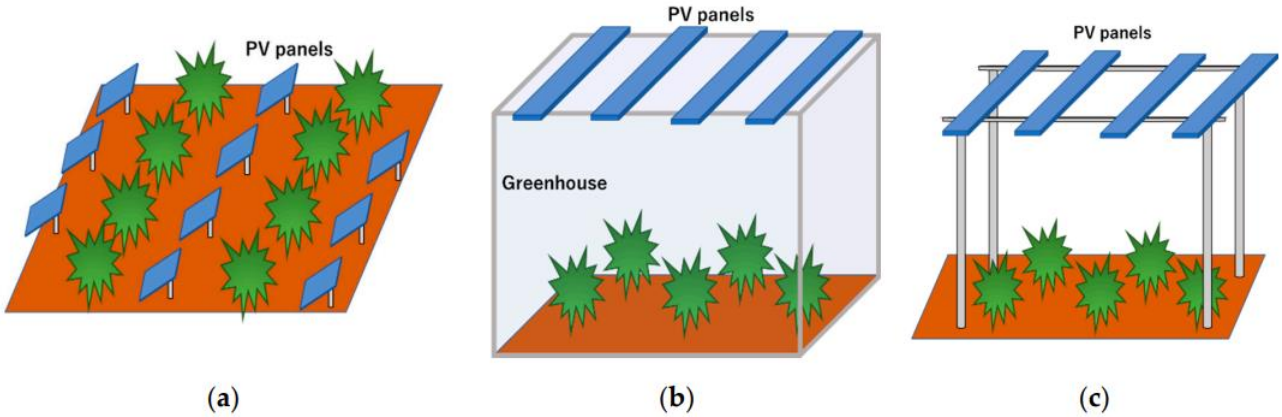


Image Source: T. Sekiyama, A. Nagashima. "Solar Sharing for Both Food and Clean Energy Production: Performance of Agrivoltaic Systems for Corn, A Typical Shade-Intolerant Crop." Environments 2019, 6, 65.

Much of the research found is focused on food/vegetable crops, like lettuces, peppers, tomatoes, herbs, etc. There were only a few studies that looked at corn. To summarize multiple studies, it's generally been found that agrivoltaics is particularly beneficial with shade-tolerant crops in areas that experience water stress (like drought or extreme heat). In these scenarios, both crops and solar panels may actually increase in productivity[v]. With the right species of plant and environment, agrivoltaics can create the conditions for three mutually beneficial impacts: 1) improved water efficiency through reduced evaporation and increased soil moisture, resulting in water conservation from reduced irrigation, 2) improved plant growth as a result of greater water efficiency and milder microclimates under the panels, and 3) improved power generation due to reduced heat-stress resulting from cooler day-time temperatures below the panels[vi]. These benefits are well explained in a video from Oregon State University available here: https://youtu.be/ZP7kuQS6QiI. A related Oregon State study showed that cropland and grassland were the top two land covers associated with the greatest solar

PV power potential, further confirming the mutually beneficial potential of dual-use solar and/or grazing[vii]. One study in particular noted that there is little adaptation to farming practices needed to convert to agrivoltaics, and thus most of the focus in decision-making and further development should be placed on light-reduction mitigation and crop selection[viii].

There were two studies in particular reviewed to better understand the potential for agrivoltaics with corn crops. Both studies used elevated panels to allow for farming beneath the panels as opposed to between the panels. One study in Japan showed that stilt-mounted panels over sweetcorn did reduce yield slightly, but the crop production loss was far more than offset by the increased revenue from selling generated power[ix]. The other study modeled rainfed maize growth in North Italy using elevated tracking panels, which indicated that despite slightly reduced production levels the improved water efficiency could increase maize's resistance to drought caused by climate change[x].

No studies were found in relation to solar co-location with hay production. In fact, some of the earliest and largest examples of active agrivoltaics in the U.S. converted the farm away from hay to an array of other plants, vegetables, and pollinators[xi,xii]. There was, however, anecdotal reference to plantings of winter wheat and grasses that are promising for the prospect of hay production within an agrivoltaic system.

Image Source: Cornell University

In addition to cropland, pastureland has high potential for dual-use installations. Initial speculation and study indicate that the shade and milder microclimates beneath panels may be helpful to animals (and farmworkers) as well[xiii]. A study at Cornell University looked specifically at grazing sheep on ground mounted solar sites for the purpose of vegetation management. The study found that 3 sheep per acre is on average optimal for solar sites (less for marginal pastures and more for optimal pastures). Some benefits include potential improvements in soil health and biodiversity, lowering the barriers to entry for sheep farming and the potential for significant growth of the sheep industry, increasing availability of local meat (particularly lamb), and potential savings of $300 per acre annually to solar site developers on vegetation management. However, the study also found that the vast majority of sheep farms in NYS manage fewer than 25 sheep, which would not be sufficient to graze most solar sites, and would need support and technical assistance to expand flocks enough to enter this line of business. Furthermore, the infrastructure for meat production, such as auction barns and slaughterhouses, and veterinary services are currently insufficient for significant sheep industry growth. That being said, Cornell experts are available throughout the state to assist farmers considering grazing solar sites[xiv].

Image Source: Energy News Network

While grazing sheep has been studied and implemented in numerous instances across the country, there is limited information about grazing cattle. There is, however, a farm in Vermont, Maple Ridge Meats, that grazes cattle among a solar array (see photo to the right). In this one instance, there were some increased costs (approximately $50,000) for this solar installation. The panels needed to be raised higher than would be necessary for sheep and thus would be subject to higher wind exposure, and the greater weight of cattle needed to be accounted for in the case that the animals were to run into the posts. These factors meant the poles needed to be anchored deeper into the ground. However, despite these additional costs the developer and farmer alike consider the installation a success[xv]. In Tioga County, solar installations on sloped land may be particularly well suited to grazing rather than dual-use crop production or agricultural displacement. The picture below shows an existing solar installation on State Route 96 in the Town of Tioga that demonstrates a suitable area for both solar and grazing.

Image Source: John Lacey

According to a survey of 338 New York State farmers conducted by the American Farmland Trust, 45% were willing to consider grazing livestock and 36% were willing to consider grazing sheep alongside solar panels. Furthermore, 41% were open to attempting to grow crops under or around a solar array facility. This contradicts the common assumption that the prospect of navigating equipment around panels is a primary barrier to agrivoltaics experimentation.[xvi]

Additional/Alternative Options

A number of the studies and reports referenced in this summary also point to solar arrays as an ideal place to grow native plants and grasses, as well as habitats that are specifically catered to pollinators. This type of effort could improve the ecosystem and support nearby crops through bolstering pollinator populations, and would not generally be very costly. In the absence of an opportunity for crops or grazing (or in some cases in conjunction with these uses), this type of an effort would

provide an opportunity to sustain the health of the land and ecosystem during the duration of the array's lifespan. This is an increasingly popular practice, and some states have included additional benefits or standards for pollinator-friendly arrays. One study from Yale conducted a cost benefit analysis of the private and social benefits and costs of converting traditional corn and soy farmland in Minnesota into conventional or pollinator-friendly solar arrays (not dual crop/solar installations). This analysis was modelled based on a set of assumptions, not a physical study of the actual outcomes of such conversions. Conversion to solar had a greater benefit than cost in all scenarios, but the benefit increased with pollinator-friendly arrays due in part to increased crop yields in surrounding areas. Conversion of soy to pollinator-friendly arrays had the largest benefits[xvii].

Considerations

While overall the results of these studies are promising, there are multiple factors to consider with agrivoltaics.

1) As noted above, the benefits of the system are greatest in environments that experience ongoing or seasonal water stress. These same improvements to water efficiency may not hold in an environment with naturally/consistently high soil moisture levels. The same benefit would also be negated without high heat intensity from the sun. Areas that don't experience a lot of sun would obviously not generate as much solar power from the panels, but would also not experience the benefit of reduced evaporation from shading.
2) Cleaning considerations are greater in agrivoltaic crop systems. The use of farming equipment between or beneath the panels would likely cause increased dust accumulation, and as such the panels would need to be cleaned more often or have self-cleaning mechanisms[xviii]. This could impact the cost of operation and maintenance depending on the type of farming occurring.
3) The increase in the amount of land required for agrivoltaics, or reduction in potential solar capacity on the same amount of land, could be substantial. Panels often must be spaced farther apart for dual-use, and as such more land is required to create the same level of energy. It is important to consider how much extra land is needed (and the additional cost associated) versus the value realized through colocation, particularly in a traditional ground mounted installation.
4) Agrivoltaic systems can be costlier to implement than standard systems due to increased land requirement for ground-mounted arrays with wider spacing, or different mounting materials/practices for raised panels. Developers may seek additional incentives or cost offsets in order to comply with such a recommendation/request.
5) The benefit of diversified revenue through agrivoltaics to the farmer is highly dependent on the crop, site specifics, and the ownership structure of the array. If the farmer has a land lease, the revenue upside of the solar installation is limited by the structure of that lease and thus would impact the cost benefit analysis for crops that do not produce as well in conjunction with the array. Furthermore, the size of the farmer's existing equipment could be a barrier if it is larger than "standard", particularly for a stilt mounted array.
6) The current use of the land is important, and the implications and cost benefit analysis are different for inactive farmland or pastureland versus cropland. There is little or nothing lost by building an array on farmland that is not actively cultivated on an annual basis, and as

such lessor efforts (such as simply planting native grasses) may be enough to realize a greater benefit from the land.

7) Ensuring that agrivoltaic installations are able to retain agricultural use taxation on the land could be a key incentive for developers/landowners to consider agrivoltaics.[xix] Once it is confirmed that this exemption can remain, it will be important that relevant parties have a good understanding of how agrivoltaic installations versus traditional installations impact the tax context for the underlying land (which is typically not included within a PILOT agreement). This could impact the cost benefit analysis of a project. When farmland is converted to a conventional array, the land loses an agricultural exemption and may incur a penalty. By maintaining qualifying agricultural activity on the land, the solar development may be able to realize some ongoing tax savings (or lease savings) due to retaining all or part of the underlying agricultural exemption. This would help to offset some of the increased development or maintenance costs associated with agrivoltaic installations. It will be important for assessors and municipal representatives to understand this dynamic and be ready to assist landowners and developers in exploring the tax implications of various installation options.

Recommendations

Given the potential benefits of improved plant growth, diversified revenue for farms, ecosystem improvement, and possible water conservation, agrivoltaics is worthy of serious consideration. However, there are specific conditions that need to be met in order to realize these benefits. To date, corn and hay production are the least successful in a dual-use system, so the pattern of agricultural production in Tioga County is, by-and-large, not ideal for agrivoltaics without a change in productive use. If the intent is to maintain agricultural production and character in Tioga County, we recommend the following:

1) Use zoning and permitting to place an upper limit on the amount of farmland that can be converted to solar with each facility. These regulations could stipulate that land that will remain in active crop production due to the implementation of agrivoltaics will not count toward this limit.
2) Absent an opportunity for continued crop production, municipalities could encourage or require some level of planting native plants and pollinators to support surrounding agricultural activity. Note that this recommendation is not an "equal" substitution for crop production in terms of economic activity or community character. Rather, it is a way to gain a different environmental benefit in situations where displacement of agricultural production is necessary.
3) As more land is converted to solar, there may be an emerging opportunity for additional sheep production and new farm revenues from vegetation management. Farmers interested in exploring or pursuing this opportunity can be directed to the Cornell Cooperative Extension Sheep Program (https://blogs.cornell.edu/newsheep/) and the American Solar Grazing Association (https://solargrazing.org/) for additional information, resources, and technical assistance.

Examples of Agrivoltaic Installations

Colorado Agrivoltaic Learning Center at Jack's Solar Garden, Boulder, CO:

- https://www.coagrivoltaic.org/
- https://www.jackssolargarden.com/

Knowlton Farms, Grafton, MA (in development):

- https://www.wbur.org/news/2020/11/10/dual-use-solar-farms-agrivoltaics-massachusetts

Biosphere 2 at the University of Arizona:

- https://biosphere2.org/research/research-initiatives/agrivoltaics

Maple Ridge Meats, Benson, VT:

- https://energynews.us/2019/02/05/renewable-energy-growing-among-vermonts-animals-and-crops/

Agrivoltaic Resources

- Yale and American Farmland Trust Agrivoltaics report (Exhibit A outlines various options for land use regulation): https://cbey.yale.edu/research/agrivoltaics-producing-solar-energy-while-protecting-farmland
- American Farmland Trust Smart Solar Siting on Farmland report: https://farmlandinfo.org/publications/smart-solar-siting-in-new-york-report/
- Cornell review with sampling of ideal site characteristics, considerations, and State policies (published February 2021, pages 6-9): https://solargrazing.org/wp-content/uploads/2021/02/Cornell-Large-Scale-Solar-Info-and-Research-Needs.pdf
- Farmer's Guide to Going Solar, US Department of Energy: https://www.energy.gov/eere/solar/farmers-guide-going-solar
- National Renewable Energy Laboratory (NREL) / InSPIRE: https://www.nrel.gov/ & https://openei.org/wiki/InSPIRE
- Solar Massachusetts Renewable Target (SMART) Program: https://www.mass.gov/info-details/solar-massachusetts-renewable-target-smart-program
- American Solar Grazing Association (GSGA): https://solargrazing.org/
- Cornell Sheep Program: https://blogs.cornell.edu/newsheep/
- USDA Sheep Production and Marketing Grant Program: https://www.ams.usda.gov/services/grants/spmgp

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[i] Greg A. Barron-Gafford, G.A., Pavao-Zuckerman, M.A., Minor, R.L. et al. "Agrivoltaics provide mutual benefits across the food–energy–water nexus in drylands." Nat Sustain 2, 848–855 (2019).

[ii] Samantha Levy, Mikaela Ruiz-Ramón, and Ethan Winter. "Smart Solar Siting on Farmland: Achieving Climate Goals While Strengthening the
Future for Farming in New York." American Farmland Trust, February 2022, https://s30428.pcdn.co/wp-content/uploads/sites/2/2022/01/NY-Smart-Solar-Siting-on-Farmland_FINAL-REPORT_1.31.22.pdf.

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