Central New York Regional Planning & Development Board
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Paul W. Pinckney, Chairman David V. Bottar, Executive Director

MEMORANDUM

To: Pompey Town Board
From: Chris Carrick, CNY RPDB Energy Program Manager
Date: February 23, 2021
RE: Solar Energy Systems: Draft Overlay District Law – response to community feedback

The purpose of this memorandum is to respond to feedback provided by community residents regarding the current draft of the Overlay District Law, specifically regarding the following issues:

- toxicity of solar panels;
- impact on plant and animal habitat;
- minimum setbacks;
- cost of decommissioning solar farms and recycling solar panels; and
- effect of solar farms on neighboring property values

Toxicity of Solar Panels

Community residents often have questions regarding the toxicity of solar panels, specifically about the likelihood of risks posed to human health and the environment that may result from the leaching of heavy metals into ground and surface waters. When considering such risks, it is important to consider the various types of solar panels technologies and materials in use today. Ground-mounted solar PV arrays are typically made up of panels of silicon solar cells covered by a thin layer of protective glass, which is attached to an inert solid underlying substance (or "substrate"). While the vast majority of PV panels (about 95 percent) currently in use are made of silicon, certain types of solar cells may contain cadmium telluride (CdTe), copper indium diselenide (CIS), and gallium arsenide (GaAs).

Because solar PV panel materials are enclosed, however, and don't mix with water or vaporize into the air, there is little, if any, risk of chemical releases to the environment during normal use. All solar panel materials, including the chemicals noted above, are contained in a solid matrix, insoluble and non-volatile at ambient conditions, and enclosed. Therefore, releases to the ground from leaching, to the air from volatilization during use, or from panel breakage, are not a concern. The most common type of PV panel is made of tempered glass, which is quite strong. They pass rigorous hail tests and are regularly installed in Arctic and Antarctic conditions. Only in the unlikely event of a sufficiently hot fire (1000°C) is there a slight chance that chemicals could be released. This is unlikely because most fires are not hot enough to melt PV components and PV systems must conform to state and federal fire safety, electrical and building

codes. Particulate emissions could only occur if the materials were ground to a fine dust, but there is no realistic scenario for this.[1]

Although thin film photovoltaics do contain some heavy metals, including cadmium, numerous studies have found that these metals do not leach from the modules into the environment under normal conditions or anticipated accidents such as storm damage or fires.[2]

It is important to consider the full lifecycle environmental impacts of solar PV relative to other commercially-available technologies. Heavy metals used in thin film systems do need to be mined, but that process creates less environmental damage than mining for coal or uranium for use in electricity generation.[3] While generating electricity, a solar plant produces no emissions or solid waste whereas emissions from a coal plant cause harmful air and carbon pollution, natural gas power plants and pipelines emit methane which is a more powerful greenhouse gas than carbon dioxide, and nuclear power creates waste products that remain extremely toxic to humans for millions of years.

Impact on Plant and Animal Habitat

The impacts of solar farms on local habitat will vary from project to project and location to location, as will the approach to managing biodiversity, which is why utility-scale solar facilities larger than 25 MW will need to follow the state's Article 94-c permitting process. This process requires multiple public meetings and engagement of the local community. Developers need to study the land being proposed for the project to identify and mitigate any sensitive features such as wetlands and habitat for sensitive species. The resulting project-specific studies and reports are reviewed by the NYS Department of Environmental Conservation which will determine if the potential adverse environmental effects of the construction and operation of the facility will be minimized or avoided to the maximum extent practicable. Smaller community solar projects (typically 5-10 MW) are also subject to environmental review through the SEQR process.

That said, most developers of both community solar and utility-scale projects set a higher standard and actively seek to maximize benefits for wildlife wherever possible. Soil health is essential for the sustainability of farming in the longer-term and solar farms could play an important role by resting soils through the life of the solar farm (typically 25-30 years). Visual buffers planted around the outside of a facility can support a wide variety of wildlife, including plants, invertebrates, birds, reptiles and mammals. Birds, bats and small mammals can benefit from the provision of artificial nesting and roosting structures. Solar facilities can support pollinators by planting seeds to create a variety of native species bees prefer, and the industry is rapidly moving towards the use pollinator-friendly plantings and away from laying turf grass or gravel underneath the solar panels. These low-growing plants do not shade the panels, provide better stormwater control, reduce erosion and provide higher attraction to pollinators.[4]

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[1] https://www.mass.gov/doc/ground-mounted-pv-guide/download

[2] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.558.4686&rep=rep1&type=pdf. See also: https://www.sciencedirect.com/science/article/abs/pii/S1364032109000896

[3] https://solar.gwu.edu/do-solar-panels-contain-toxic-chemicals

[4] https://www.eanvt.org/wp-content/uploads/2017/04/Pollinator-Friendly-Solar-Summary-03-30-17.pdf

Pollinator-smart habitats can also enhance biodiversity by connecting ecosystems that would be fragmented and weakened by "traditional" land development such as housing subdivisions.[5] This connectivity also benefits nearby farms by boosting crop productivity and reducing reliance on external bee pollination services.[6] Additionally, native plants help maintain cooler surface temperatures, which can improve the efficiency of the solar arrays. Finally, one of the most important environmental benefits of native plants is their capacity to sequester carbon, a process that allows solar energy systems to move even closer to being carbon-neutral, if not carbon negative.[7]

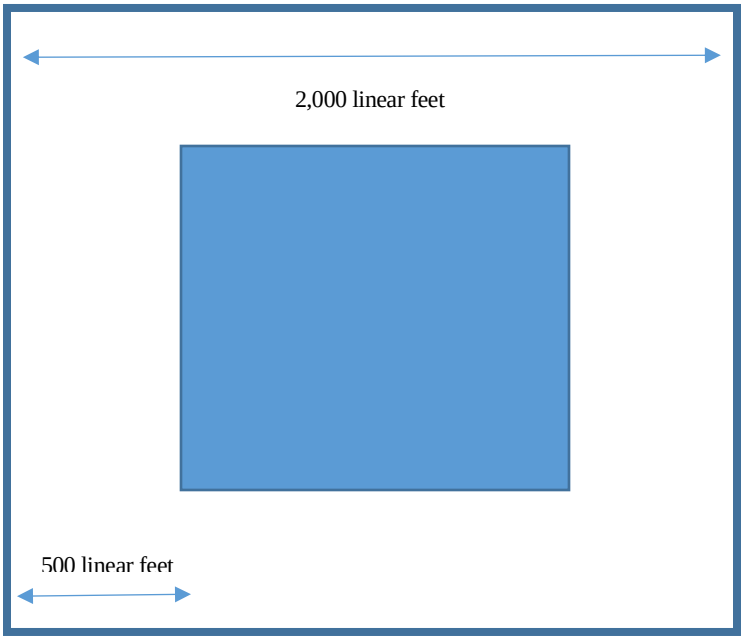
Minimum Setbacks

The proposal made to the Town Board to increase the minimum setbacks from 100 feet to 500 feet in its draft Overlay District Law would present a significant challenge to private property owners who wish to develop their lands for solar while providing little benefit or protection to neighbors. Consider the example of a 100-acre (approx. 4,000,000 square feet) parcel that is bounded by four equal sides of approximately 2,000 linear feet each.

In this example, as illustrated below, a 500-foot setback requirement would comprise 75 percent of the parcel's total acreage as follows:

- 2,000 linear feet x 500 linear feet x 2 sides = 2,000,000 square feet of buffer
- 1,000 linear feet x 500 linear feet x 2 sides = 1,000,000 square feet of buffer

As such, the buildable area would be limited to approximately 25 percent of the parcel, resulting in a maximum lot coverage ratio of 25 percent.



[5] https://www.utilitydive.com/news/pollinator-habitats-the-bees-knees-of-rural-solar-development/530716/
[6] https://www.scientificamerican.com/article/solar-farms-shine-a-ray-of-hope-on-bees-and-butterflies/
[7] https://www.dcr.virginia.gov/natural-heritage/pollinator-smart-benefits

It is important to note that the draft Overlay District Law as written includes a maximum landscape coverage of 50 percent for Tier 3 ground-mounted solar systems. Thus, a 500-foot setback requirement would reduce the maximum buildable area by roughly half. It is also important to note that the current draft law requirements (i.e., 100-foot setback and 50 percent lot coverage threshold) provide landowners and developers with the flexibility they need to create project designs that address the specific characteristics of individual parcels, such as irregular shapes, varied topography, setbacks from wetlands and proximity to utility infrastructure (e.g., three-phase power lines). In addition, it is generally agreed that height limitations and landscape screening requirements provide neighbors with the protections needed to protect property values and important community resources such as viewsheds.

Decommissioning and Recycling

Solar project developers are generally required to have a decommissioning plan for the solar farm, and the draft Overlay District Law contains such requirements. When the solar project has reached the end of its life, all structures and equipment shall be removed at the owner's expense. When designing the project, measures can be implemented to ensure that the project does not have any negative permanent impacts on the land, and it can be returned to its previous or another beneficial use. Municipalities typically require the developer to post a bond or some other surety which is recoverable by the municipality to cover the costs of decommissioning, should the company go bankrupt before the end of the project's useful life. Again, the Town has followed this best practice in drafting its solar law. It is important to note that such occurrences are expected to be rare and in any case the bank or other entity which financed the project would step in to find another system operator so that the project will continue to generate the revenues necessary to pay off the financing. In addition, all financiers place substantial insurance requirements on project operators to cover instances of damage to the solar farm in the case of extreme weather or other unforeseen events.

There are two generally accepted approaches to ensuring that the developer allocates sufficient resources through its bond or surety in order to fulfill its decommissioning obligations: (1) following the NYSERDA guidance which recommends approximately $50,000 per megawatt or (2) requiring the developer to provide an independent, third party estimate of decommissioning costs. In its discussions, the Town Board has chosen the latter method.

Concerns have been raised that such a method may not fully account for the costs of recycling the equipment, which currently range from $12-30 per solar panel including transportation costs depending on the regional market. There are several points worth noting in this regard.

First, solar panels are considered to be hazardous waste in most states which subjects them to severe limitations on their transportation by limiting the amount that can be trucked at one time and placing significant requirements for tracking, both of which significantly increase hauling costs. These costs are oftentimes equal to the cost of the recycling process itself.[8] On January 1, 2021 California became the first state in the nation to add solar panels to its "universal waste program," a move intended to promote solar panel recycling and reuse and to keep them out of landfills. This law will allow solar panels to be handled as "universal waste" as opposed to "hazardous waste" if the panels are solely being disposed of for recycling and will allow recyclers to store solar panels for up to one year, while the general hazardous

[8] https://grist.org/energy/solar-panels-are-starting-to-die-what-will-we-do-with-the-megatons-of-toxic-trash/

waste requirements generally allow accumulation for only 90 days. This allows a longer time to accumulate enough solar panels to make transportation in bulk instead of a more frequent basis, which significantly reduces the cost per unit. Along with the universal waste requirements of less labeling and record keeping, the ability to transport without a hazardous waste manifest adds to the lower cost per solar panel for recycling.[9] Shifting the transportation and handling from hazardous waste to universal waste significantly reduces those costs, thus boosting the profitability of recycling and encouraging more recyclers to become involved in this effort. The new regulation is a stepping-stone toward the full "cradle-to-grave" approach for climate initiatives that California sets forth and acts as a model for the rest of the nation to follow.[10] Other states are already working on the issue, with North Carolina and New Jersey passing study bills and Illinois and Minnesota pursuing voluntary stakeholder collaboration studies.[11]

Second, recycling costs are significantly lower in Europe where the solar PV market is more mature and recycling programs are 5-10 years ahead of the United States. As the researchers from the **National Renewable Energy Laboratory (NREL)** noted in the first global assessment into the most promising approaches to end-of-life management for solar modules published in the journal ***Nature Energy*** in July 2020, recycling costs can be expected to decrease as waste volumes increase.[12] There is already a robust solar panel recycling market in Europe led by ***PV Cycle***, the successful non-profit organization that offers waste management help to 70% of European solar manufacturers and by manufacturers like Veolia. Over the last decade, PV Cycle has organized the collection and treatment of more than 33,000 tons of PV panel waste, equivalent to roughly half a gigawatt of solar capacity.[13] Whereas EU regulations require 85 percent collection and 80 percent recycling of the materials used in PV panels, the crystalline silicon recycling facility opened by the French solar company Veolia claims a 95 percent recovery rate for materials and is ultimately expected to handle more than 4,000 tons a year. It is important to note that this is an exceptional figure for a multi-component product, especially when compared to other products such as washing machines which typically don't reach 70 percent. PV Cycle is working with the US-based startup company ***Recylce PV*** which aims to get volumes large enough (about 10,000 panels a month) to build a dedicated solar recycling plant in the United States.

Third, solar panel recycling markets are expected to grow rapidly as there is a tremendous amount of value to be captured. A 2019 study by researchers at the University of California, Santa Barbara published in the journal ***Renewable Energy*** found that 9.2 million metric tons (Mt) or 94 percent of the total 9.8 million Mt of PV waste that are expected between 2030 and 2060 will consist of metals which can be recovered, with aluminum, silicon, gold, steel and copper making up 75 percent of the total value of nearly $22 billion dollars.[14] That is why U.S. companies like **First Solar**, America's largest solar manufacturer, established a recycling program back in 2005 to recover valuable tellurium. The company now has

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[9] https://www.jdsupra.com/legalnews/california-s-new-program-to-increase-5328576/
[10] https://dtsc.ca.gov/2020/10/26/news-release-t-17-20/
[11] https://www.waste360.com/solar/california-pushes-solar-panel-waste-policy
[12] https://www.nature.com/articles/s41560-020-0645-2.epdf?sharing_token=5rcvmd0ekCd_JCht9IcXdtRgN0jAjWel9jnR3ZoTv0OtL9QEzcgFMYa45OUzo4NrEw1OIgCvF7kztdoztUxEKn065bOkZGb4rZ6T17ObbWqsHMx6aakmgQteTwHgZaPwcJtZUV8u6-5sozcmyB-ujN_ifb5pIY4FQzl23iabpg4rFug2Mvbw9BsJE0KeM630kWd8sm4i9kLDkCSn0xaaCA%3D%3D&tracking_referrer=grist.org
[13] https://www.greentechmedia.com/articles/read/solar-panel-landfill-deemed-safe-as-recycling-options-grow
[14] https://www.sciencedirect.com/science/article/abs/pii/S0960148118310139#!

recycling plants attached to its manufacturing facilities in Ohio, Malaysia and Vietnam as well as a stand-alone recycling plant in Germany. First Solar estimates that the value of its recyclable PV solar panel components will exceed $450 million in the major solar markets of Germany, Japan, India, China, and the U.S.[15] Independent market research has forecast the total solar panel recycling market to record a compound annual growth rate of about 37% from 2019 to 2027, reaching a valuation of $600 million from about $40 million in 2018.[16] To help its members recover this value, industry advocacy group **Solar Energy Industry Association (SEIA)** has begun organizing recycling efforts through its **PV Recycling Working Group**. From an environmental perspective, recycling of solar panel materials will make it possible to produce 2 billion new panels or around 630 gigawatts (GW) of energy just from reusing previously used materials, equal to the world's total installed capacity through 2019.

Impact on Property Values

The findings of a new study published in September 2020 by economists at the University of Rhode Island have been brought to the attention of the Town Board to consider in its deliberations regarding certain provisions of the draft Overlay District Law including a proposed 500-foot setback requirement. This study, which looked at 400,000 real estate transactions in New England over the course of 15 years, found that suburban residential property values suffered negative impacts when nearby solar farms replaced resources perceived as scarce, such as open green space.[17]

Until this study was published, there had been only a limited number of smaller studies on the impact of solar farms on neighboring property values, all of which had shown such effects to be negligible. While the Rhode Island study is the largest of its kind to be published to date, however, there are several important factors to consider regarding it findings.

First, this same study found no associated impact on property values for solar farms located in rural areas such as the Town of Pompey and it is important to note that the draft Overlay District Law does not allow Tier 3 systems in residential zones. As noted by Gregory F. Nemet, a researcher at the La Follette School of Public Affairs at the University of Wisconsin-Madison who studies the interaction between energy systems and public policy, "This is not about proximity to solar panels being a negative" but rather the loss of a valuable amenity (i.e., open green space) within non-rural areas.[18]

Second, the Rhode Island study did not account for differences between projects that are adequately screened from those that are not. As Rich Kirkland, owner of Kirkland Appraisals in Raleigh, North Carolina noted, "How do we know it's not a 12% hit if there's no screening, and a 0% hit if there is screening?"[19]

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[15] https://www.goodnewsnetwork.org/first-solar-solar-panel-recycling-program/
[16] https://www.prnewswire.com/news-releases/glass-material-segment-to-propel-significant-growth-in-solar-panel-recycling-market-tmr-301115563.html
[17] https://web.uri.edu/coopext/files/PropertyValueImpactsOfSolar.pdf
[18] https://energynews.us/2020/10/20/northeast/study-solar-can-hurt-home-values-if-it-displaces-scarce-suburban-greenspace/
[19] https://energynews.us/2020/10/20/northeast/study-solar-can-hurt-home-values-if-it-displaces-scarce-suburban-greenspace/

Third, numerous studies have found the impact of wind energy generation on neighboring property values to be negligible.[20] As solar farms do not have the same impacts as wind farms (i.e., PV facilities do not cast a shadow on neighboring properties, cause light flicker, or have the same visual impact as wind farms), the impacts on property values caused by solar farms are anticipated to be less than the impacts of wind farms. Again, the Town of Pompey has included best practice mitigation measures to reduce visual impacts of solar farms such as vegetative screening and height limitations for ground-mounted systems.

Fourth, the findings of the Rhode Island study have been contradicted by other findings including those of numerous studies completed by professional property appraisers[21] and by researchers at the University of Texas which surveyed residential home assessors and showed that the majority of respondents believe that proximity to a solar installation has either no impact or a positive impact on home values.[22] Interestingly, while this study found that assessors tended to associate closer proximity to larger facilities (i.e., within 100 feet of farms 20 MW or larger) with negative impacts on property values, these perceptions were most prevalent among appraisers who had had no direct experience working with such properties. In any event, it seems clear that such perceptions among assessors and neighbors alike is generally subjective and will vary from person to person.

Finally, considering that solar farms have very little impact on public services such as schools and roads, and that such projects contribute to the town's tax base in the form of required PILOT agreements, there is expected to be a net economic benefit to the town as a result of any projects developed in Pompey.

Conclusion

While the issue of regulating solar development has become contentious in many communities, and is often the subject of unfortunate misinformation and misunderstanding, the Town of Pompey should be commended for drafting a comprehensive and well-considered Overlay District Law that fairly balances the rights of private property owners to develop their land for solar against valid and important community interests to protect productive agricultural land, open space, viewsheds, natural habitat and neighboring property values.

[20] http://www.realtor.org/field-guides/field-guide-to-wind-farms-their-effect-on-property-values. See also: https://emp.lbl.gov/publications/impact-wind-power-projects and https://econpapers.repec.org/article/jreissued/v_3a33_3an_3a3_3a2011_3ap_3a279-316.htm

[21] https://www.asfmra.org/blogs/asfmra-press/2021/02/16/solars-impact-on-land-values

[22] https://emp.lbl.gov/sites/default/files/property-value_impacts_near_utility-scale_solar_installations.pdf