

Grid Scale Solar in Pennsylvania



Source: Lightsourcebp

Solar Information

- Not here to advocate for solar of any type
 - Provide fact-based information to base decisions
- Theme today will be grid scale solar vs. others
- Offered a number of other web-based programs on solar
 - Solar leasing for landowners
 - Solar technologies
 - Solar and farmland preservation programs
 - Financial and estate planning for landowners
 - Ongoing webinar for officials to highlight and discuss solar questions of interest
 - Programs for PSATS, CCAP, others
 - Solar guide(s) for municipal/county officials



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Municipal Solar Guide

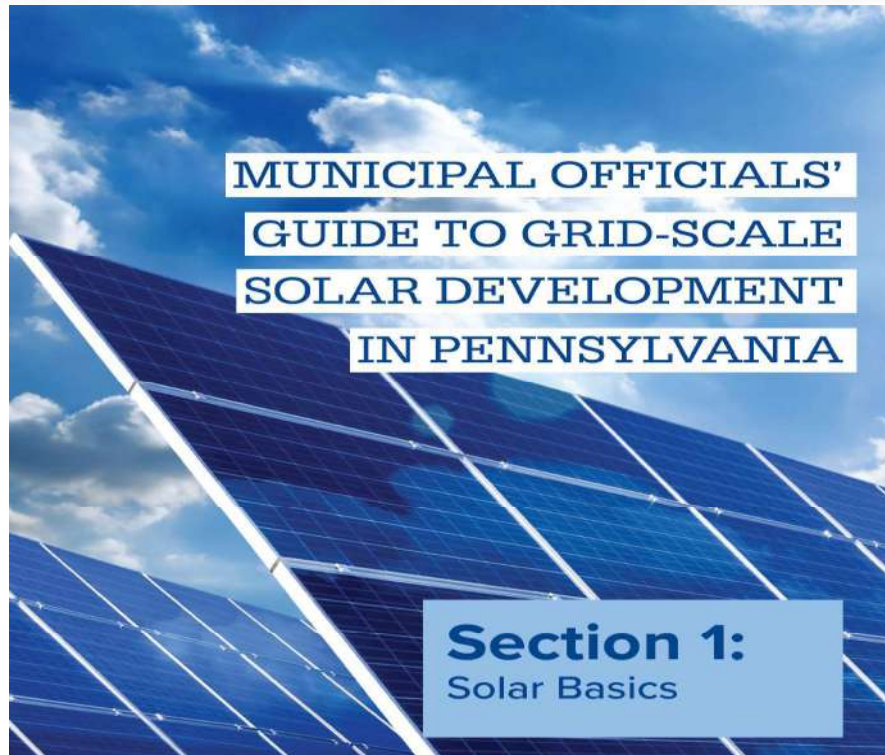
- Print and web-based
- Key topics:
 - A. Solar “basics” including a glossary of terms
 - B. Technologies being used in grid scale solar
 - C. A virtual tour of various solar facilities
 - D. Physical impacts of grid scale solar deployment
 - E. Questions on possible environmental impacts
 - F. Land use implications
 - G. Economic impacts of solar in a community/region
 - H. Tax implications associated w/transitioning to solar
 - I. Ordinance considerations for solar development

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Solar Guide



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Different Scales of Solar



Residential & Commercial

- For on-site energy use
- Rooftop or mounted adjacent to structure
- Measured in kW
- Considered accessory use system
- Mature market – available guidance

Community Solar

- For off-site energy use within community (distribution grid)
- Usually ground mounted requiring multiple acres
- Measured in 100s of kW up to 5 MW
- Considered primary use system
- Not yet allowed in PA (Senate Bill 472)

Grid-Scale Solar

- For off-site energy use distributed through transmission grid
- Ground mounted requiring significant acres to reach economies of scale
- Measured in MW
- Considered primary use system
- Emerging market – guidance in development

Source: DEP



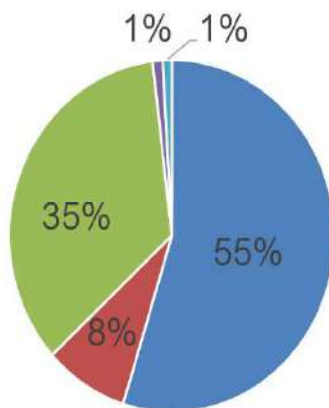
Why Solar in PA

- State is an acceptable location in the U.S. for solar
 - With 500+ projects in PJM queue
- PA is large electric generator and export state
- Abundant electrical infrastructure
 - transmission
- Generally favorable political/policy support
 - 80K(+) acres of surface are anticipated
- Investor support --\$13B by 2030??
 - \$1.13M/MW (approx. 6 acres/MW)
- Central location to markets
- New storage technology and declining costs
 - What's over horizon??

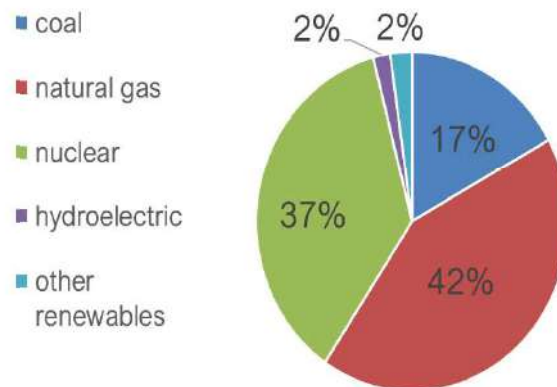
Pending Constraints

- Dept of Commerce investigation
- Tariffs
- Supply chain issues
- Various increases in costs
- Access to grid
- Public response
- Local ordinances
 - Lack of commercial predictability

Pennsylvania - Net Electricity Generation
2007



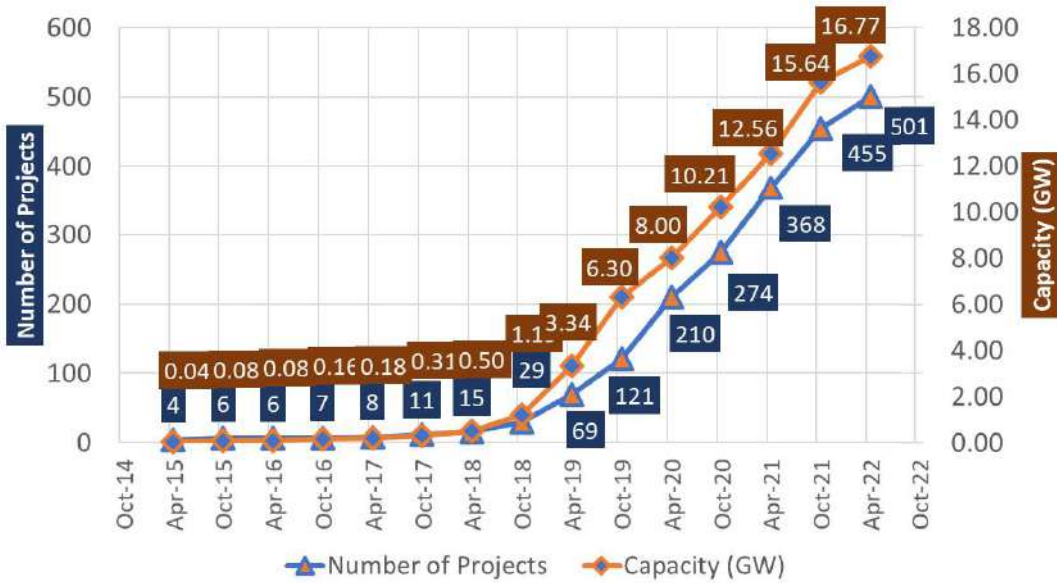
Pennsylvania - Net Electricity Generation
2019





Growth of Grid-Scale Solar Proposals

Projects in PJM New Services Queue in Pennsylvania



Based on data from PJM, graphic by DEP



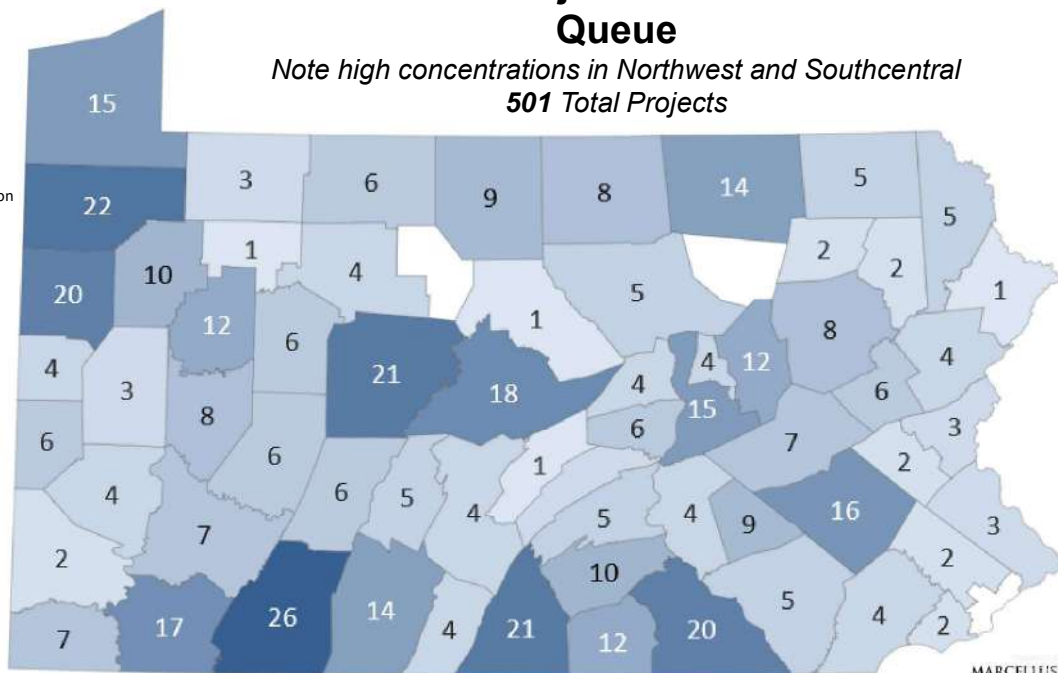
Development Potential (# of Projects)

Total Number of Projects in PJM New Services Queue

Note high concentrations in Northwest and Southcentral
501 Total Projects

Review Phase:

- 255 Initial Review
- 132 Advanced Review
- 107 Interconnection Agreement
- 7 Operations

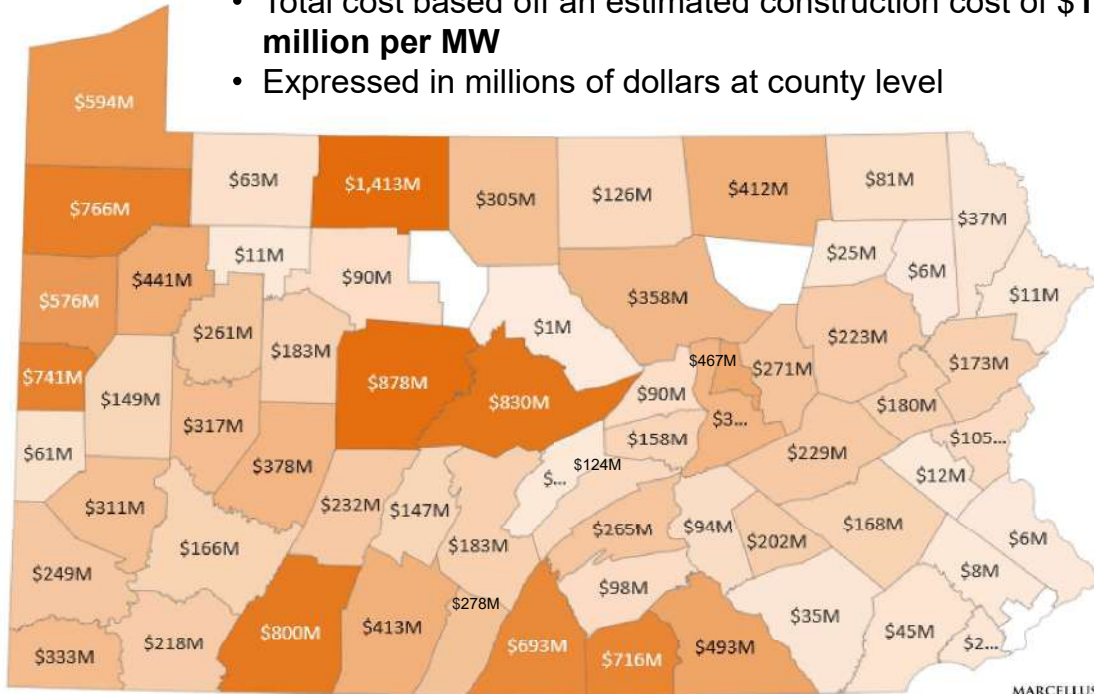


Based on data from PJM, graphic by DEP



Project Investment Potential

- Total cost based off an estimated construction cost of **\$1.13 million per MW**
- Expressed in millions of dollars at county level



Based on data from PJM, graphic by DEP



Hot Issues

- What is in a solar option/lease contract
 - Est. 20K+ acres leased now??? Heading to 80K+??
- Siting Considerations
 - Overall land use issues
- Impacts to existing infrastructure
- Eminent domain
 - Grid connections
- Environmental impacts
 - Baseline testing/water
- Stormwater/impervious surfaces

- Impacts to prime farmland
 - Where to place
 - Rooftop vs. ground mount
 - Agland vs. industrial zones
 - What to preserve
 - Bigger view of development
 - Dual use options
- Agrivoltaics
 - Contractual language in lease
 - Vegetation management
 - Grazing is common answer
 - Emerging options with newer technologies

If high-voltage power lines are not nearby, utility-scale solar developers are probably not interested at this time.



PennState Extension

Other Site selection criteria:

- Amount of land available
- Slope: Utility scale solar projects require good southerly exposure on gently sloping (slope less than 7%) ground.
- Avoiding wetlands and floodplains
- Avoiding surface restriction clauses
- Well-drained soils
- Avoiding extremely rocky sites
- Brownfields?



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Leasing Factors to Consider

- USE an attorney for lease review, etc.
- Caution signing solar option and lease
- More than the \$\$\$\$. Understand the terms
- Lease extension 20-25 years, plus
- Dual use clause Maintenance contracts
- Amount of acreage actually being leased
- Options on residual acreage -- Access??
- Tax changes on acreage – responsible party
- <https://extension.psu.edu/utility-scale-and-community-solar-in-new-york-and-pennsylvania>
- <https://extension.psu.edu/leasing-your-land-for-solar-energy-development>

Virtual Tour of Utility-Scale Solar

Penn State Research Project

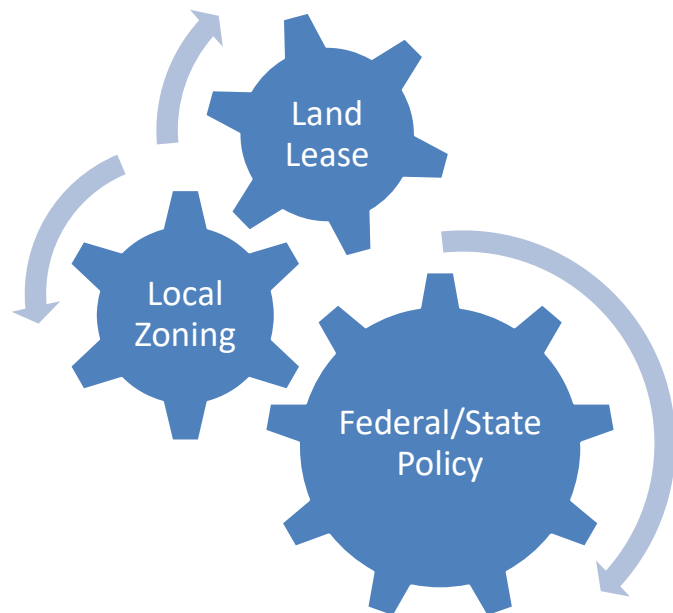
- Collect and review all 2500+ municipal/township zoning ordinances to identify regulation of solar energy systems, with a particular focus on:
 - Authorization of such facilities as a “right” or a “conditional use”
 - Requirements for such facilities, either through application of existing zoning requirements or special requirements
 - Definition of solar systems, both in terms of type of installation, scale of installation and purpose of installation
- Identify common practices with the commonwealth and across the U.S., with the aim of eventually preparing a library of information, including an updated model ordinance, for use by municipal/township officials

Preliminary Results

| Principal Use Solar Allowed | Accessory Use Solar Allowed | No Solar Guidance |
|---|--|---|
| 8% | 15% | 85% |
| The zoning ordinance clearly allows for solar energy to be the principal use of the land for given districts, generally subject to approval (as a conditional use). | Accessory solar energy is permitted, often subject to various requirements. Principal use solar is either implicitly or explicitly prohibited. | These ordinances either fail to mention solar energy at all or only mention solar without specifying where or under what circumstances it is permitted. |

The Regulatory Dynamic

- Federal/State Policy
 - Significant movement towards mandating **decarbonization** of the energy system
- Land Lease
 - **Profit** incentive for landowners to lease land for solar projects
 - Significant increase in **financial capital** driving scale and profit margins on solar projects
- Local Zoning
 - Inconsistent & Volatile
 - In many communities, **backlash** against solar is greater than prior opposition to fracking



The Opportunity

Global solar capacity to grow 30% this year, said analyst

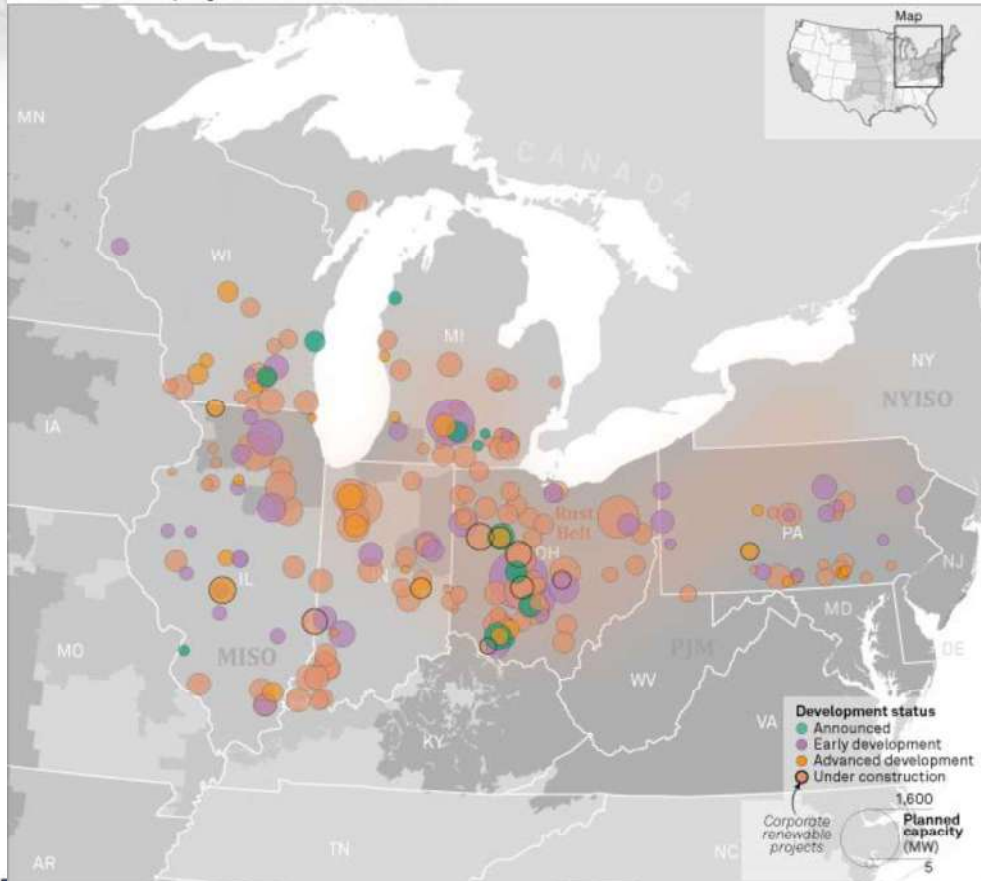
Once the epicentre of the oilpatch, Texas now humming with wind and solar power

Colorado poised for unprecedented boom in wind and solar power projects

From steel to solar: Assessing the pending solar boom in the Rust Belt



Planned solar projects across Rust Belt



As of June 12, 2022.
Only includes solar projects with a proposed capacity of 5 MW or more.
Map credit: Ciaralou Agaplo Palicpic
Source: S&P Global Market Intelligence



Electric Utility Substations and Transmission Lines in Pennsylvania, 2021



Data source: Department of Homeland Security Homeland Infrastructure Foundation-Level Data (HIFLD), 2021.
Prepared by the Center for Rural Pennsylvania.

• = 1 Substation (n=1,537)
— Transmission Lines

The Challenge

Big Solar Gets Spanked Again, This Time In Maine

Influx of solar farms leads to backlash among
some upstate residents

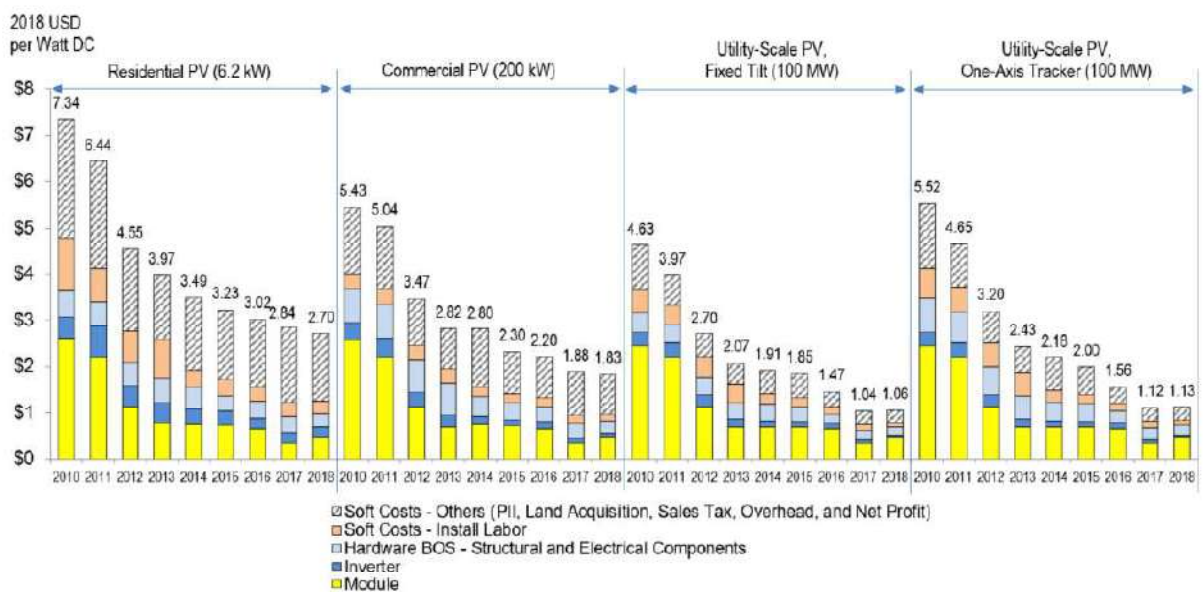
Backlash Against Renewables
Surged In 2021, With 31 Big Wind
And 13 Big Solar Projects Vetoed
Across US

*He Set Up a Big Solar Farm. His
Neighbors Hated It.*

The Benefit of Solar-Specific Ordinances

- The Grand Bargain
 - Establishing specific guidance for solar projects at the local level helps officials, residents and investors by:
 - Reducing regulatory costs through predetermined permitting procedures and fees
 - Building awareness amongst residents about the realities of solar projects and reflecting their concerns in policy
 - Creating a consistent and predictable framework for officials to apply to projects despite variations across location, scale, technology and purpose

Increasing Impact of Soft Costs

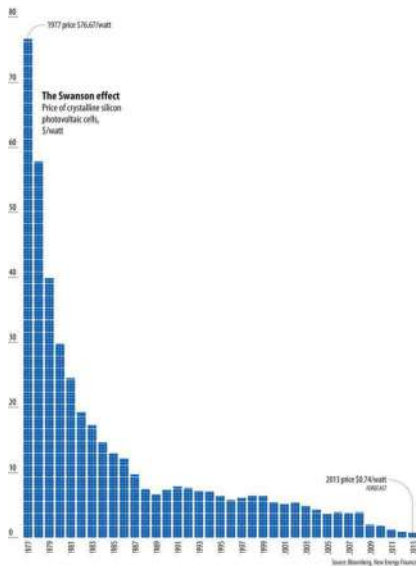


Permitting as a Component of Soft Costs



Regulatory Costs

- As technology costs fall...
- The impact of regulatory costs increases...



Impact for Rural Communities

- By some estimates, 30% of all utility scale solar development occurs in rural areas
 - Likely a higher percentage in Pennsylvania
- The key factors driving this interest are:
 - Availability of “shovel ready” land
 - Low cost of land leases
 - Availability of existing transmission infrastructure
 - Advantageous tax treatment/assessment
 - Low “friction” permitting and environmental compliance
 - Compared to urban and/or brownfield sites

Common Elements of Solar Ordinances

- Accessory vs Non-Accessory/Principal Systems
- Location/Coverage
- Setbacks & Height Limitations
- Lot/Parcel Size
- Glare/Reflection Mitigation
- Buffers/Screening
- Decommissioning

Accessory Systems

Lycoming County & Montour County

ACCESSORY SOLAR ENERGY SYSTEM: An area of land or other area used for a solar energy system used to capture solar energy, convert it to electrical energy or thermal power and supply electrical or thermal power **primarily for on-site use**. Ground mounted or freestanding Solar Energy Systems with **an output size of not greater than 10kw** shall be considered Accessory Solar Energy Systems. **Roof Mounted Solar Energy Systems on the roofs of buildings on-site used primarily for on-site use shall have no limit as to power output.** An accessory solar energy system consists of one (1) or more free-standing ground, or roof mounted solar arrays or modules, or solar related equipment and **is intended to primarily reduce on-site consumption of utility power or fuels for use on-site by the generator.**

How do we determine the “primary” use of a system?



Principal Systems

Lycoming County & Montour County

An area of land used for a solar collection system principally to capture solar energy, convert it to electrical energy or thermal power and supply electrical or thermal power **primarily for off-site use**. Principal solar energy systems consist of one (1) or more **free-standing ground, or roof mounted** solar collector devices, solar related equipment and other accessory structures and buildings including light reflectors, concentrators, and heat exchangers, substations, electrical infrastructure, transmission lines and other appurtenant structures.



Why Definitions Matter



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LOCATION/COVERAGE

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(2) Solar Array Locations:

(a) Solar Arrays may be located **only on 75% of the total Class I and II agricultural soils within the SEF Development Area**, unless the area will be devoted to **Agrioltaic activities**, in which case **100%** of the Class I and II soils may be included in the SEF Development Area.

(b) For each parcel on which a SEF, or a component of a SEF, is proposed, a map shall be provided by the applicant detailing the SEF Development Area, the Constrained Area the Class I and II agricultural soils, and the Portion of the SEF Development that may be devoted to Solar Arrays.

(c) Solar Arrays shall only be placed within that portion of any lot that lies within the Portion of the SEF Development that may be devoted to Solar Arrays.



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SETBACKS

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The fence, as required in subsection C- 6 Security, shall be considered a principal structure for purposes of setbacks. **Minimum setbacks shall be in accordance with Zoning District requirements.** Where a SEF is adjacent to a **residential building**, a minimum setback of **fifty (50) ft. from the property line** shall be required. **No lot line setback will be required where there is a grouping of two or more SEF's which are held by a common owner or leased to a common lessor and which are part of a single solar energy production development project, where each landowner has provided a written waiver of the lot line setback.** A minimum of a **50 Ft buffer** shall be maintained along either side of any regulated stream or regulatory wetland.

The application shall include with the project submission, details of **mitigation** measures to be implemented to preserve wildlife corridors including between SEF's of a Solar Energy Project.



Lot/Parcel Size

GROUND MOUNTED PRINCIPAL SOLAR ENERGY SYSTEMS:

1. Minimum lot size: The minimum lot size for every lot on which a SEF, or a component of a SEF, is proposed shall be one hundred (100) acres.

Principal Use. A Solar Energy System shall be permitted as a principal use subject to conditional use approval in the T- Township and A/C Agricultural/ Cluster Residential Districts only, subject to the following and as otherwise provided herein:

- (a) The maximum area occupied by a principal Solar Energy System on any lot shall be ten (10) acres;



BUFFER/SCREENING

Lycoming & Montour County

Buffering:

Ground mounted SEF shall be screened and buffered in accordance with the following standards:

a) Vegetative buffering, **to the extent practical**, shall be installed around the entire perimeter of the SEF installation, except where the Zoning Administrator determines that the **retention of existing trees** within the vegetative buffering area may constitute the required vegetative buffer or where the Zoning Administrator determines that the Solar Panels cannot be viewed from a public roadway or residential building.



BUFFER/SCREENING

Montour County

(c) **Vegetative buffering should be designed to emulate the mix of native species and appearance of existing tree lines, hedge rows, and wooded areas already in existence within the landscape where the SEF is proposed.** The **applicant shall assess** the species mix and characteristics found in existing tree lines, hedge rows, and wooded areas surrounding the SEF **and document** that the vegetative buffering is designed to emulate these characteristics. Arborvitae may be used as vegetative buffering.

(d) No less than 20% of vegetative buffering plantings shall be **pollinator friendly** species.

(e) Vegetative buffering shall be selected to provide year-round buffering and shall be of sufficient height, density, and maturity to screen the facility from visibility, as set forth herein **within thirty-six months of the installation of the SEF.**



GLARE

Montour County

(a) All SEF shall be placed such that concentrated solar radiation or **glare does not project onto nearby structures or roadways**. Exterior surfaces shall have a non-reflective finish.

(b) The **applicant has the burden of proving** that any glare produced does not have significant adverse impact on neighboring or adjacent uses either through siting or mitigation.

Lycoming County

All SEF shall be placed such that concentrated solar radiation or glare **does not project onto nearby structures or roadways**. Exterior surfaces shall have a non-reflective finish. The applicant has the burden of proving that any glare produced does not have significant adverse impact on neighboring or adjacent uses either through siting or through mitigation. A completed **glare study** ensuring that reflective glare is not directed towards, nor upon any adjacent properties as well as any adjacent street rights-of-way. The Glare Study shall include:

- Angle of the SEF's panels, arrays, cells, etc. at the location.
- A diagram showing the maximum and minimum angles of reflective glare from the SEF's panels, arrays, cells, etc. at the location and the relationship of that glare to adjacent properties, structures and rights-of-way.
- A mitigation plan that limits or eliminates reflective glare on adjacent properties, structures and rights-of-way.



DECOMMISSIONING

Montour County & Lycoming County

(a) The SEF owner is required to notify the County immediately upon cessation or abandonment of the operation. The SEF shall be presumed to be discontinued or abandoned if no electricity is generated by such system for a period of twelve (12) continuous months.

...

(c) **To the extent possible the materials shall be re-sold or salvaged. Materials that cannot be re-sold or salvaged shall be disposed of at facility authorized to dispose of such materials by federal or state law.**

...

The **developer** shall, **at the time of zoning application**, provide the County or municipality **with an estimate of the cost of performing the decommissioning activities required herein**. The solar project Owner shall **provide financial security** of 110% of the estimated cost of decommissioning, **which will be reviewed** by *** County's **consulting engineer**. The **estimate may include an estimated salvage and re-sale value**, discounted by a factor of 10%. The decommissioning cost estimate formula shall be:

$$\begin{aligned} & \text{Gross Cost of Decommissioning Activities} \\ & - 90\% \text{ credit of salvage and re-sale value} \\ & = \text{the Decommissioning Cost Estimate} \end{aligned}$$

On every 5-year anniversary of the date providing the decommissioning financial security, **the SEF Owner shall provide an updated decommissioning cost estimate**, utilizing the formula set forth above with adjustments for **inflation and cost & value changes**. If the decommissioning security amount **decreases** by greater than 10%, the County or Municipality shall release from security any amounts held in excess of 110% of the updated decommissioning cost estimate. The decommissioning security may be in the form of cash deposit, surety bond, irrevocable letter of credit, cashier's check, or escrow account from a federal or Commonwealth chartered lending institution in the amount of 110% of the total proposed decommissioning cost estimate and in a form satisfactory to the County's or Municipality's Zoning administrator and Solicitor.



DECOMMISSIONING

An important difference in Montour County's Ordinance:

iii. Decommissioning security estimates shall be subject to review and approval by the County and the **SEF Developer/Owner shall be responsible for administrative, legal, and engineering costs incurred by the County for such review.**



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