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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Energy Programs Office

Pennsylvania Solar on Mine Lands Summit

In support of *Assessment of Opportunities for Grid-Scale Solar Development on Previously Impacted Mine Lands in Pennsylvania*

July 19, 2023

Today's Agenda

- Welcome and Project Background
- Presentation of Initial Assessment Findings
- Lunch and Networking
- Overview of Characteristics of Previously Impacted Mine Land and Demonstration of EPCAMR Solar Site Selection Criteria GIS Suitability Modeling Tool
- Presentation of Initial Assessment Recommendations
- Panel Discussion and Q&A

Today's Goals

- Preview content of assessment report
- Gather additional feedback and suggestions
- Build relationships among key stakeholders operating in this sector

Project Partners

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Project Sponsor

EPCAMR
Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

Stakeholder Coordination

LaBella
Powered by partnership.

Research and Assessment Development

Acknowledgements

Lunch this afternoon has been sponsored by:

- ARM Group, LLC
- Kleinfelder
- LaBella Associates
- Penn Environmental & Remediation, Inc
- The Nature Conservancy
- Tetra Tech, Inc.
- Tract Engineering, PLLC
- U.S. Light Energy
- Wallace Montgomery

Understanding Stakeholders

- Landowners of current and previously mined sites
- Developers of solar projects
- Engineering firms that develop site plans for solar projects
- Government agencies that regulate or assist with developing solar projects
- Non-profit organizations that assist with solar development
- Economic development corporations
- Other




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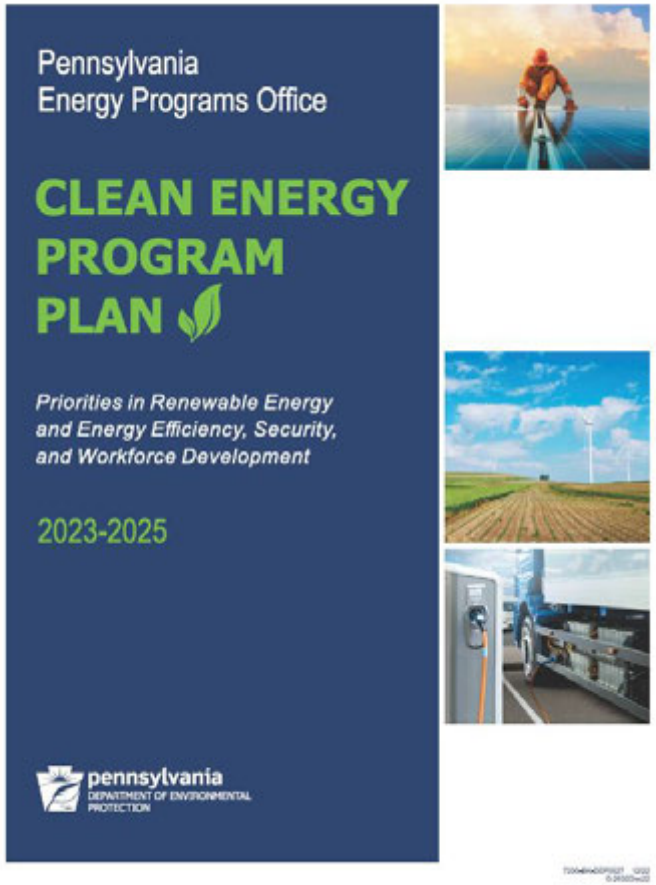
Background On Commonwealth Policy and Activities Related to Solar Development

DEP Energy Programs Office (EPO)



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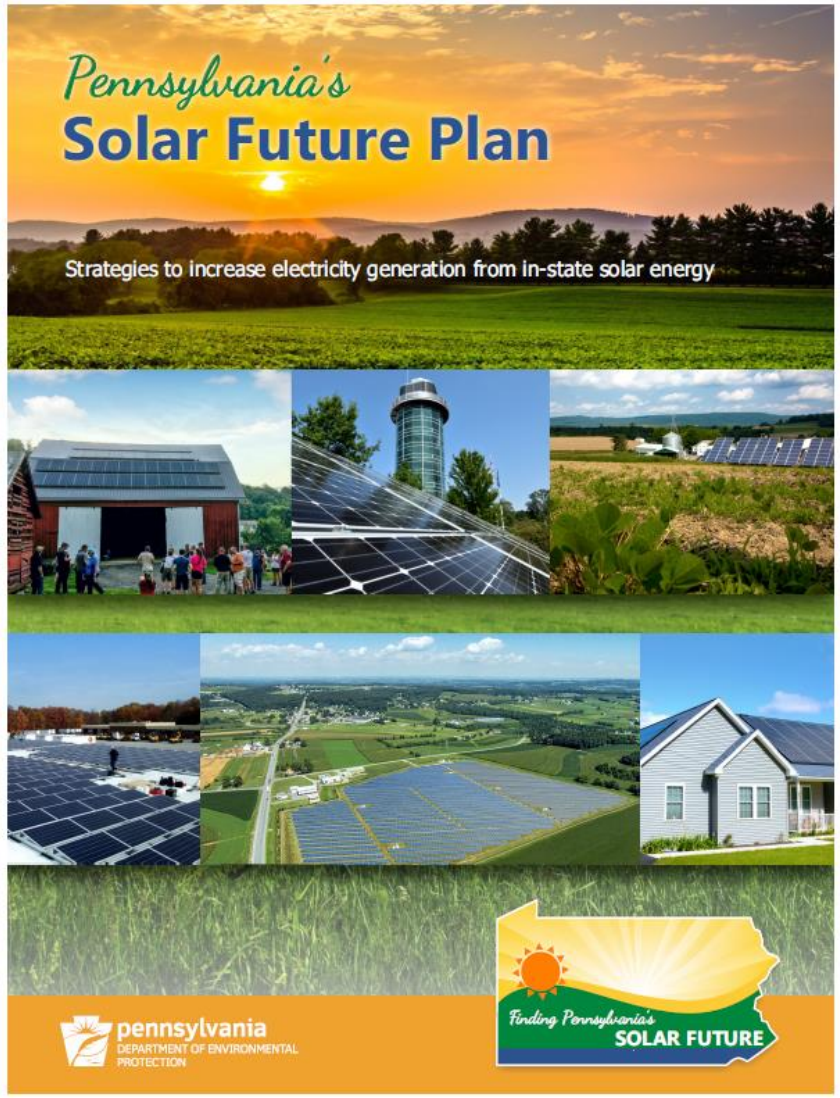
- EPO is the primary agency responsible for implementing clean energy programs in Pennsylvania
- Non-regulatory office
- Responsible for supporting **renewable energy**, energy efficiency and conservation, climate change mitigation and adaptation, alternative transportation, energy assurance, and **associated education, outreach and technical** support efforts
- Acts as State Energy Office for US Department of Energy

Pennsylvania's Solar Future Plan (2018)



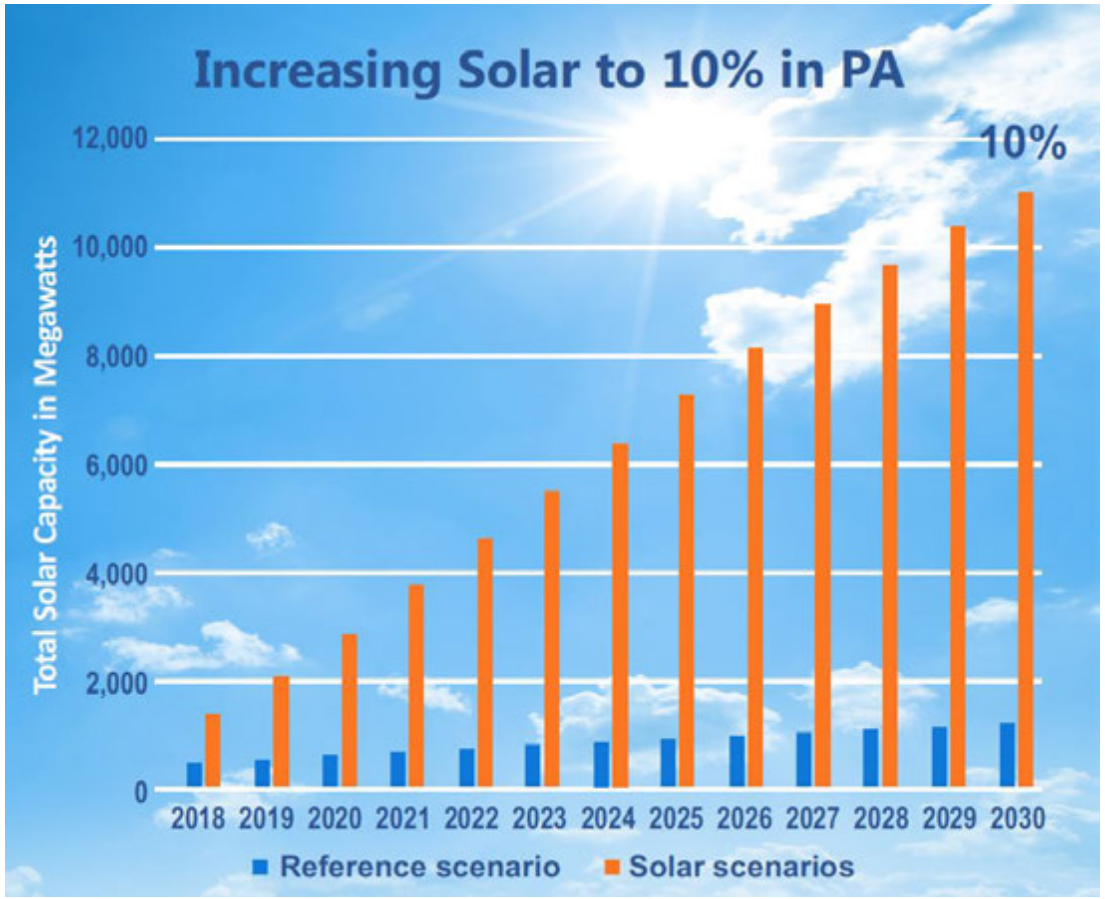
Plan Goals:

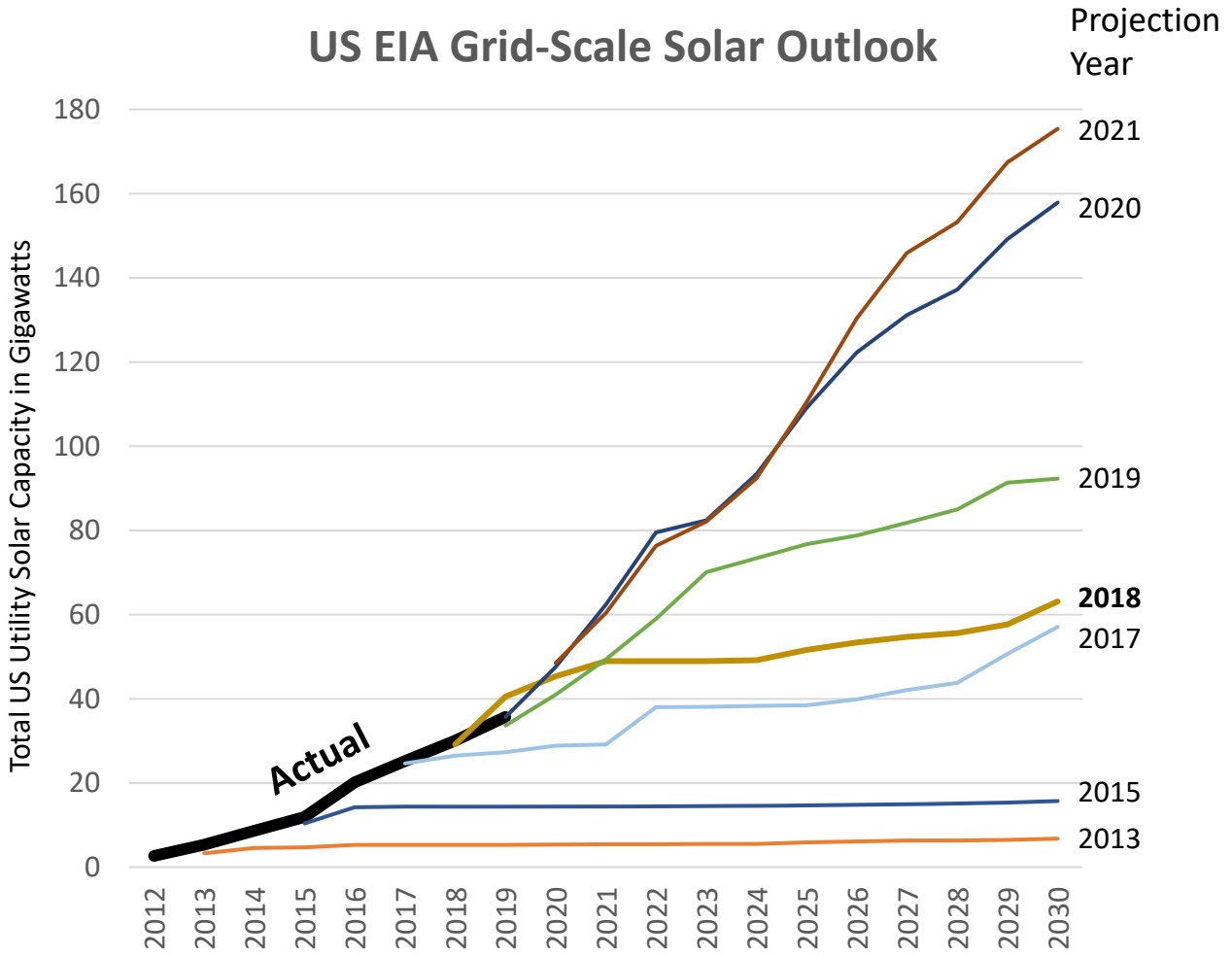
- Target 10% electricity (11 GW) from in-state solar by 2030 (currently less than 0.5%)
- If 90% of in-state solar comes from grid-scale sources:
  - **~10 GW** of solar generation
  - ~80,000 acres of land – this represents 0.3% of total land in Pennsylvania

Strategy #5: Support the creation and adoption of uniform policies to streamline siting and land-use issues while encouraging conservation.

- *Less valuable lands such as landfills, **abandoned mine lands**, and other brownfields are often better choices to be redeveloped with solar projects.*

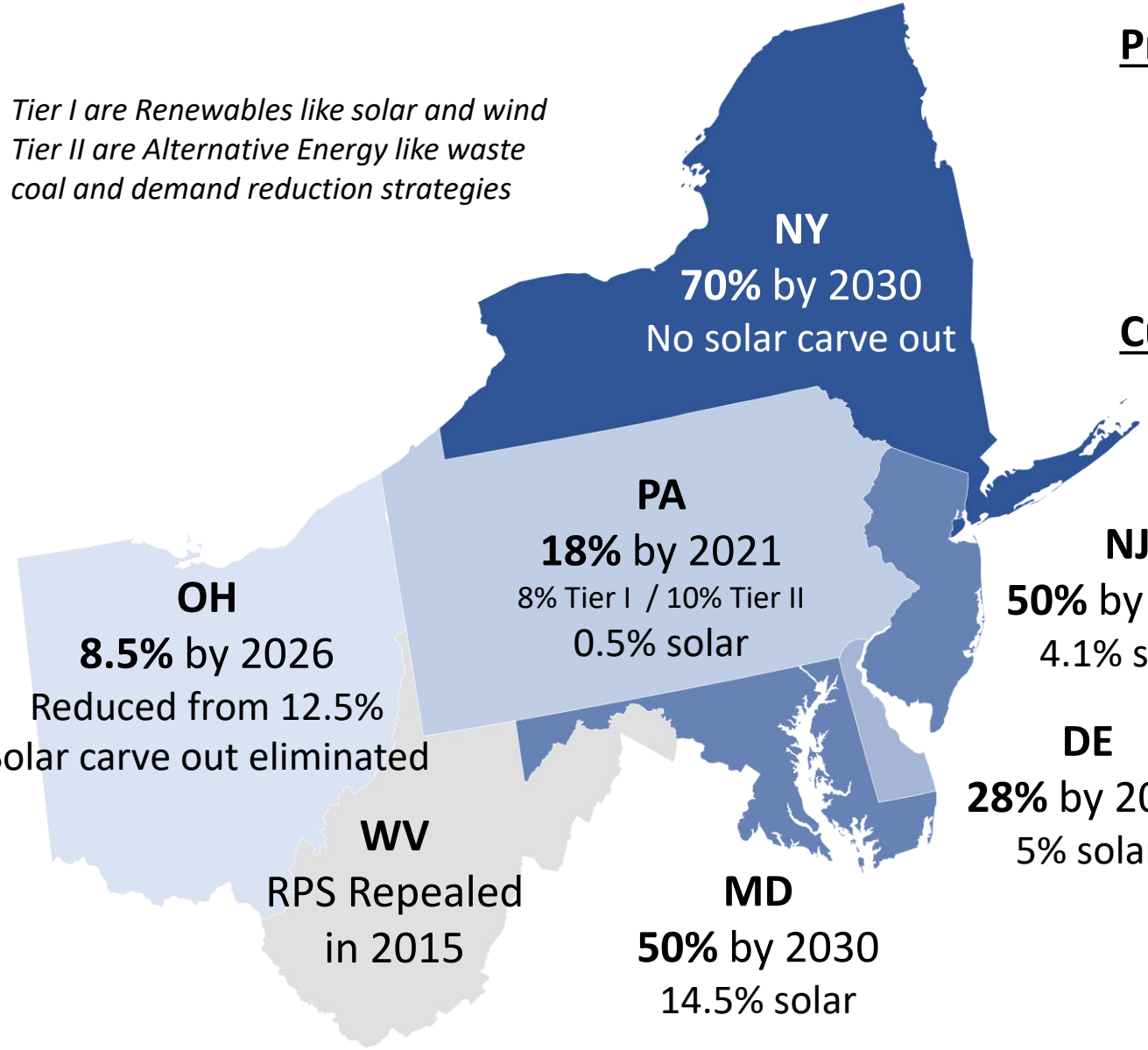
Projecting Grid-Scale Solar Deployment





Regional Renewable Portfolio Standards

- *Tier I are Renewables like solar and wind*
- *Tier II are Alternative Energy like waste coal and demand reduction strategies*



Previous Modifications to AEPS

Act 40 of 2017 required all new generators eligible for solar credits be located in Pennsylvania

Current Proposals in 2023-24 Legislative Session:

- **SB 230 / HB 1467:** expands AEPS Tier I requirement from 8% to 30% by 2030 (14% solar carve out) and enables Community Solar up to 5 MW
- **SB 550:** Enables Community Solar (5 MW project size, up to 20 MW on brownfields, including AML)
- **HB 330:** Enables "Local" Solar (up to 30 MW)
- **SB 798:** Agricultural land limitations and brownfield tax credits
- **SB 211 / HB 925:** Decommissioning Requirements

Inter-Agency Solar Siting Work Group

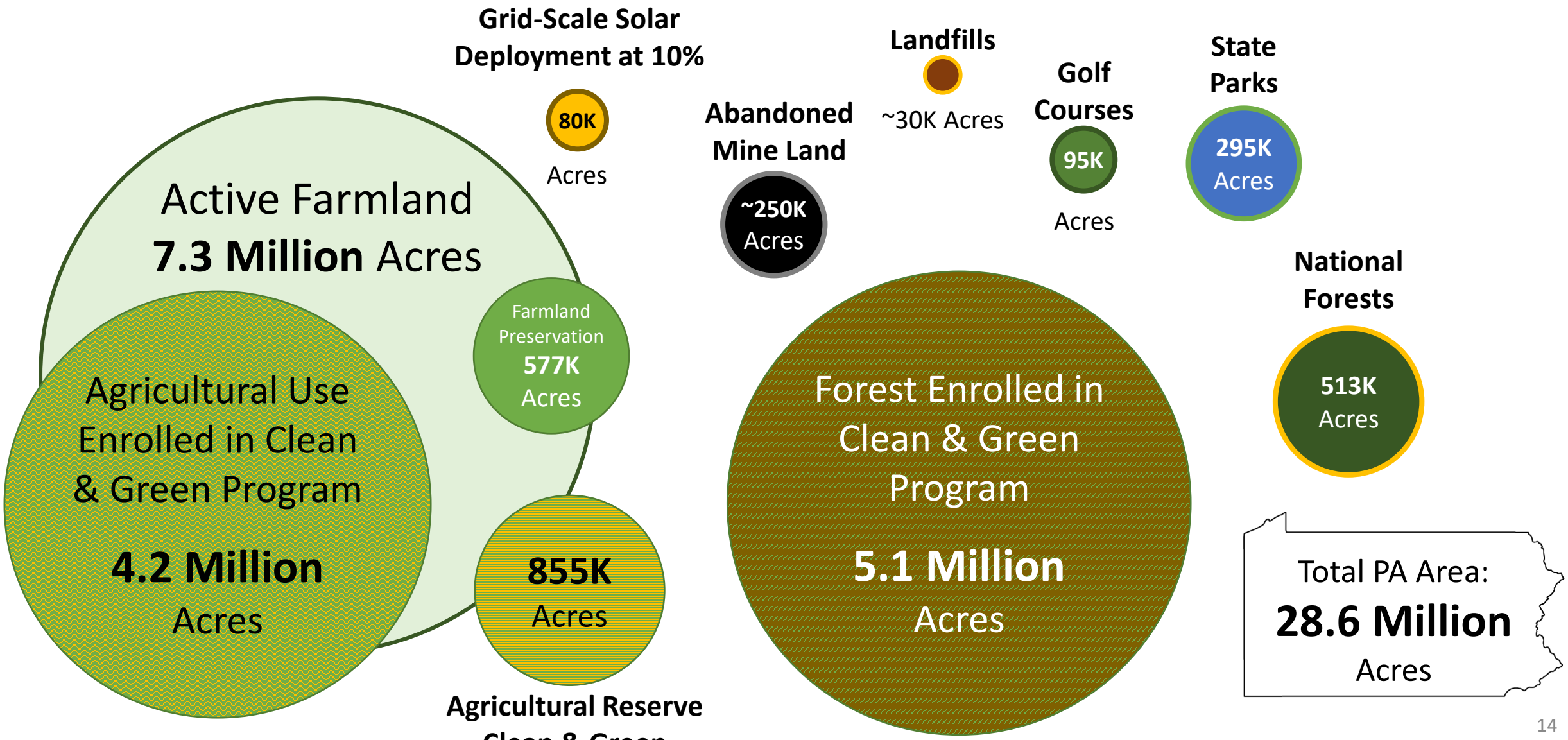
Note: In general, Commonwealth agencies have limited oversight regarding solar development

- **DEP:** Stormwater Management
- **Agriculture:** Farmland Preservation and Clean and Green Tax Program

Grid-Scale Solar Siting Policy Statement

- **Prioritize reuse and repurposing of previously impacted** lands to make these sites viable alternatives for hosting grid-scale solar
- Balance potential opportunities of grid-scale solar energy projects with priorities and benefits of **agricultural preservation and sustainable forest management**.
- Support project siting that elevates equitable sharing of environmental, health, social, and economic benefits.
- **Respect local decision making on the siting of projects** within parameters established community-based comprehensive planning efforts.
- **Protect landowner interests and safeguard future land uses** through informed project planning that includes project decommissioning plans.

Land Use Comparison



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Local Government Outreach & Technical Assistance

Outreach

Direct assistance to areas with high concentration of proposed projects

Regularly scheduled webinars (Phase I only)

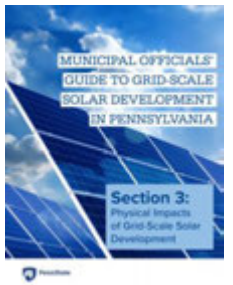
- **Phase I:** with Penn State Extension in 2021-22
- **Phase II** with Pennsylvania State Association of Township Supervisors (PSATS) current

- Best practices
- Industry standards
- Context on how it can impact project design

- Physical impacts
- Land use impacts
- Economic impacts
- Environmental impacts

Research

Municipal Officials' Guide to Grid-Scale Solar Development in Pennsylvania



PennState Dickinson Law

Agency Guidance Resources

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https://www.agriculture.pa.gov/Plants_Land_Water/Sustainability/Documents/PDA-Solar-Guidance-Final.pdf

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AND NATURAL RESOURCES

https://elibrary.dcnr.pa.gov/GetDocument?docId=4659215&DocName=Conservation_Considerations_for_Grid-Scale_Solar_Systems_Pennsylvania_Sept2022.pdf



Current Status on Solar Development in Pennsylvania

Different Scales of Solar

10 kW home system

500 kW commercial system

5 MW community-scale system

25 MW grid-scale system

Residential & Commercial

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

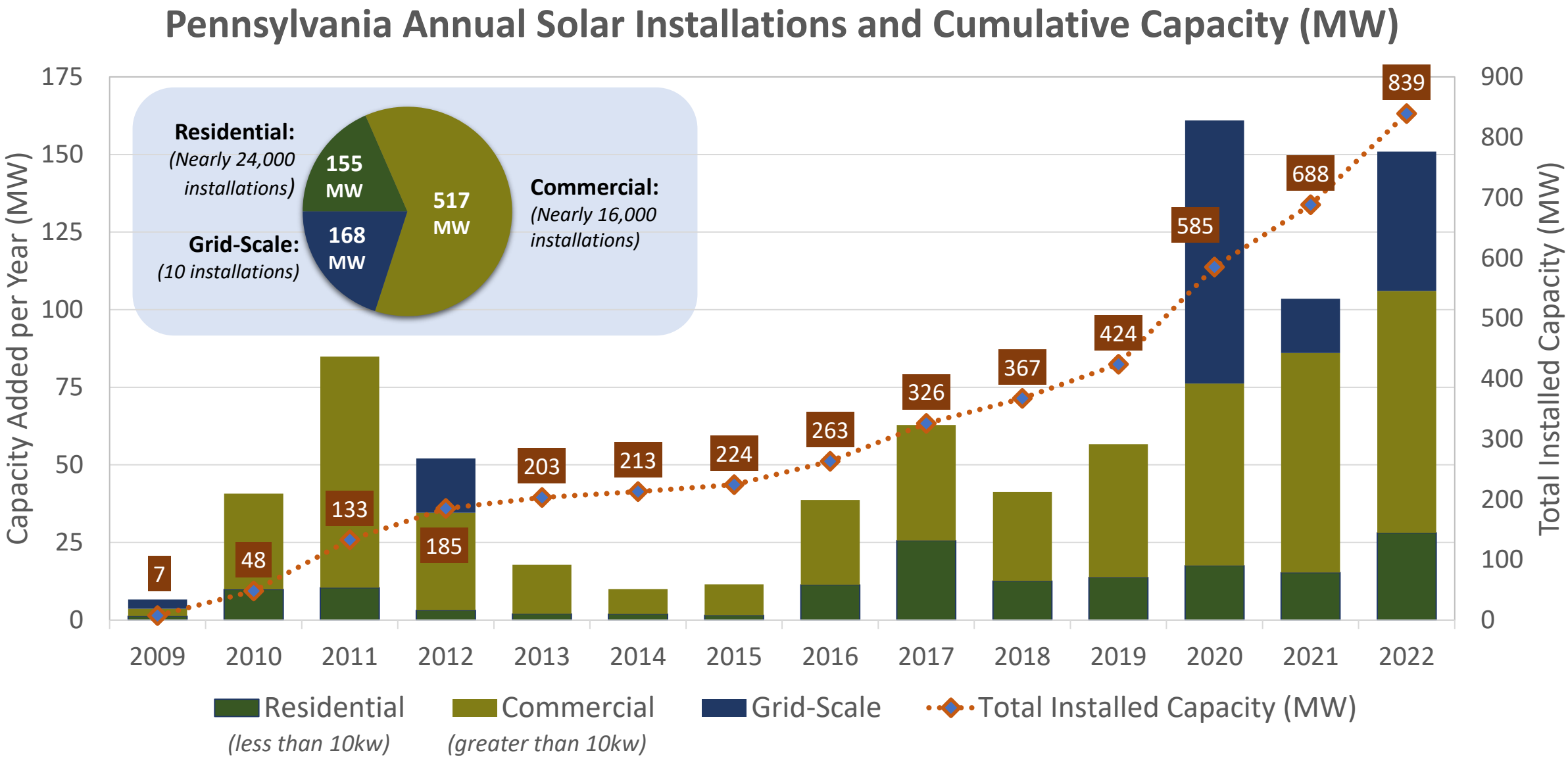
Community Solar

- For off-site energy use within community (distribution grid)
- Usually ground mounted requiring multiple acres but potential for rooftop or parking lot installations
- Measured in 100s of kW up to 5 MW
- Requires enabling legislation (multiple bills in current session)

Grid-Scale Solar

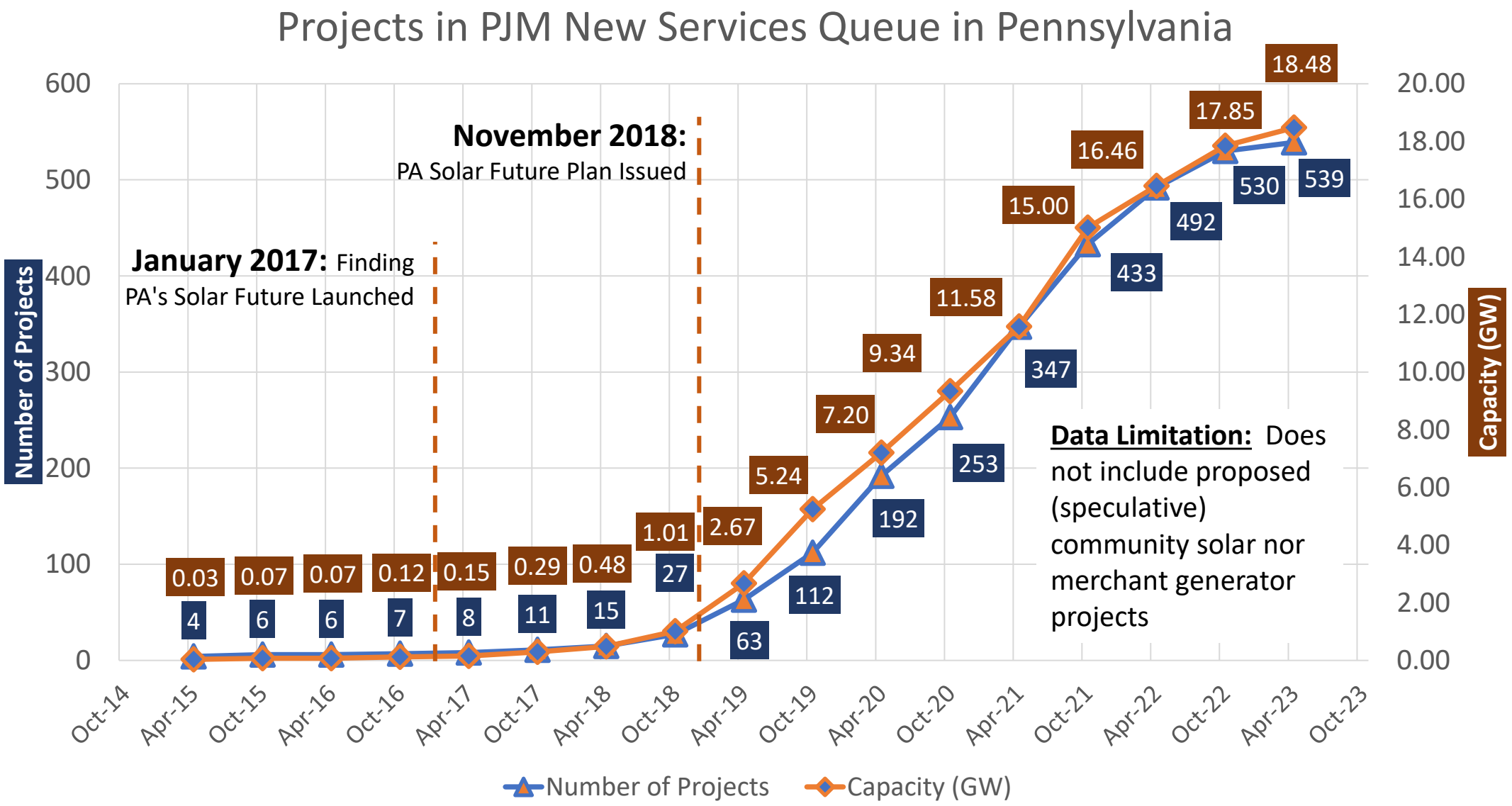
- For off-site energy use distributed through transmission grid
- Ground mounted requiring significant acres to reach economies of scale
- Measured in MW
- Emerging market – guidance in development

Growth of All PA Solar – 2009 to 2022



Source: *AEPS Qualified Facilities Report*

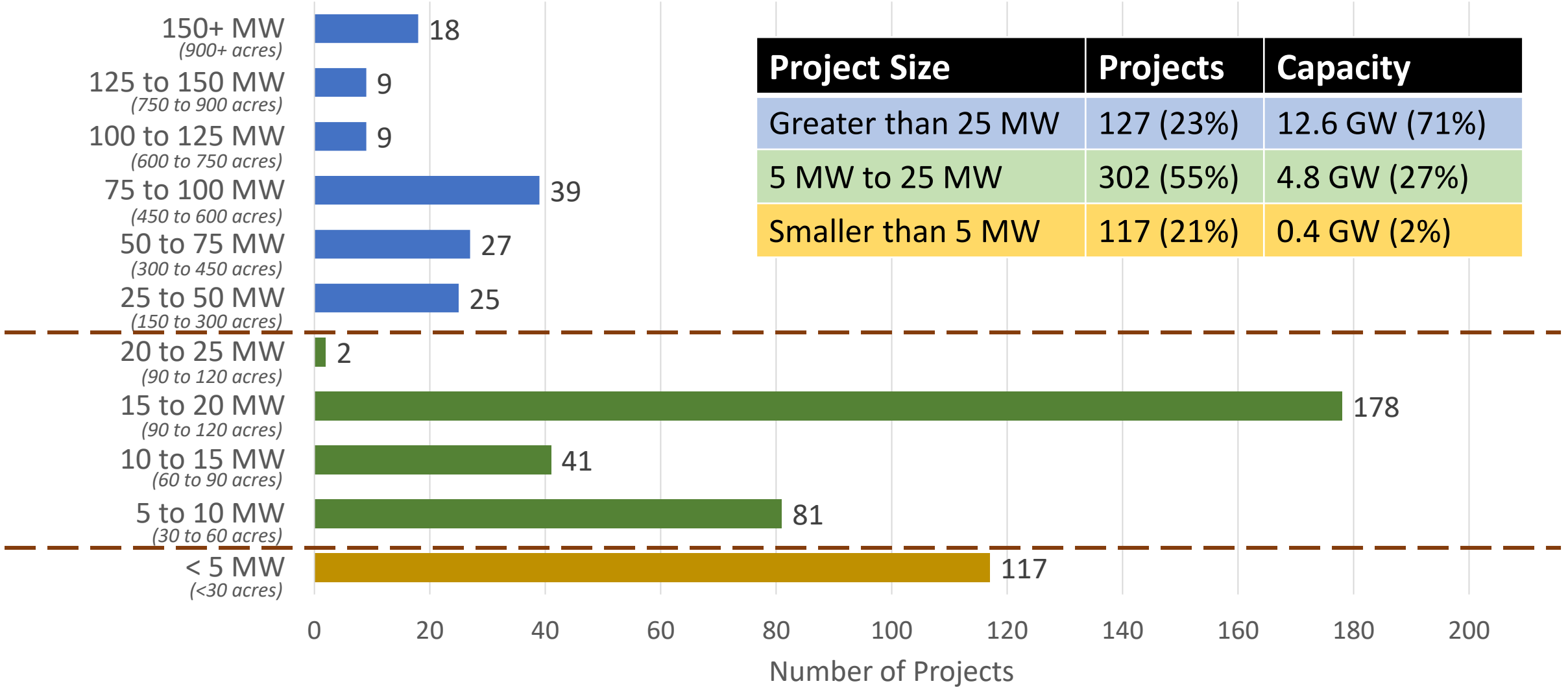
Growth of Grid-Scale Solar Proposals



Land Use Impact

Planning Estimate:
6 acres per MW

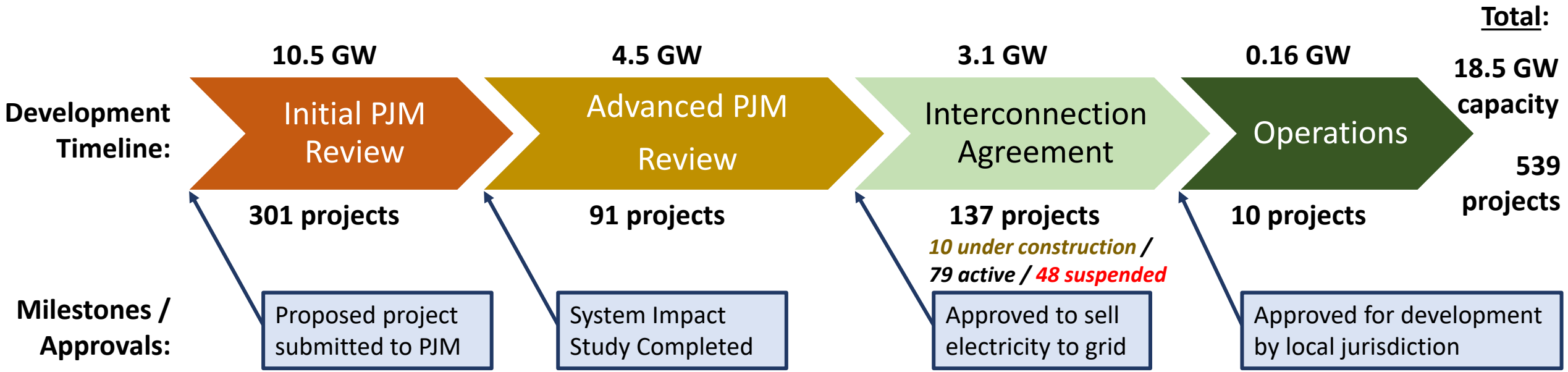
Projects (by Capacity) in PJM New Services Queue



Project Size	Projects	Capacity
Greater than 25 MW	127 (23%)	12.6 GW (71%)
5 MW to 25 MW	302 (55%)	4.8 GW (27%)
Smaller than 5 MW	117 (21%)	0.4 GW (2%)

Grid-Scale Solar Project Development Process

- Currently **18.5 GW** in new development queue – Finding PA's Solar Future Plan had 9.9 GW grid-scale solar goal by 2030 to reach 10% target for in-state solar



Trends Since Last Data Analysis (October 2022):

- Overall number slightly reduced (546 vs. 539) – number of withdrawals exceeded new projects submitted
- Advanced PJM Review number has been worked down (123 to 91), while projects with Interconnection Agreements has increased (112 to 137)
- Of projects with Interconnection Agreements, number of suspended increased from 35 to 48

Data from PJM New Services Queue (07/11/2023) https://www.pjm.com/planning/services-requests/interconnection-queues.aspx

Development Potential (# of Projects)

Review Phase:

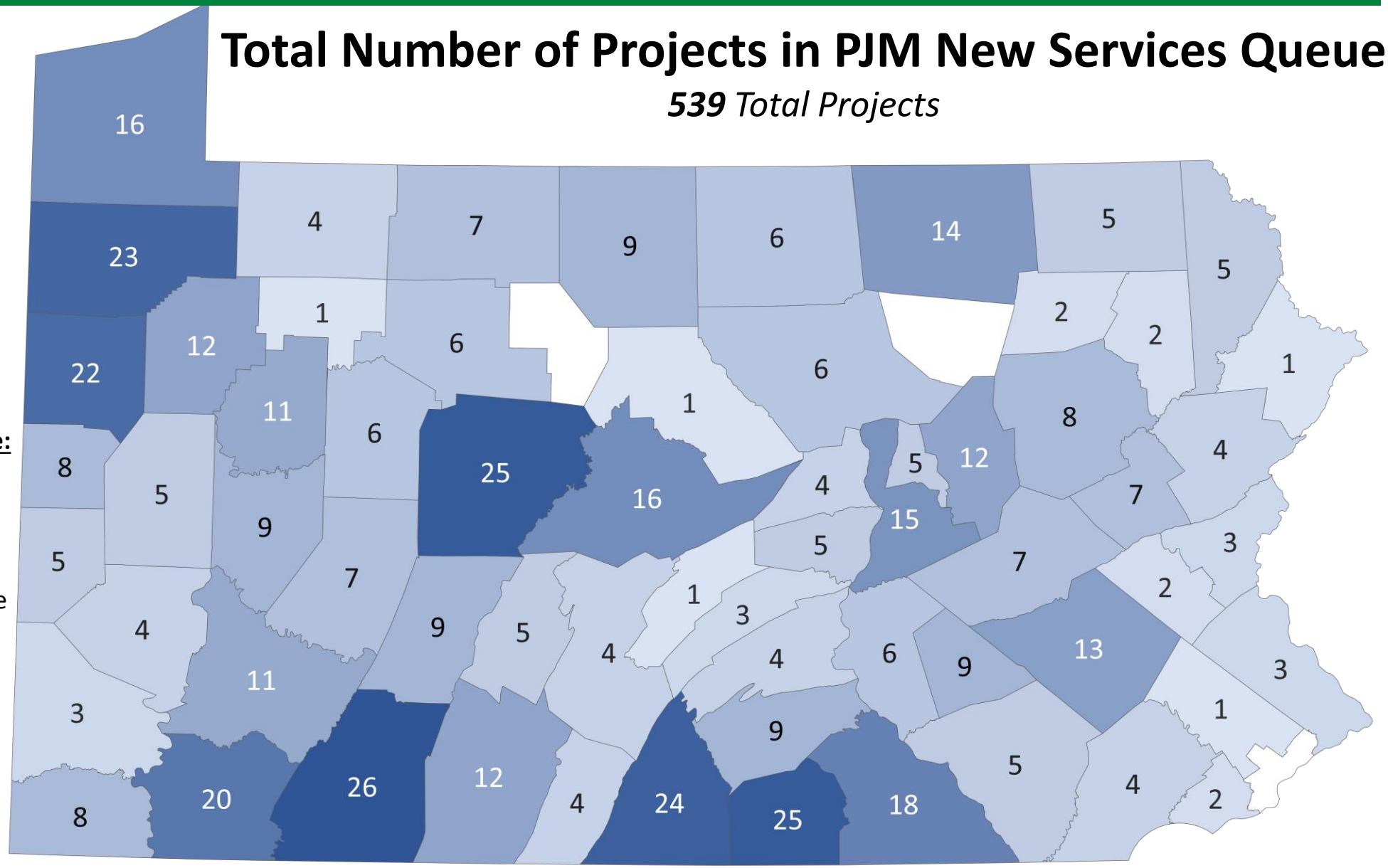
301	Initial Review
91	Advanced Review
137	Interconnection Agreement
10	Operations

Site Land Use Type:

- **80%** open / agricultural
- **5%** forest
- **15%** previously impacted / reuse

Total Number of Projects in PJM New Services Queue

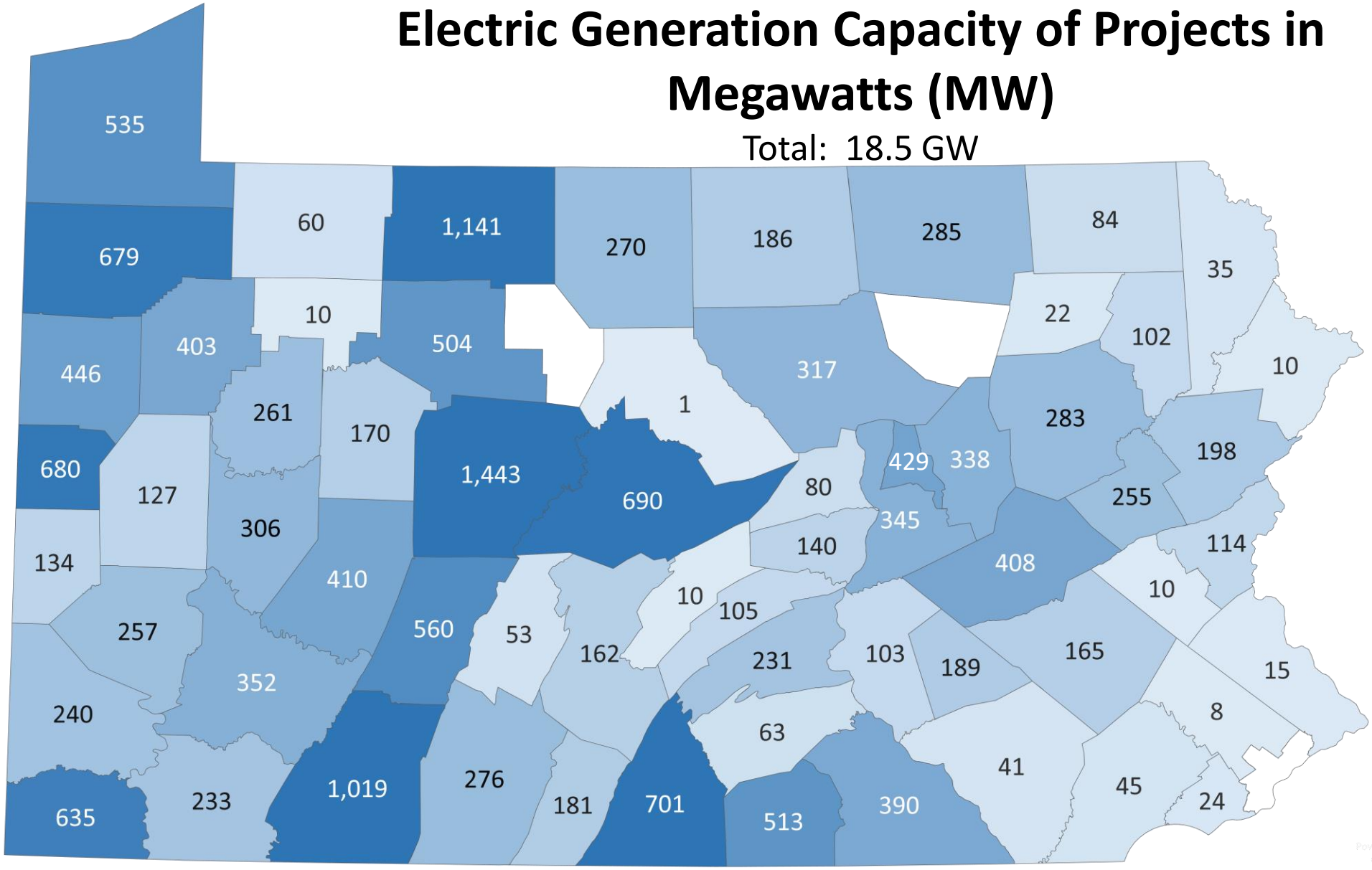
***539** Total Projects*



Development Potential (Capacity)

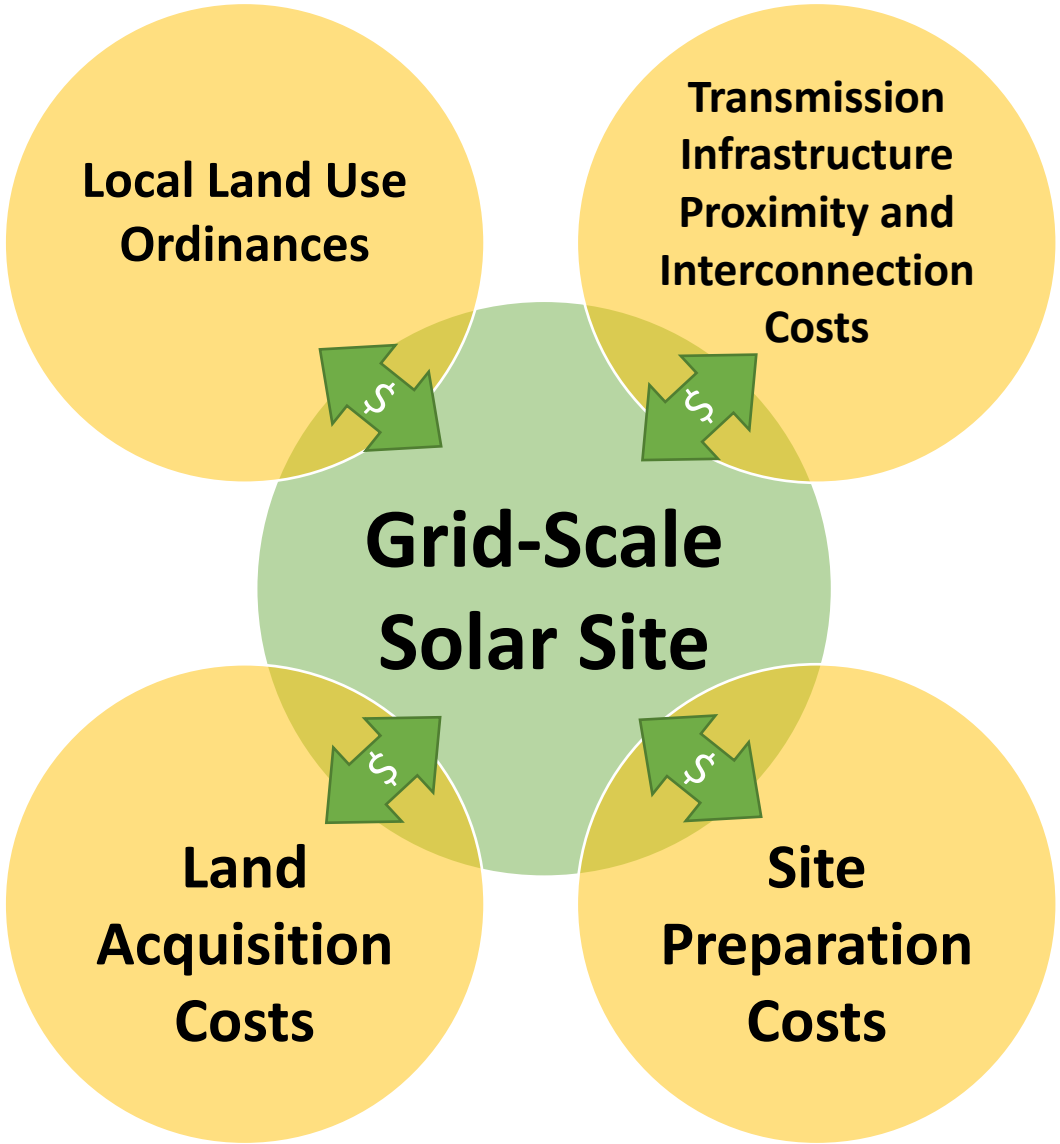
Electric Generation Capacity of Projects in Megawatts (MW)

Total: 18.5 GW



Grid-Scale Solar Site Selection Considerations

- Where does the community stand on grid-scale solar development?
- Final siting authority rests at local government level



- Developer responsible for costs to tie into transmission system as well as any upgrades to lines, substations, etc.

- Productive agricultural land vs. previously impacted sites with lower economic value

- "Shovel-ready" greenfield site vs. land requiring significant reclamation and/or grading activities

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Assessment of Opportunities for Grid-Scale Solar Development on Previously Impacted Mine Lands in Pennsylvania

Assessment Goals

1. Explore challenges associated with siting grid-scale solar development on previously mined lands
2. Gain a better understanding of the roles and responsibilities of the different stakeholders involved in the development process
3. Identify factors leading to successful deployments of grid-scale solar project projects in Pennsylvania on previously mined lands
4. Develop actionable recommendations to improve the processes and other factors involved in siting grid-scale solar projects on previously mined lands.

Assessment Scope

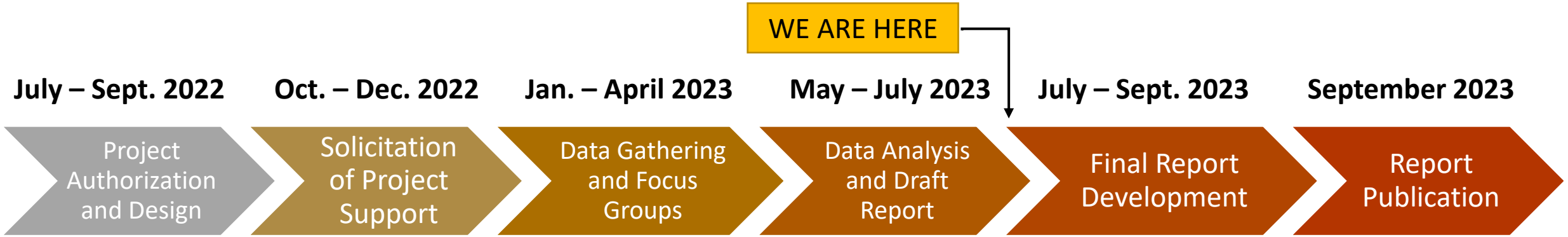
Inside Scope:

- Policy Recommendations
- Internal Processes and Procedures
- Investment of BIL / IRA funding
- Other state-level Investments and Incentives
- Next Steps

Outside Scope

- Identification of individual sites / parcels
- Short-term grant opportunities (Clean Energy Demonstration Program)
- Non-mine related brownfields
- Non-solar renewable energy

Assessment Process



- Funded through State Energy Plan Funding
- Define project scope and goals

- Competitive solicitation for assessment development (LaBella Associates)
- Partnership with EPCAMR for stakeholder engagement & outreach

- Three focus group sessions (Harrisburg, Westmoreland County, Luzerne County)
- Research and data collection

- Follow-up interviews
- Review of existing processes and programs

- Incorporate summit feedback
- Finalize recommendations

- Publish on PADEP EPO Website
- Presentation at 2023 PA Abandoned Mine Reclamation Conference (October 24-26) in Altoona

“Previously Impacted Mine Land”

- **Abandoned Mine Lands:**
  - Parcels of land already remediated through state and federal funding under SMCRA Title IV AML Program
  - Parcels of land designated as Abandoned Mine Lands (pre 1977) which have not yet been reclaimed but are eligible for reclamation through the Bureau of Abandoned Mine Reclamation with federal funding under SMCRA Title IV AML Program.
- **Other Impacted Mine Sites:**
  - Parcels of land that no longer have active mining activities (non-coal sites and post 1977 coal sites) that have already been reclaimed or have an approved reclamation plan in place
  - Parcels of land were the mine site was forfeited due to failure by the operator to meet its regulatory obligations.
  - Parcels of land with current mining activities (post 1977) that have the option to integrate planning for hosting solar facilities into reclamation plans

Assessment Components

1. **Background:** Opportunity, issues, current activities
2. **Current State of Previously Mined Lands:** High level inventory of previously mined lands, mine reclamation process, reclamation funding opportunities.
3. **Commonwealth Solar Development Initiatives:** Current policy initiatives, permitting process, development resources and solar advocacy.
4. **Opportunities for Solar Development on Previously Mined Lands:** Site characteristics, comparison to development on greenfield sites, policy and permitting considerations from other states
5. **Commonwealth Solar Development Process on Previously Mined Lands:** Site identification and characteristics, landowner engagement, interconnection, permitting, financing, construction, O&M
6. **Grid-Scale Solar Stakeholders and Outreach:** Feedback from focus groups and interviews
7. **Recommendations:** Timeline, costs, responsibilities



Questions?

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DEP Solar Energy Resource Hub: https://www.dep.pa.gov/Citizens/solar/Pages/default.aspx

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENERGY PROGRAMS OFFICE

ASSESSMENT OF OPPORTUNITIES FOR GRID-SCALE SOLAR DEVELOPMENT ON PREVIOUSLY IMPACTED MINE LANDS IN PENNSYLVANIA

2023 Statewide Summit

Ramada Conference Center
State College, Pennsylvania

Overview

- The Opportunities
- The Issues
- Current State of Previously Mined Lands
- Solar Development & The Commonwealth
- Solar Development on Previously Mined Lands vs. Greenfield Sites
- Stakeholders and Outreach

OPPORTUNITIES & ISSUES

The Opportunities:

- Pennsylvania has significant energy resource abundance and a history of energy production.
- The Commonwealth has seen a steady increase in total installed solar capacity over the last decade (residential, commercial, and grid-scale), and is projected to continue to grow in a positive trend.
- Pennsylvania holds the opportunity to use previously mined lands to develop grid-scale solar facilities:
  - Harness growth in the energy sector.
  - Promote economic opportunities.
  - Protect farmlands and forested areas by developing on impacted lands

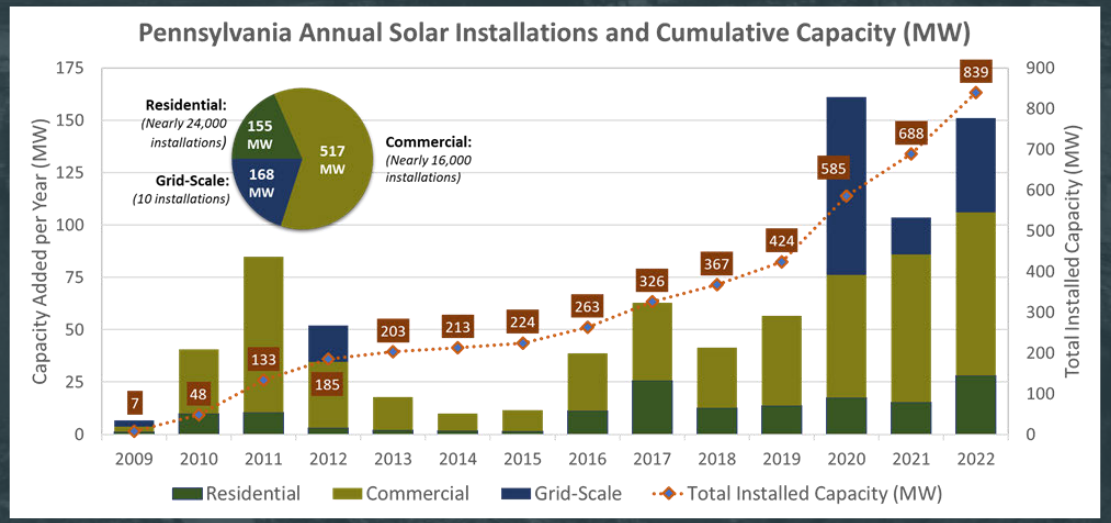
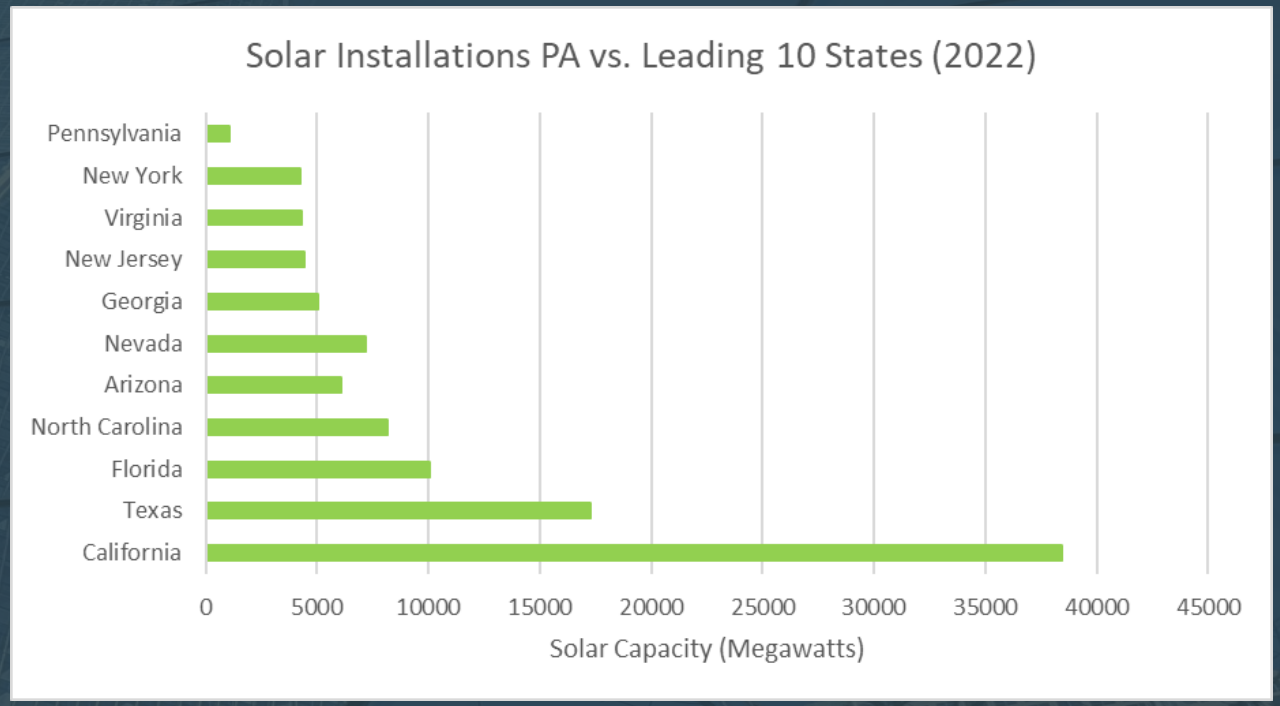


Figure 1: PA's Annual Solar Installations and Cumulative Capacity (MW)

The Issues:

- As of 2022, Pennsylvania ranks 26th in the nation for cumulative installed solar power capacity (1,036 MW).
- Limited land availability, presence/lack of existing grid infrastructure, and high costs.
- Protection and preservation of valuable arable lands through:
  - Thoughtful policies.
  - Actionable recommendations.

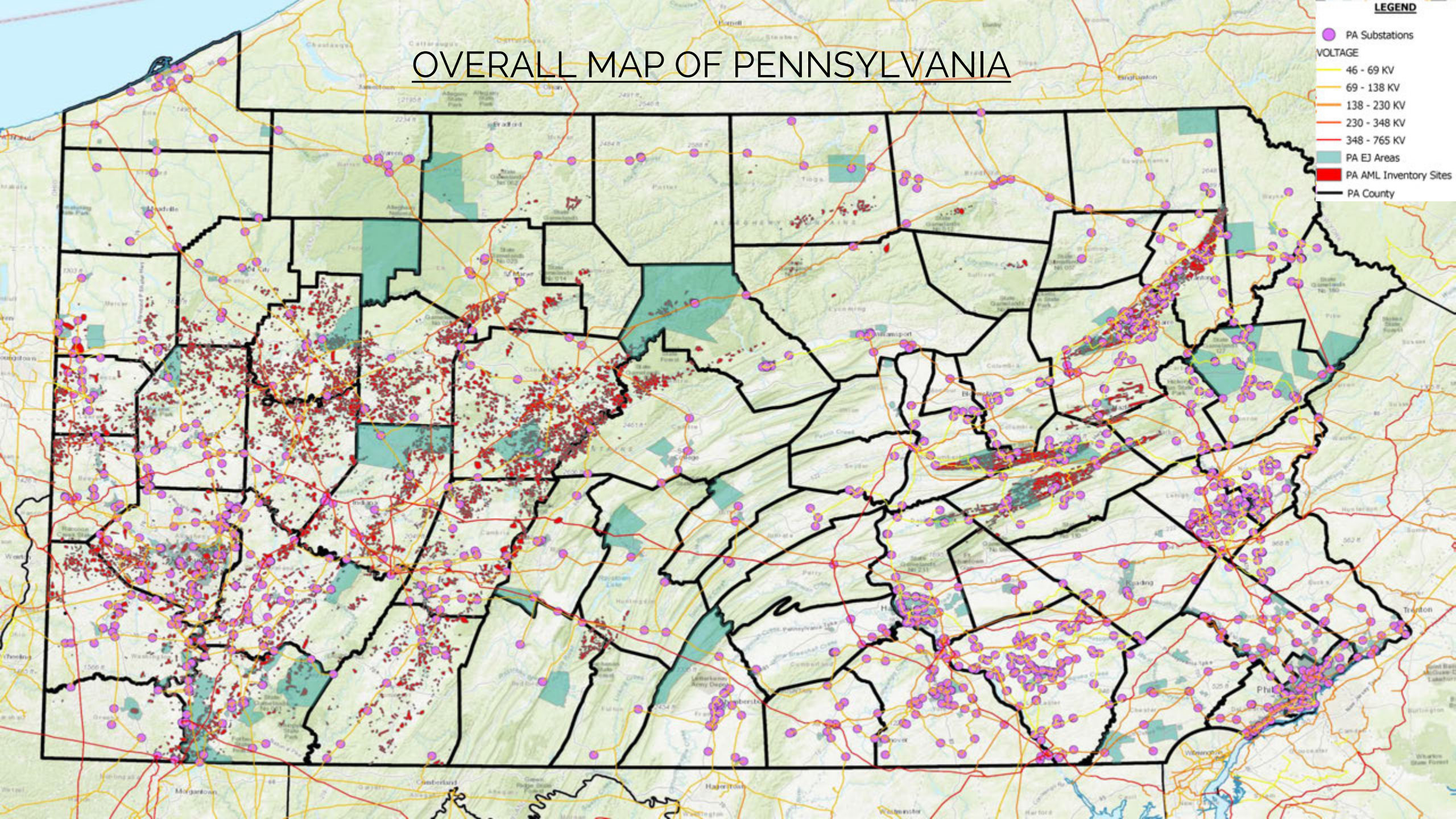


CURRENT STATE OF PREVIOUSLY MINED LANDS

Current State of Previously Mined Lands

- “1.4 million people live within one mile of an abandoned mine site.” – *Senator Bob Casey*
- Types of Mine Lands Defined by Surface Mining Control and Reclamation Act (SMCRA):
  - **Abandoned Mine Lands –** Pre 1977 mining operations, before SMCRA standards were in place, and abandoned when mining operations ceased.
  - **Regulated Mine Lands –** Mining operations performed post 1977, regulated through SMCRA and includes a reclamation plan as part of the permitting process.

OVERALL MAP OF PENNSYLVANIA



Mine Reclamation Process

- The course of restoring mine lands to a beneficial use.
- Abandoned Mine Lands – Conducted through BAMR
- Regulated - Conducted through SMCRA
  - Module 20 – A reclamation form that is submitted to satisfy the mining permit obligations.

Abandoned Mine Reclamation Funding Opportunities

Bureau of Abandoned Mine Reclamation (BAMR)

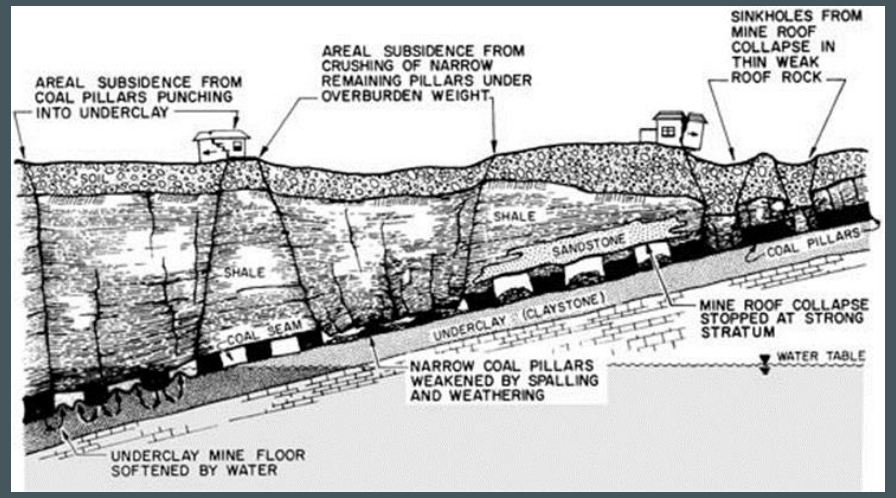
- **AML/AMD:** Abandoned Mine Land and Acid Mine Drainage Grant Program
- **AMLER:** Abandoned Mine Land Economic Revitalization
- **BIL-AML:** Bipartisan Infrastructure Law – Abandoned Mine Land
- Commonwealth Combination of Funds

	AML Fee Based	AMLER	BIL
FFY 2022 Funding in Millions	$26.5	$26.6	$244.9
Source	Tax on coal. Tax reauthorized through November 2034. 13 years.	Annual appropriation - treasury funds. Not guaranteed every year.	Treasury funds – available for 15 years – funds available for projects through 2041.

Benefits of Solar Development on Previously Mined Lands

- Leverage Existing Infrastructure
- Preserve Agricultural and Green Space
- Community Revitalization
- Economic Incentives
- Create Job

Drawbacks of Solar Development on Previously Mined Lands



- Liability
- Mine Subsidence
- Settlement
- Unforeseen Environmental Challenges
- Extensive Grading for Site Preparation

SOLAR DEVELOPMENT & THE COMMONWEALTH

Community Solar Initiatives

- Pennsylvania is experiencing an increase in requests to install community solar systems.
- **Community Solar –** solar systems/projects that benefit individuals, businesses, nonprofits, and other groups who either invest in, or subscribe, to solar power generated from an off-site location,
- Community Scale systems often feature:
  - Allow subscribers to purchase shares of energy output over a set time.
  - Expand solar access to new people/communities.
  - Developments by utilities or third-party developers.
  - Oversight from utility regulators, local government, and/or cooperative boards.

Commonwealth Solar Development Permitting Process

Community Solar

- Pennsylvania does not have laws or in place to allow for the execution of community solar, current bill moving through legislature.

Utility/Grid-Scale Solar

- Pennsylvania has limited state regulation for utility-scale solar beyond local Zoning and Subdivision and Land Development Ordinances (SALDO).

PADEP has published an FAQ for Chapter 102 (Stormwater) Permitting for Solar Farms.

- Slope criteria (under 15%)
- Panel spacing requirements to promote natural infiltration between panels.
- Vegetation specifications
- The same NPDES permit application is utilized for solar development (no priorities for solar)

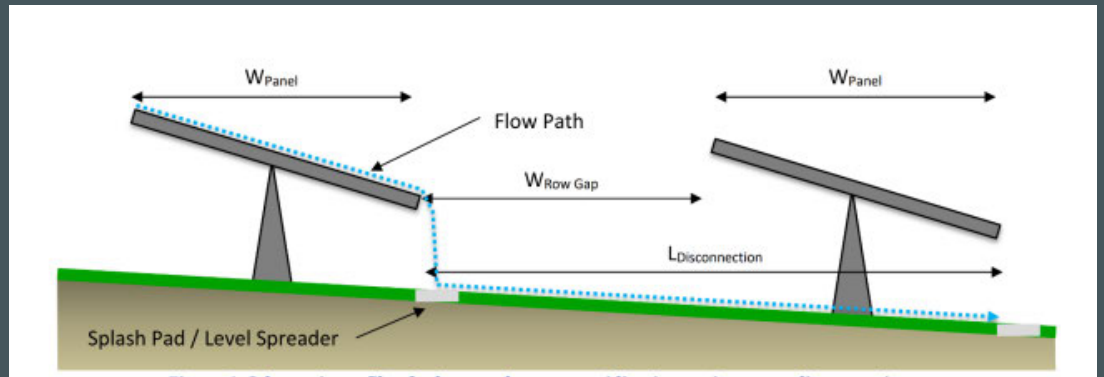
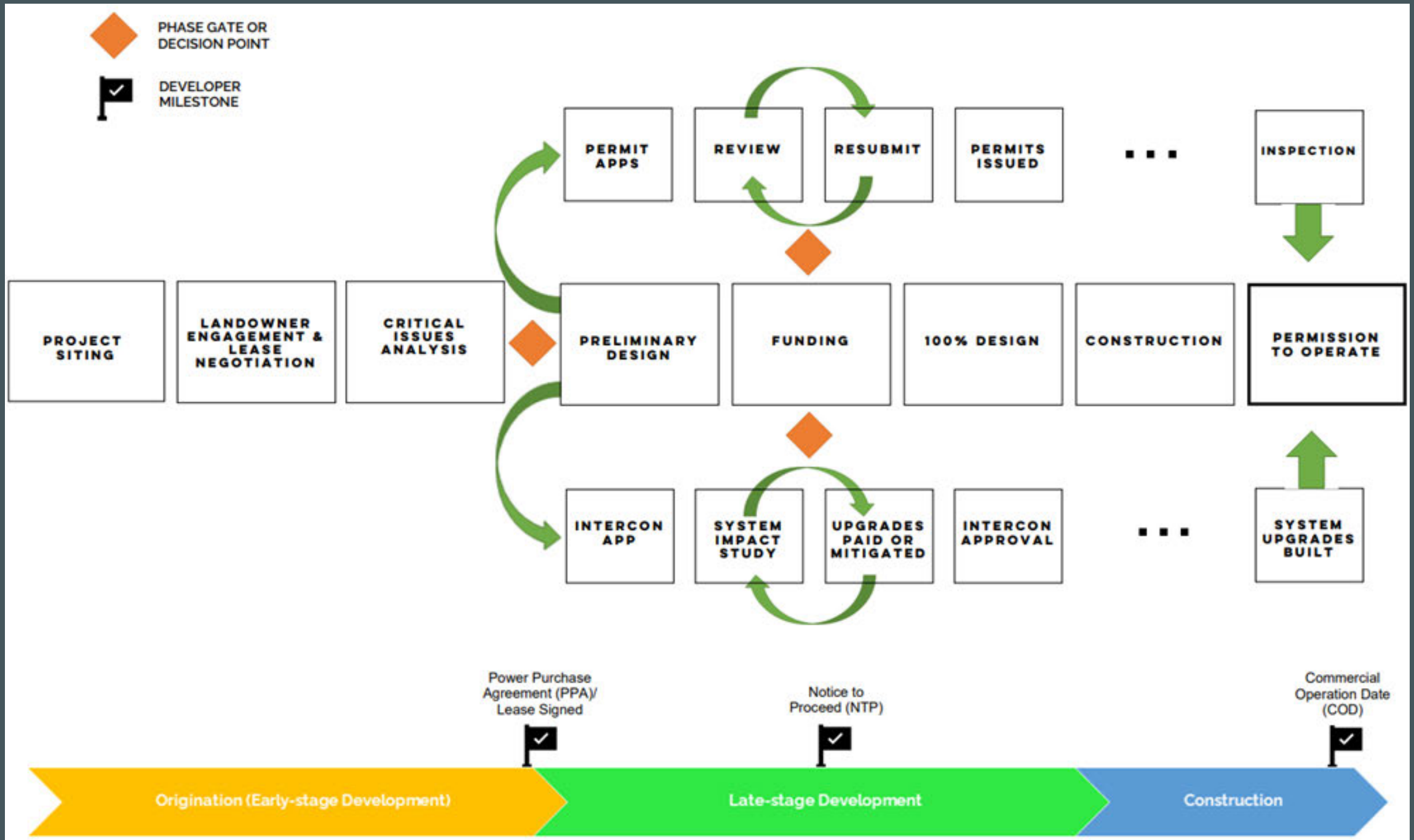


Figure 1: Schematic profile of solar panel array providing impervious area disconnection.

Source: Ohio EPA, October 2019


PHASE GATE OR DECISION POINT
DEVELOPER MILESTONE
PROJECT SITING
LANDOWNER ENGAGEMENT & LEASE NEGOTIATION
CRITICAL ISSUES ANALYSIS
PRELIMINARY DESIGN
FUNDING
100% DESIGN
CONSTRUCTION
PERMISSION TO OPERATE
PERMIT APPS
REVIEW
RESUBMIT
PERMITS ISSUED
INSPECTION
INTERCON APP
SYSTEM IMPACT STUDY
UPGRADES PAID OR MITIGATED
INTERCON APPROVAL
SYSTEM UPGRADES BUILT
Power Purchase Agreement (PPA)/ Lease Signed
Notice to Proceed (NTP)
Commercial Operation Date (COD)
Origination (Early-stage Development)
Late-stage Development
Construction


SOLAR DEVELOPMENT ON PREVIOUSLY MINED LANDS VS. GREENFIELD SITES

Leasing

- Mined land is less valuable
- Mined land often requires additional time to identify and secure interest of landowners
- Leasing risk is similar

Greenfield	Previously Mined Site
$$  ?	$  ?

Site Preparation

- Mined land requires costly reclamation
- Mined land requires significant time to adequately reclaim the site
- Risks associated with mined sites is higher

Greenfield	Previously Mined Site
$	$-$$$
🕐	🕐🕐🕐
?	???

Permitting

- Mined land may require repeating permitting due to elapsed time, resulting in increased cost
- Permitting on mined lands requires more time due to the lengthened duration of process (mine permits closeout and/or reclamation)
- Repeated permitting opens the project to changing conditions and additional risks as regulations and protections change over time

Greenfield	Previously Mined Site
$  ??	$$  ???

Geotech

- Requires costly investigation
  - Historical mining practices
  - Subsurface rights and conditions
  - Surface conditions
  - Subsidence risk
  - Settlement risk
- Time required to complete extensive geotechnical analysis on mined sites exceeds
- Risk of mined sites is higher due to previous disturbance

Greenfield	Previously Mined Site
$	$$$
🕐	🕐🕐🕐
?	???

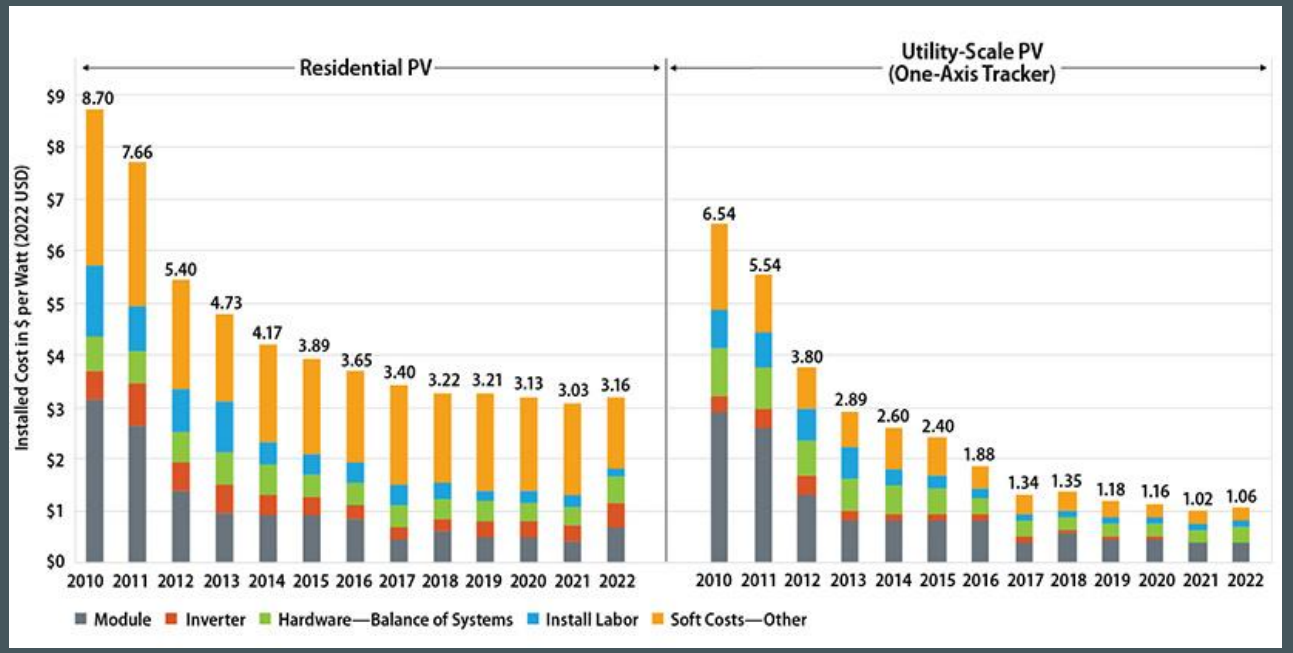
Interconnection

- Interconnection costs are site specific
- Time required for interconnection process is site specific
- Risk associated with interconnection delays or costs is site specific

Greenfield	Previously Mined Site
$$  ?	$$  ?

Other Cost Considerations

- Pricing trends for long-term median installed prices for non-residential installations have fallen to roughly $1.06/Watt
- It is important to consider that PV systems that can handle undulating terrain are more expensive



Policy and Permitting in States with Accelerated Solar Development on Brownfields

EPA Repowering America's Land Initiative

- Led by the Office of Communications, Partnerships, and Analysis.
- Provides technical and programmatic assistance.
- Promoting policies and best practices that encourage renewable energy on contaminated lands.
- Partner with stakeholders.
- Leverage agency efforts.

New York Solar Development Process

- Often overseen by the Office of Renewable Energy Siting and NY State Energy Research and Development Authority.
- NY enacted: Accelerated Renewable Energy Growth and Community Benefit Act, Clean Energy Resource Development and Incentives Program, State Power Grid Study and Program.
- Programs make solar energy more accessible to residential, commercial, and community projects.

Virginia Solar Development Process

- Led by the VA Department of Environmental Quality and State Corporation Commission.
- Enacted programs and legislature such as: Small Renewable Energy Projects Act, Virginia Clean Economy Act, Brownfield and Coal Mine Renewable Energy Grant Fund Program.

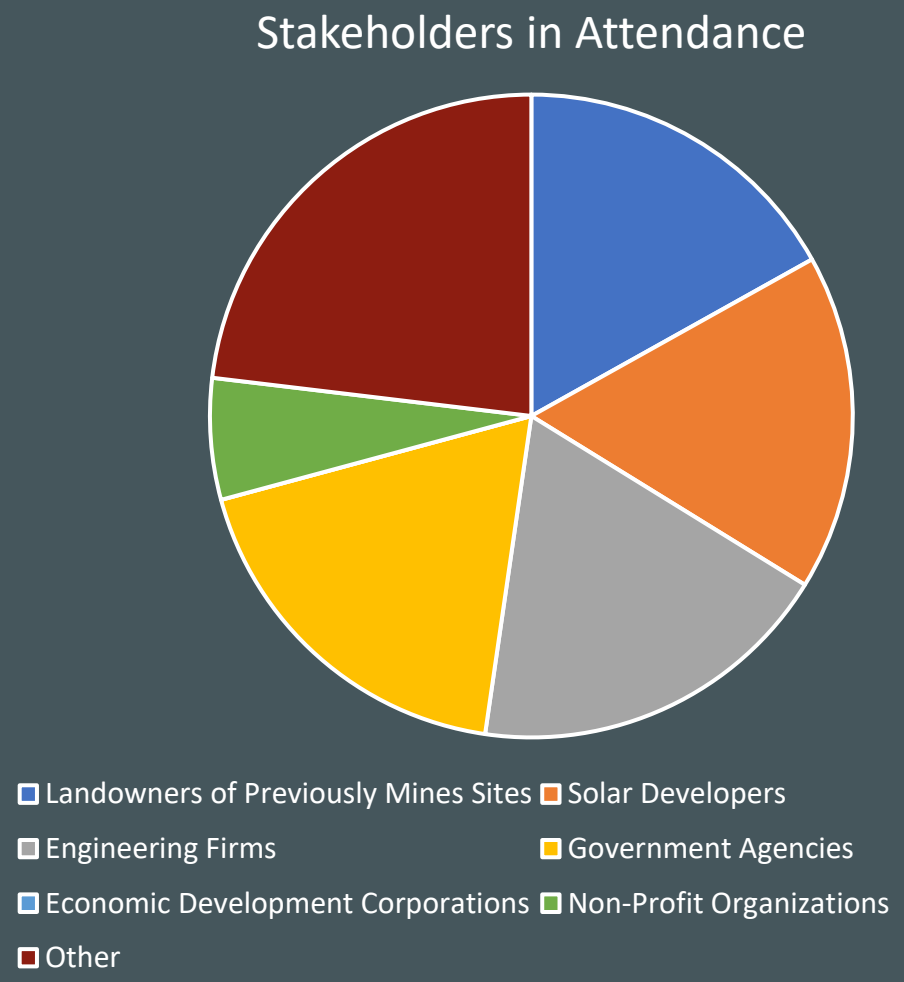
STAKEHOLDERS AND OUTREACH

Listening Sessions

- Engage stakeholders
- Understand challenges and perspectives
- Solicit ideas for improvements and efficiencies.

Locations:

- Latrobe, PA (Western)
- Harrisburg, PA (Central)
- Nanticoke, PA (Eastern)



Landowners

Listening:

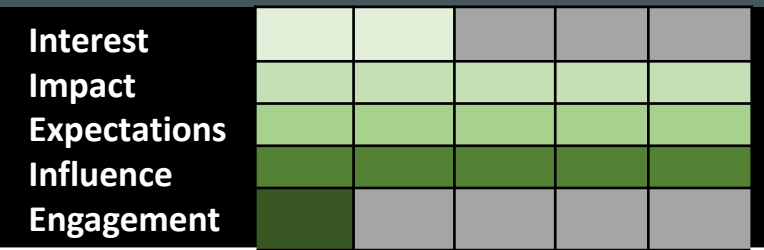
Seek mining replacement revenue. Reports indicate landowners often have concerns with solar projects.

- Aesthetics
- Soil erosion
- Concerns for health and safety
- Liability

Actions:

- Advocate for pilot projects and new policies
- Coordinate with developers
- Coordinate with neighboring landowners to enable larger projects
- Coordinate with non-profit organizations
- Coordinate with BAMR to begin land reclamation and ready the site for solar development

Landowners



- **Hold high degree of power over land utilization**
- **Engage early in the process**
- **Educate and Incentivize**

Developers

Listening:

High degree of concern regarding feasibility, permitting, time to operation

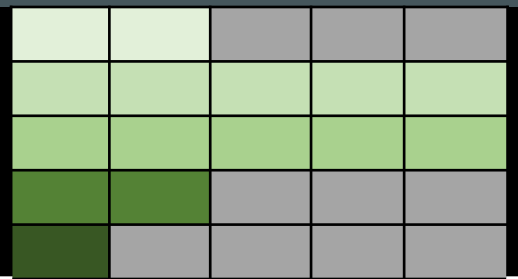
- Risk and liability for siting previously mined lands
- Transmission attributes
- Identification of viable project locations
- Complicated state aid and permitting
- Lack of community solar legislation

Actions for Developers:

- Engage landowners and operators of mined lands.
- Advocate for pilot projects and new policies, legislation.
- Coordinate with non-profit organizations to identify potential project locations.
- Coordinate with BAMR for phased remediation

Developers

Interest
Impact
Expectations
Influence
Engagement



- **Hesitant to pursue due to risk and time to return**
- **Engage in advocacy for solar development**
- **Take actions to leverage non-profit and Commonwealth resources**

Engineers

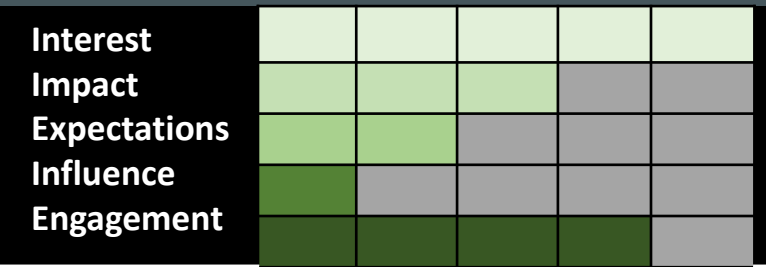
Listening :

- Transmission attributes and easements
- Coordination with multiple agencies for clearances
- Time sensitivity of permits/approvals
- Grading requirements for AML, solar development, runoff management
- Need for approved technical specifications to minimize infiltration

Actions:

- Educate local communities
- Coordinate with non-profits
  - Support new policies and understand proposed legislation
  - Identify potential project locations
- Support developers in advancing projects
- Engage early and often with BAMR

Engineers



- **High interest in development opportunity**
- **Concern regarding complex permitting/approval**
- **Concern regarding conflicting requirements**
- **Maintain engagement**

Utility Owners / Operators

Listening:

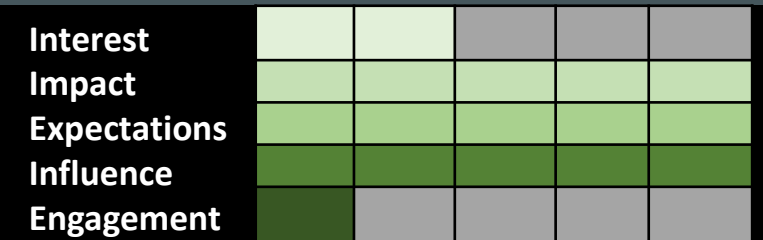
Not included in the stakeholder focus group. Review of reports show high influx of new interconnection requests and capacity shift.

- New wind and solar driven by federal and state renewable incentives
- Generating plant deactivations
- Market impacts introduced by demand and energy efficiency programs

Actions:

- Complete Interconnection Process Enhancements
- Lift moratoriums on Interconnection Applications
- Prioritize transmission line upgrades to support solar development on previously mined lands
- Prioritize interconnection review requests and approvals for sites utilizing previously mined lands

Utility Owners & Operators



- **Current backlog and restructuring**
- **Invest in infrastructure**
- **Drive approval and advancement of projects**
- **Open to fast track approval**

Nonprofit and Industry Advocates

Listening:

Guiding the advancement of solar development.

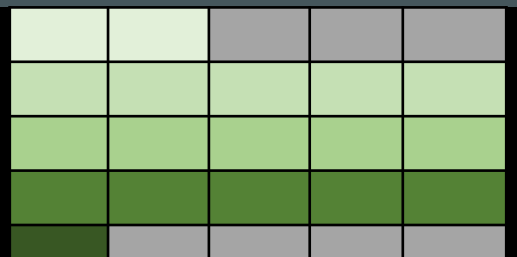
- Developing Tools
- Advocating for Policy and Legislation
- Educating and Informing
- Leading the way with model projects

Actions:

- Educate decision makers and stakeholders
- Develop tools for site selection
- Gather forums of stakeholders to drive reform
- Identify funding streams and support utilization
- Advocate for policy and legislative action that prioritize solar on previously mined lands
- Advocate and facilitate pilot projects

Non-Profit & Industry Advocates

Interest
Impact
Expectations
Influence
Engagement



- **Lead policy change**
- **Provide education and engagement**
- **Develop tools and share resources**
- **Gather forums**

Government and Regulators

Listening:

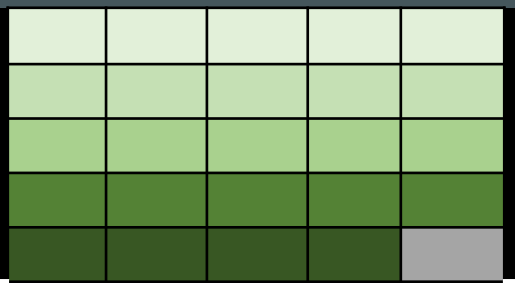
- No processes in place to phase or expedite the close-out of an active mining site for solar development, typical process takes 5 years
- Nationwide staffing shortages
- Process and utilization of funds for reclamation and economic development is strictly mandated by legislation

Actions:

- Pass community solar/solar friendly regulations and policies.
- Prioritize previously mined lands for economic development.
- Increase the number of reviewers and organize a sub-group of reviewers with a focus on solar to help expedite the permitting process.
- Allow for the reclamation and bond release timeline to be phased and expedited.
- Leverage federal funding to develop a thriving solar industry.

Government & Regulators

Interest
Impact
Expectations
Influence
Engagement



- **Implement policy change**
- **Provide education and engagement**
- **Provide incentives**
- **Key stakeholder**

Beneficiaries

Listening:

Beneficiaries include corporate off-takers, community solar subscribers, Justice40 communities.

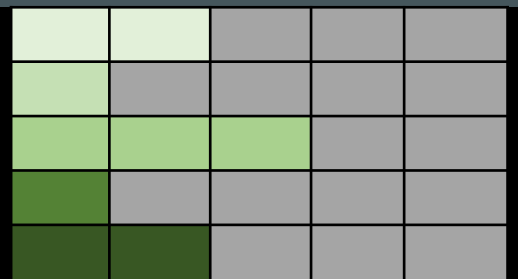
- Interest in reducing carbon emissions
- Promote green policies
- Diversify energy source

Actions:

- Corporations can make commitments to sustainability and renewable energy.
- Advocate for policies regarding solar development on previously mined lands to benefit corporate off-takers.
- Advocate for community solar.
- Subscribe to solar opportunities.
- Recommend solar facilities utilize previously mined lands when soliciting development requests.

Beneficiaries

Interest
Impact
Expectations
Influence
Engagement



- **Advocate for community solar**
- **Benefit from power generation**
- **Educate and inform**
- **Share information**

THANK YOU

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LaBella Associates | Project Manager
607-367-5013 **office**
jvaughn@labellapc.com


Questions?

Characteristics of Previously Impacted Mine Lands in Pennsylvania for Potential Solar Development

Steven Cornia

EPCAMR GIS and Watershed Specialist

Purpose of Study

- To determine how many acres of Pennsylvania's mine lands are suitable for potential future development of grid-scale and community scale solar projects.

Factors considered

- Have the Title IV lands been completely reclaimed?
- AML features
    - Filter out all flooded strip mines, subsidence prone areas, burning refuse piles, and Underground Mines (For active mine lands)
- Land cover factors
    - Filter out Developed areas
    - Filter out Open Water, wetlands
- Distance to nearest substation
    - For this study we used a 2.5-mile buffer to the nearest substation to determine if land is suitable for grid-scale solar development

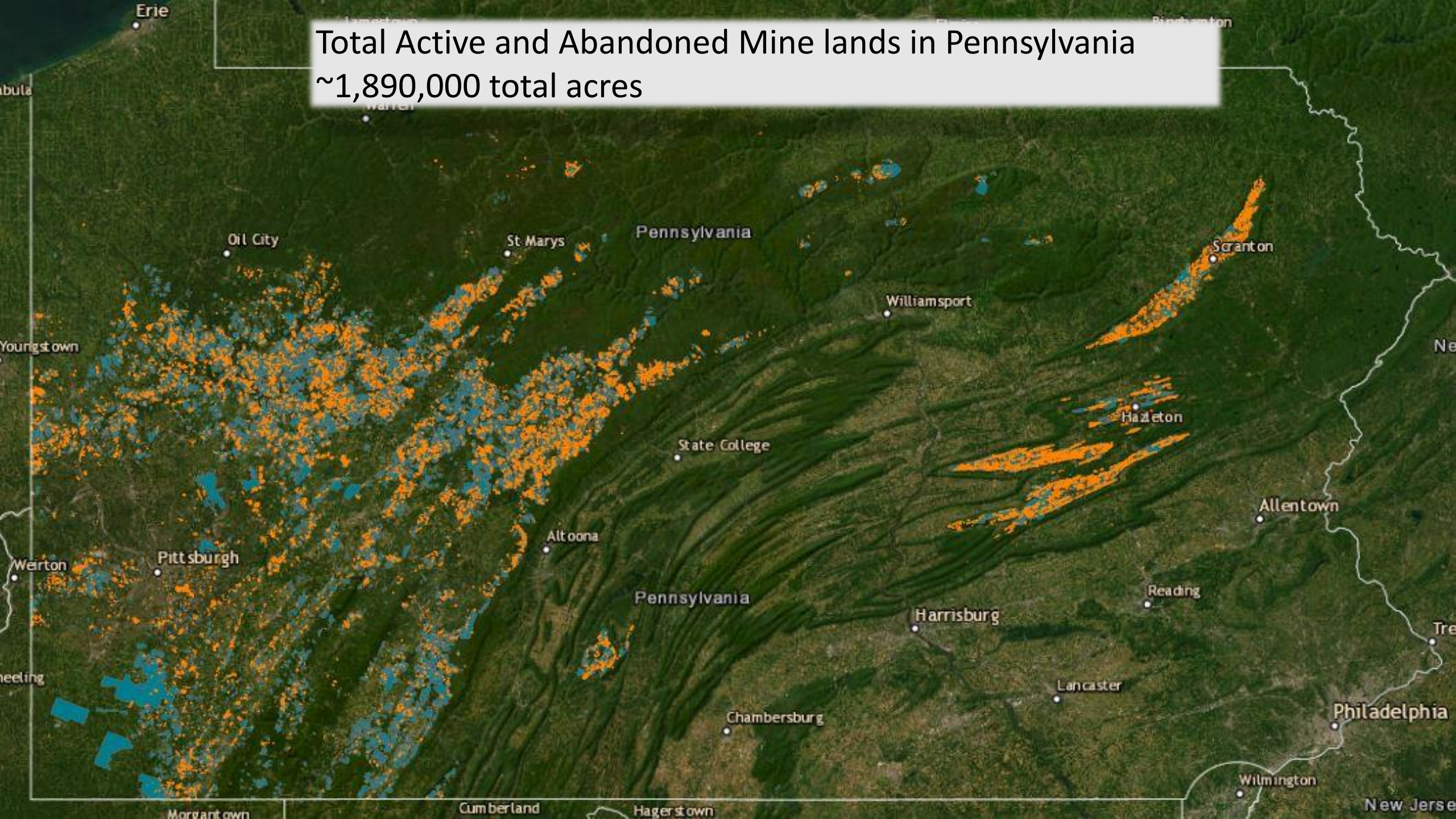
Factors Not considered

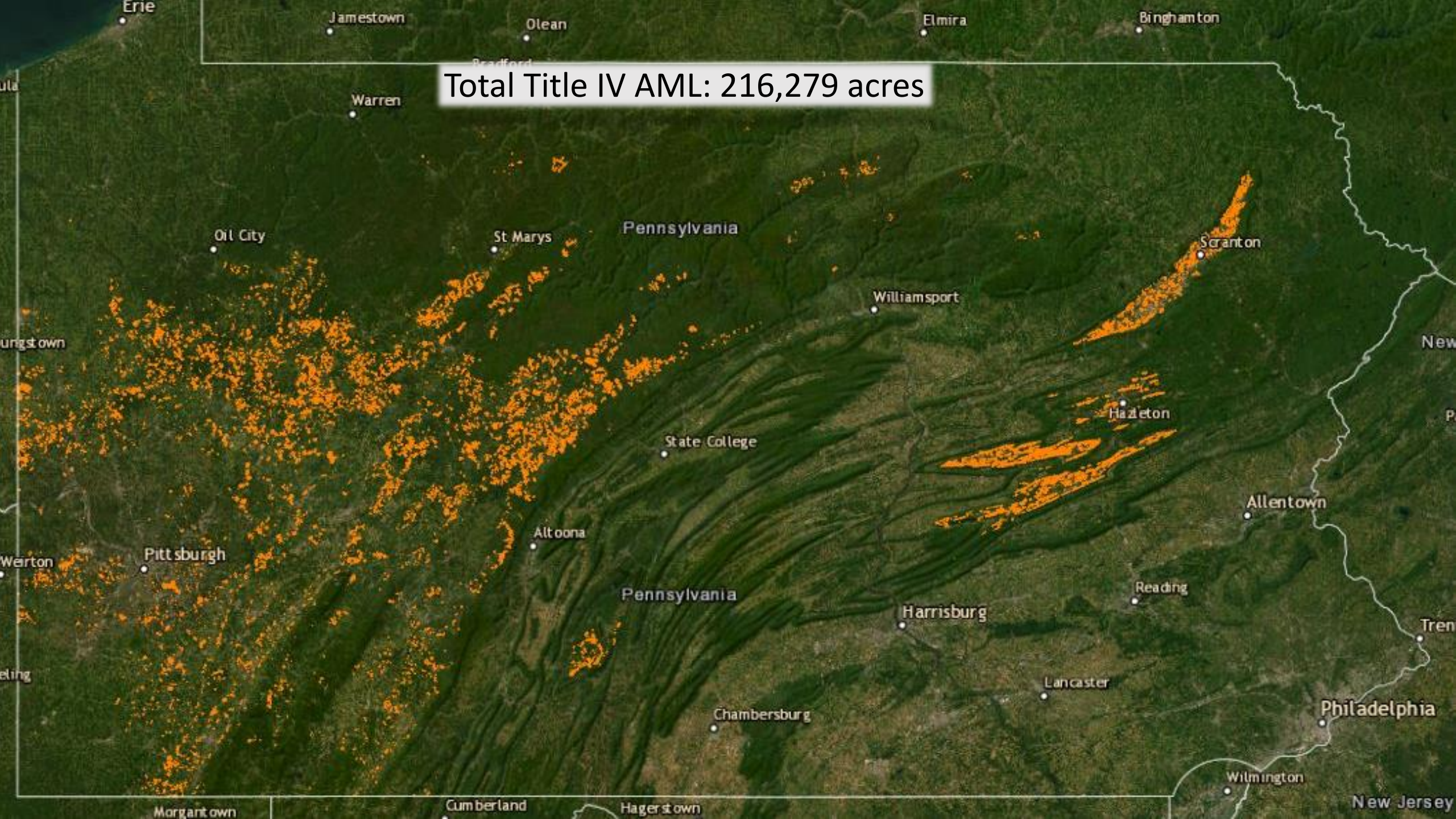
- Slope
- Aspect
- Access to electrical infrastructure (non-transmission)
- Road Access
- Parcel size and contiguous parcels

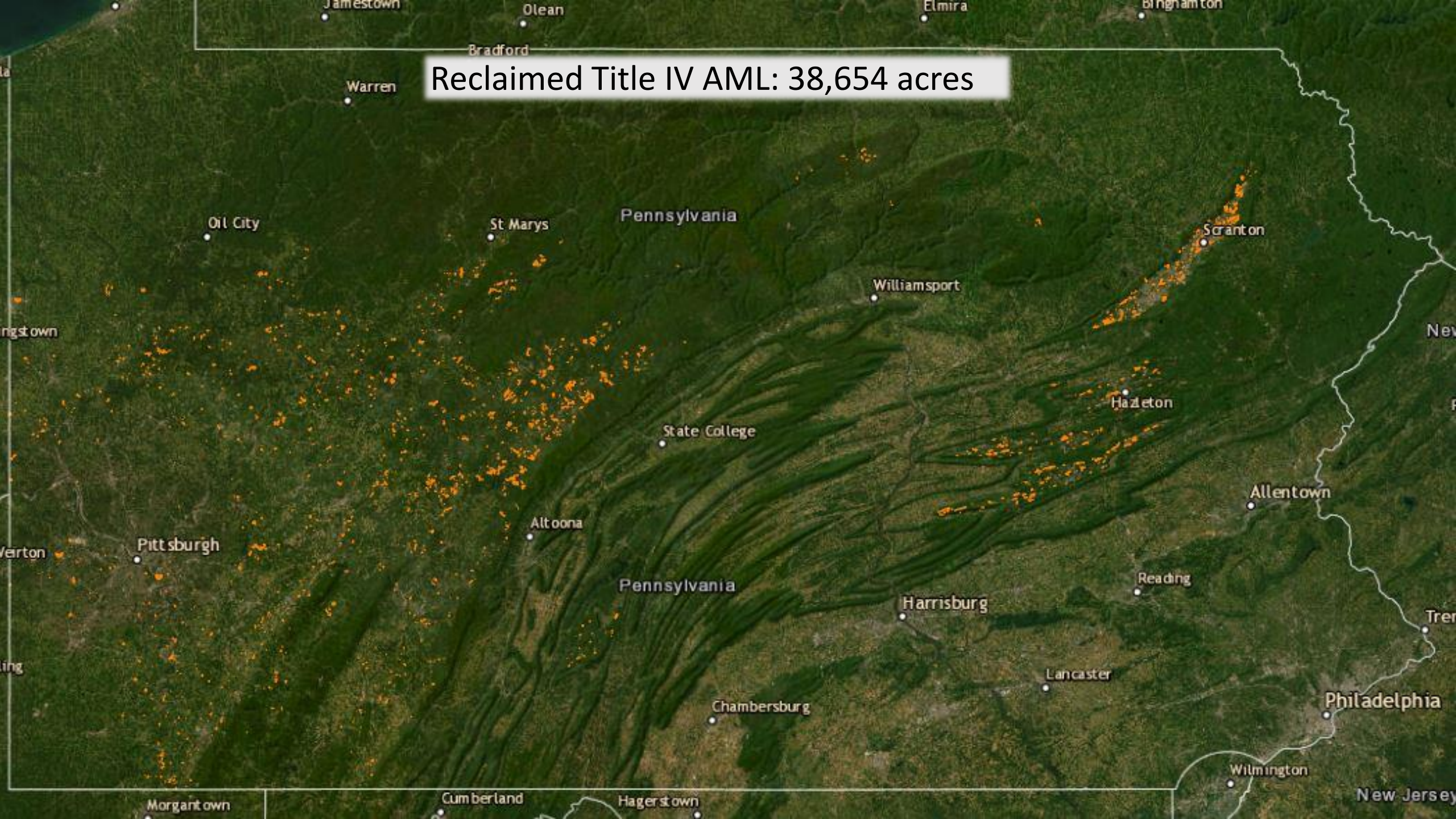
(These factors are all incorporated into EPCAMR's Solar site suitability model)

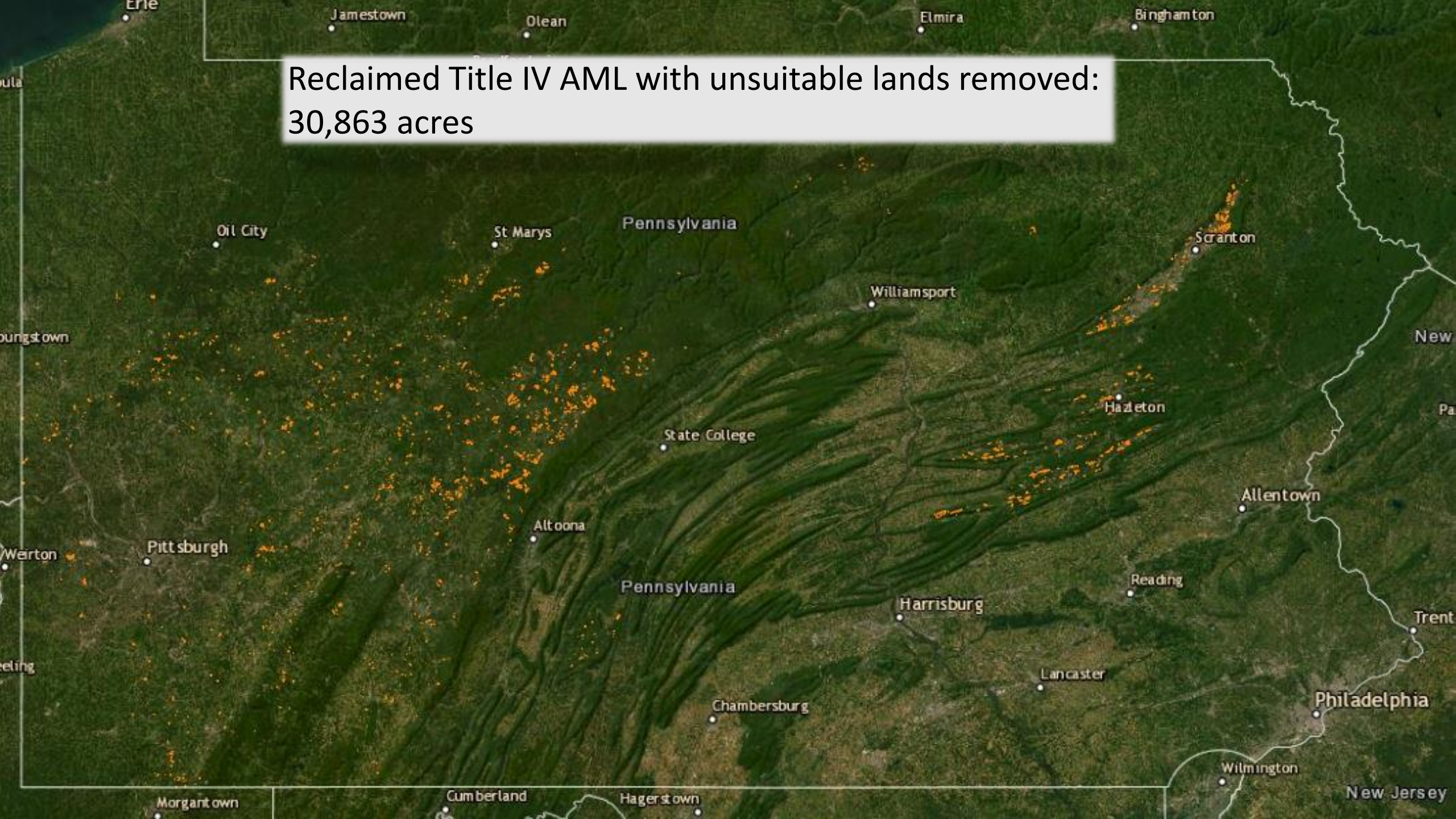
Data used for assessment

Layer	Data Type	Source
2022 Title IV AML	Polygon Shapefile	DEP
2022 Title V Active Mine Permits	Polygon Shapefile	DEP
2019 NLCD Layer	Raster	USGS
2023 Substations	Point Shapefile	HIFLD


Total Active and Abandoned Mine lands in Pennsylvania
~1,890,000 total acres
Erie
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
Youngstown
Hazleton
State College
Allentown
Altoona
Pittsburgh
Weirton
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey


Total Title IV AML: 216,279 acres
Erie
Jamestown
Olean
Elmira
Binghamton
Warren
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Cumberland
Hagerstown
New Jersey


Reclaimed Title IV AML: 38,654 acres
Jamestown
Olean
Elmira
Binghamton
Bradford
Warren
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey


Reclaimed Title IV AML with unsuitable lands removed:
30,863 acres
Erie
Jamestown
Olean
Elmira
Binghamton
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey

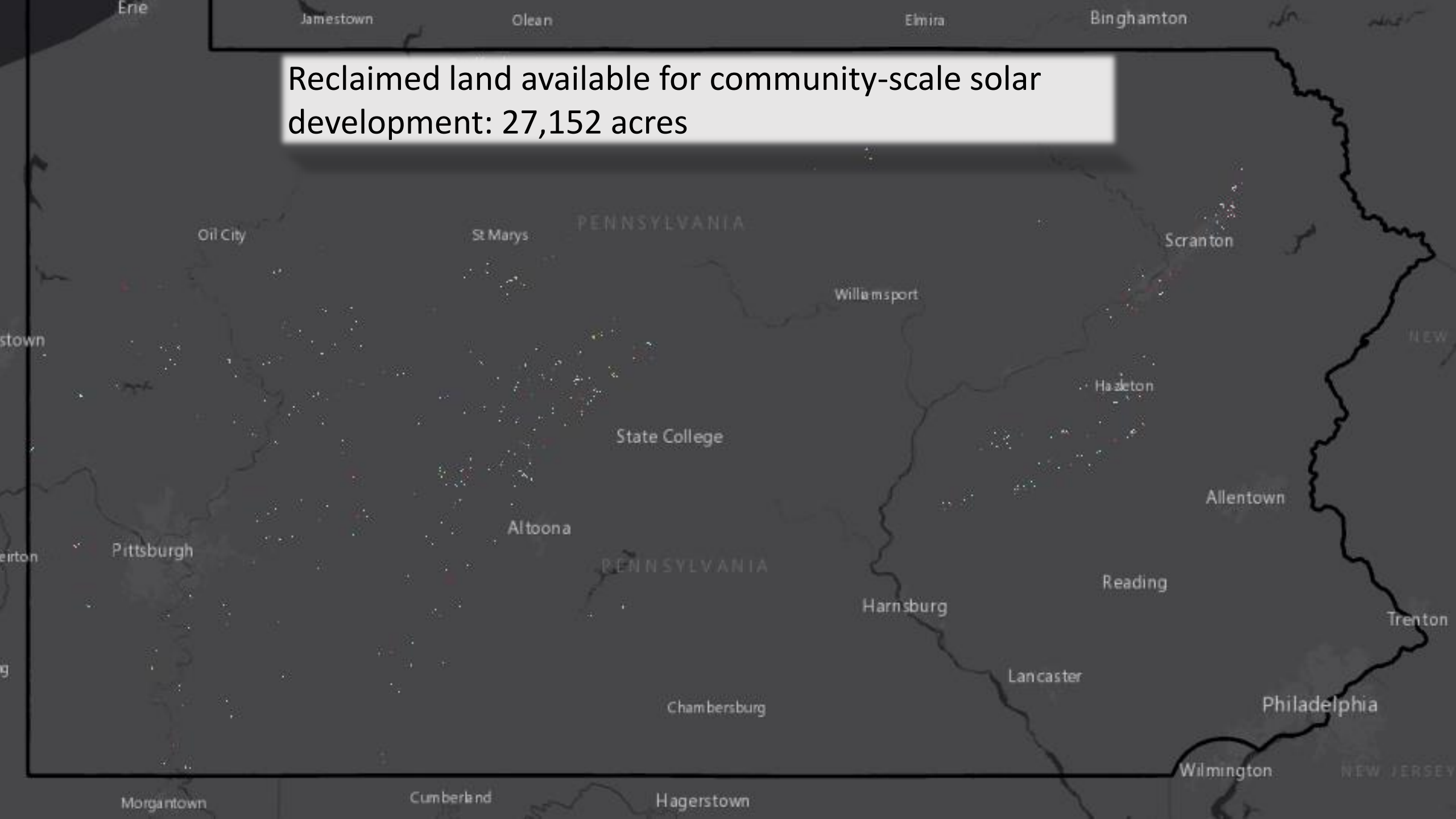

Reclaimed Title IV AML with unsuitable lands removed: overlayed on NLCD
Bradford
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey

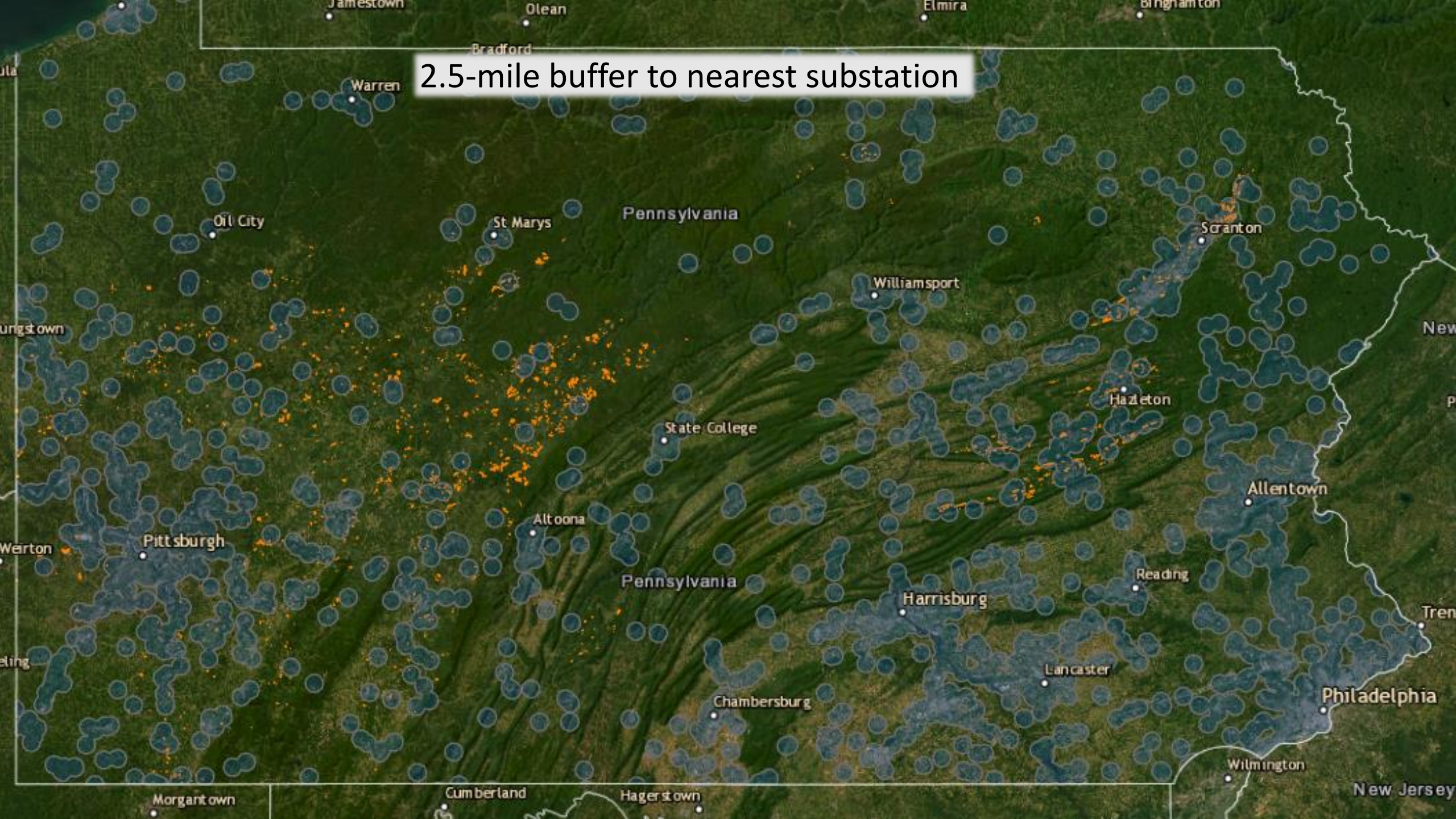

Filter out developed areas, open water, and wetlands:
27,152 acres remaining
Jenkins Twp
Mill Creek
Lampblack Creek

Reclaimed AML Land Cover Breakdown

Land Cover	Acres(%)
Forested	14,518 (54%)
Barren, Shrub/Scrub, Herbaceous	7,090 (26%)
Hay/Pasture, Cropland	5,544 (20%)
Total	27,152

27,152 acres potentially suitable for community-scale solar development


Reclaimed land available for community-scale solar development: 27,152 acres
Erie
Jamestown
Olean
Elmira
Binghamton
PENNSYLVANIA
Oil City
St Marys
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
PENNSYLVANIA
Reading
Harrisburg
Trenton
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown


2.5-mile buffer to nearest substation
Jamestown
Olean
Elmira
Binghamton
Bradford
Warren
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey


Reclaimed Land Available for grid-scale solar development: 7,859 acres
Erie
Jamestown
Binghamton
Warren
PENNSYLVANIA
Oil City
St Marys
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
PENNSYLVANIA
Reading
Harrisburg
Trenton
Lancaster
Chambersburg
Philadelphia
Wilmington

Reclaimed AML Land Cover Breakdown

Land Cover	Acres(%)
Forested	4,254 (54%)
Barren, Shrub/Scrub, Herbaceous	2,219 (28%)
Hay/Pasture/Cropland	1,386 (18%)
Total	7,859

7,859 acres potentially suitable for grid-scale solar development

Total Title IV AML = 216,279 acres

All Reclaimed = **38,654 acres**

All Unreclaimed = 177,624 acres

Filter out 7,791 acres of unsuitable lands = **30,863 acres**

Filter out 3,711 acres of open water, wetlands and developed areas = **27,152 acres**

Located within 2.5 miles of substation

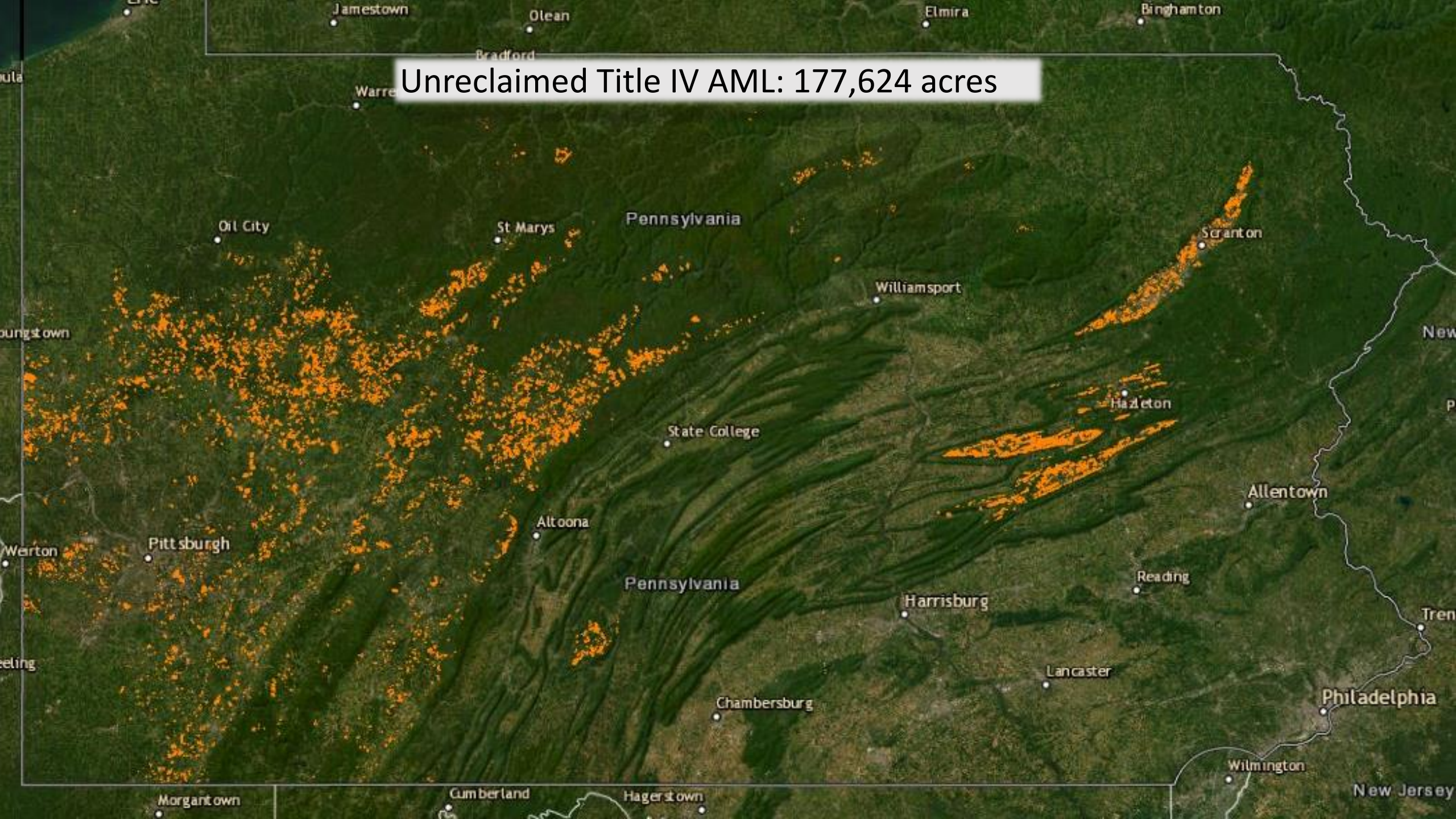
27,152 acres for potential community scale solar development

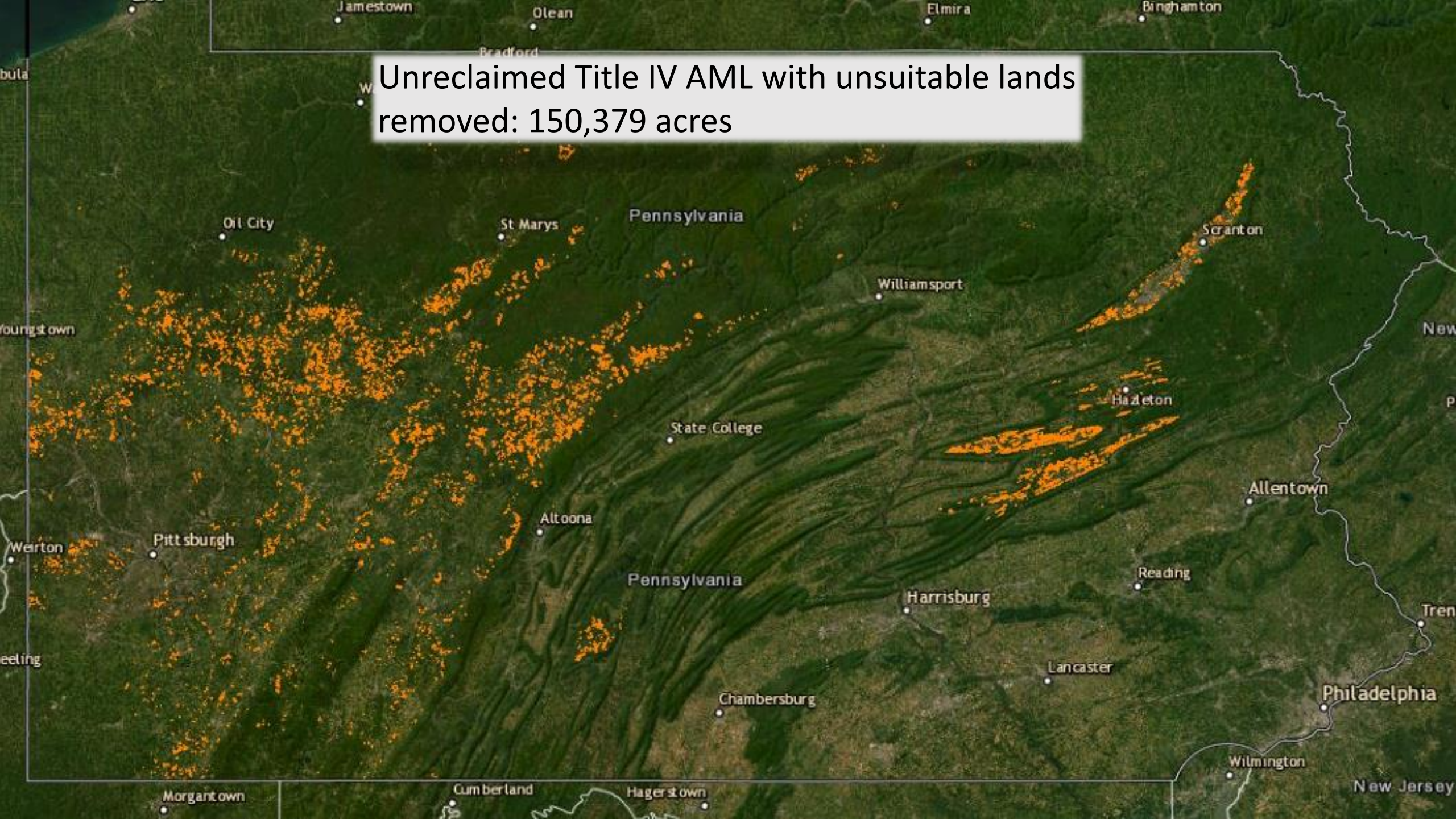
Forested = **14,518 acres** → **4,254 acres**

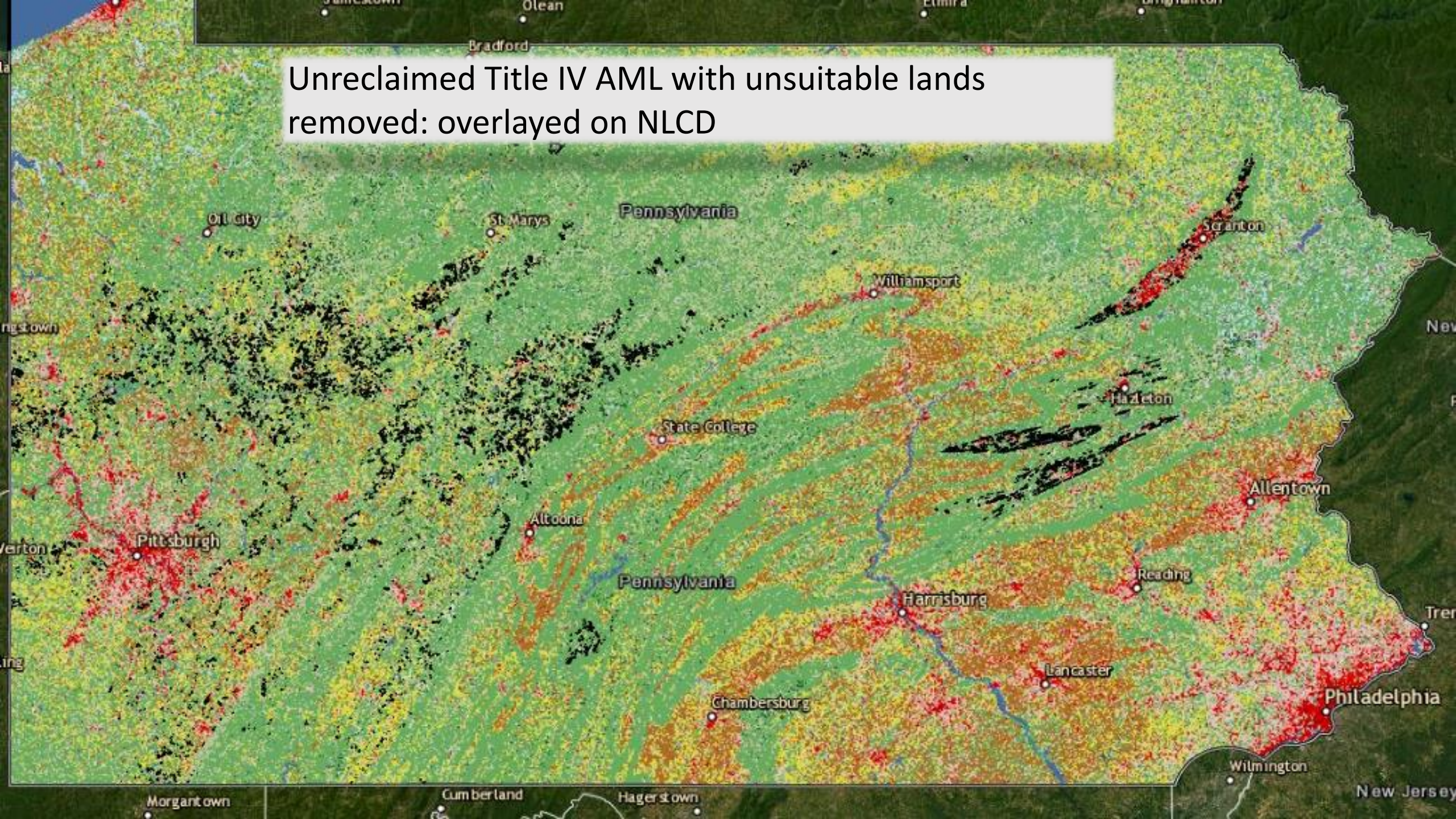
Barren/Scrub/Herbaceous = **7,090 acres** → **2,219 acres**

Pasture and crop = **5,544 acres** → **1,386 acres**

Total = **7,859 acres** available for grid-scale


Unreclaimed Title IV AML: 177,624 acres
Jamestown
Olean
Elmira
Binghamton
Bradford
Warren
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
Youngstown
Hazleton
State College
Allentown
Altoona
Pittsburgh
Weirton
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey

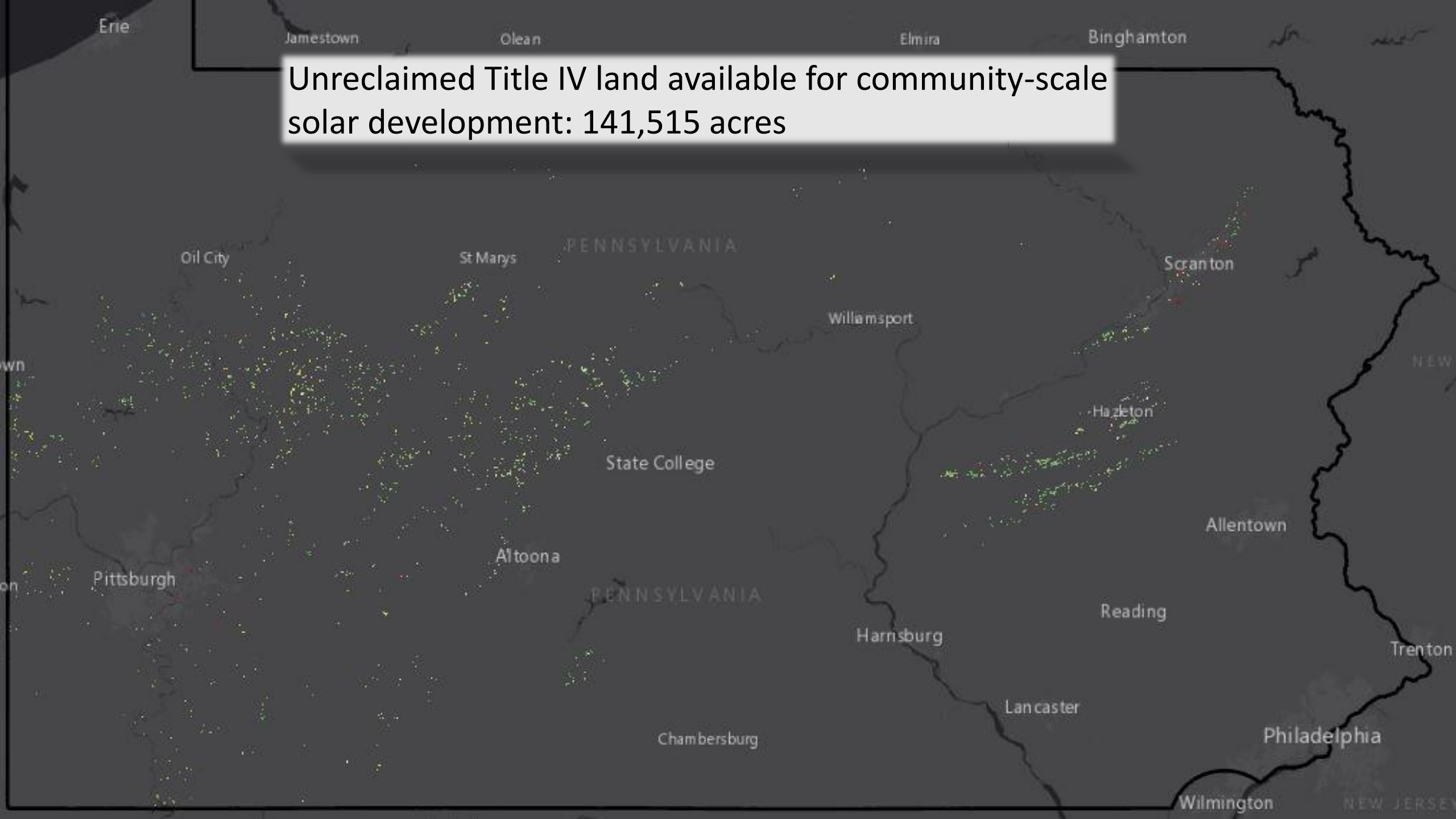

Unreclaimed Title IV AML with unsuitable lands removed: 150,379 acres
Jamestown
Olean
Elmira
Binghamton
Bradford
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey


Unreclaimed Title IV AML with unsuitable lands removed: overlayed on NLCD
Bradford
Olean
Elmira
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey

Unreclaimed AML Land Cover Breakdown

Land Cover	Acres(%)
Forested	109,739 (78%)
Barren, Shrub/Scrub, Herbaceous	18,670 (13%)
Hay/Pasture, Cropland	13,106 (9%)
Total	141,515

These 141,515 acres are potentially suitable for community-scale solar development


Unreclaimed Title IV land available for community-scale solar development: 141,515 acres
Erie
Jamestown
Olean
Elmira
Binghamton
PENNSYLVANIA
Oil City
St Marys
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
PENNSYLVANIA
Reading
Harrisburg
Trenton
Lancaster
Chambersburg
Philadelphia
Wilmington


Unreclaimed Title IV land available for Grid-scale solar development: 36,782 acres
Erie
Jamestown
Olean
Elmira
Binghamton
PENNSYLVANIA
Oil City
St Marys
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
PENNSYLVANIA
Reading
Harrisburg
Trenton
Lancaster
Chambersburg
Philadelphia
Wilmington

Unreclaimed AML Land Cover Breakdown

Land Cover	Acres(%)
Forested	26,787 (74%)
Barren, Shrub/Scrub, Herbaceous	6,551 (18%)
Hay/Pasture, Cropland	2,750 (8%)
Total	36,088

36,088 acres potentially suitable for community-scale solar development

Total Title IV AML = 216,279 acres

All Unreclaimed = **177,624 acres**

All Reclaimed = **38,654 acres**

Remove 27,139 acres of unsuitable lands = **150,485 acres**

Remove 8,970 acres of open water, wetlands and developed areas = **141,515 acres**

141,515 acres for potential community-scale solar development

Forested = **109,739 acres**

Barren/Scrub/Herbaceous = **18,670 acres**

Pasture and crop = **13,106 acres**

Located within 2.5 miles of substation

26,787 acres

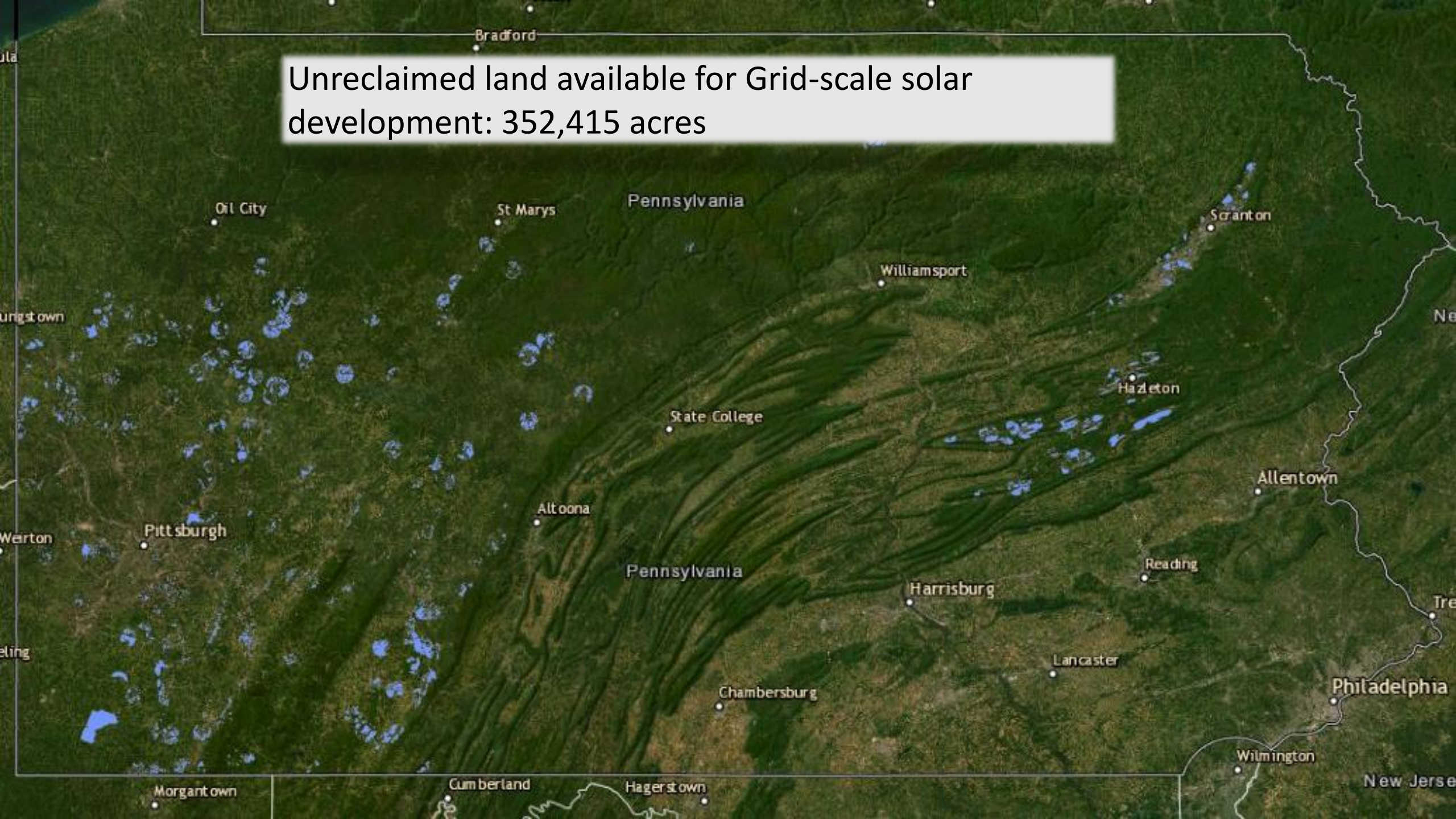
6,551 acres

2,750 acres

Total = **36,088 acres** for potential grid-scale solar development


Total Title V Active Mine Lands: 1,675,398 acres
Jamestown
Olean
Elmira
Binghamton
Bradford
Warr
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
ungstown
Hazleton
State College
Allentown
Altoona
Pittsburgh
Weirton
Pennsylvania
Reading
Harrisburg
eling
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown
New Jersey

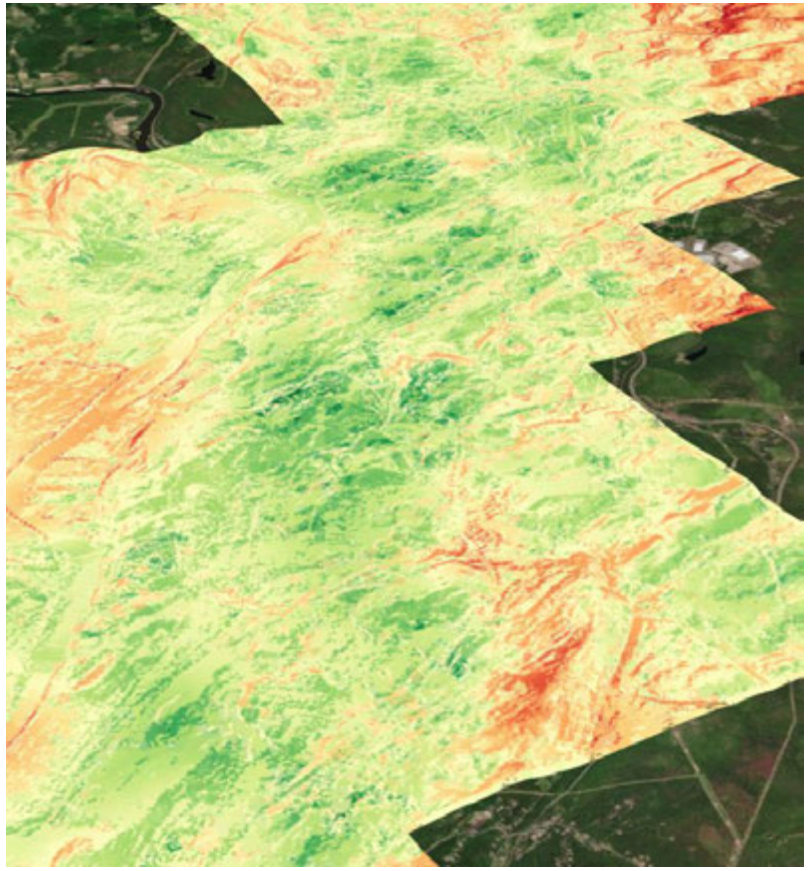

Title V Active Mine Lands with underground permitted areas removed: 1,617,990 acres
Jamestown
Olean
Elmira
Binghamton
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
State College
Hazleton
Allentown
Altoona
Pittsburgh
Weirton
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
New Jersey
Morgantown
Cumberland
Hagerstown

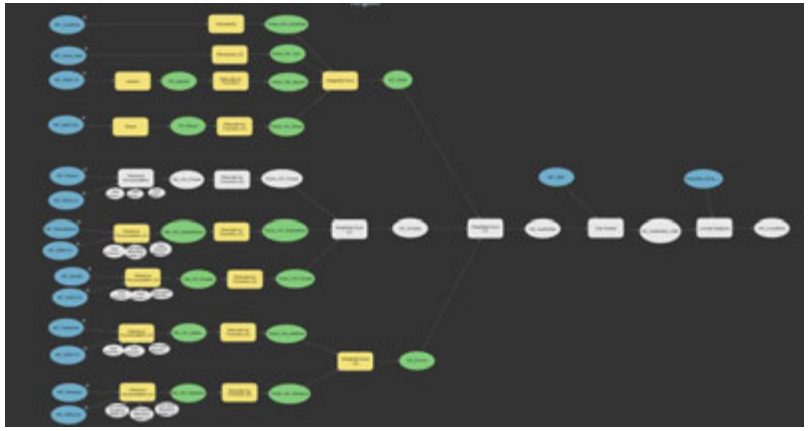

Unreclaimed land available for Grid-scale solar development: 352,415 acres
Bradford
Oil City
St Marys
Pennsylvania
Scranton
Williamsport
Hazleton
State College
Allentown
Altoona
Pittsburgh
Pennsylvania
Reading
Harrisburg
Lancaster
Chambersburg
Philadelphia
Wilmington
Morgantown
Cumberland
Hagerstown

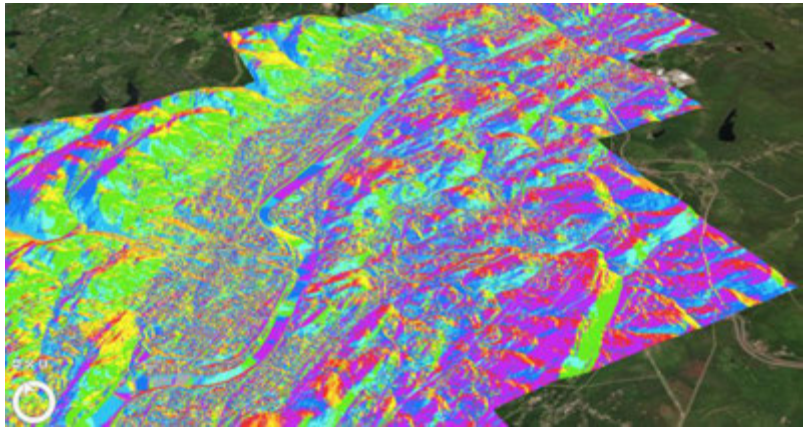
Total Title V Active Mine Lands = **1,675,398 acres**

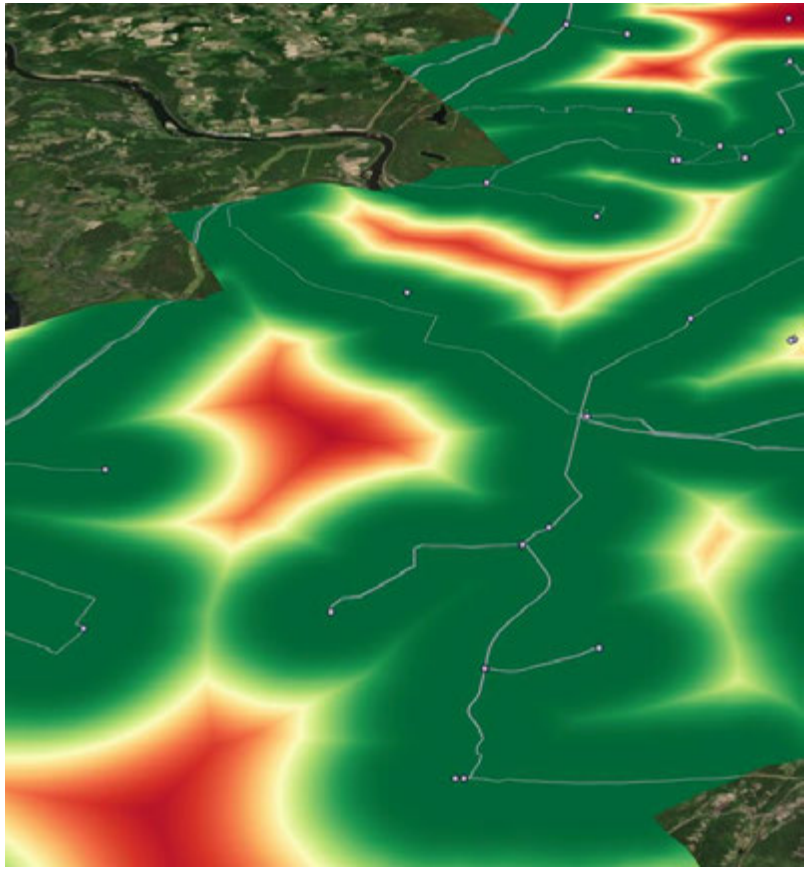
Underground Mining areas filtered out = **1,617,990 acres** for potential community-scale solar

Within 2.5-miles of nearest substation = **352,415 acres** for potential grid-scale solar









EPCAMR's Solar Suitability Model




pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Energy Programs Office

Assessment of Opportunities for Grid-Scale Solar Development on Previously Impacted Mine Lands in Pennsylvania

Draft Recommendations

Assessment Recommendations

- Require new bills and laws at legislative level

Policy & Incentives

Education & Outreach

- Provide information to external stakeholders

- Development of targeted initiatives with defined outcomes

Program Development

Investment of BIL / IRA Funds

- Priorities for investment of limited federal resources

Process Improvements

- Optimize exiting activities and overcome barriers

Status of Recommendations

Final recommendations to include additional analysis to determine:

- **Responsibility and Authority:** Who is responsible for recommendation implementation and would it require legislative or policy changes or could be accomplished within existing administrative frameworks.
- **Costs:** Breakout by recommendations that require no cost to implement (only require increased awareness and coordination), minimal cost (adjustments to internal processes and program design), or high costs (site modifications, infrastructure buildouts, etc.).
  - Will include analysis of funding availability and sources for recommendations with costs.
- **Timeframe:** Short-term (<2 years), medium-term, (2-5 years), or long-term (>5 years)
- **Priorities:** Prioritization based on what recommendations can make the greatest impact with the least amount of resource commitment

Community Solar

Policy & Incentives

Feedback: *"Community Solar enabling legislation is needed to unlock previously mined sites for solar development"*

Recommendation: Use assessment to highlight additional benefits of Community Solar legislation

- Most common recommendation heard during focus groups and interviews
- Provides pathway for smaller projects (3 to 5 MW) to be economically viable
- Greater availability of sites (smaller parcels, non-contiguous)
- Smaller sites easier to define reclamation activities and apply for funding
- Less reliance on transmission infrastructure and potentially more streamlined interconnection process
- Impact of Community Solar for mine reclamation activities provides additional benefit for legislation not commonly communicated

State Tax Abatements / Rebates

Policy & Incentives

Feedback: *"Incentives are needed to develop solar on previously impacted mine lands"*

Recommendation: Launch state tax abatement / rebate program for qualifying projects on previously impacted sites

- State tax abatements / rebates most viable pathway for incentives
- Focus on state taxes rather than local as incremental property tax revenues (property tax) are limited and projects require local approval and should provide benefit to host community
- Could be part of larger program where projects on impacted sites (mine lands, as well as other brownfields, rooftops, parking areas, etc.) meet specific requirements to be eligible – opportunity would not be available for agricultural or forested sites
- Suggestion for weighted AEPS/RECs for electricity generated on previously impacted sites was found to have limited benefit

AML Parcel Information and Mapping Tools

Program Development

Feedback: *"Lack of knowledge of ownership of previously mined sites is a barrier for project development"*

Recommendation: Develop program that identifies ownership of sites with favorable solar development characteristics and provide mechanism to connect landowners to solar developers

- For sites with favorable development characteristics, fund initiative to gather tax record data to identify parcel ownership
- Include outreach activities to site owners and education about opportunities
- Build upon EPCAMR Solar Site Selection Criteria GIS Suitability Modeling Tool
- Include improved access to transmission and distribution infrastructure data as part of site identification process.
- Partnerships with counties for ownership and GIS data

Build-Ready Site Program

Program Development

Feedback: *"Pre-identify previously mined sites, perform reclamation activities, and make sites available for solar development"*

Recommendation: Launch program modeled after NYSERDA "Build Ready" Site Program

- For sites with favorable development characteristics, coordinate with owners (public or private), gain site control, and perform reclamation activities (using public funds)
- Design to be "solar-ready" and auction site to private renewable energy developers through open and competitive process
- Ensure local permitting requirements will not be a roadblock
- Would require significant upfront funding for land acquisition and administration

Private Sector PPA Guidance

Education & Outreach

Feedback: *"Projects that are developed on previously impacted sites have additional costs that are passed on to customer"*

Recommendation: Educate organizations making bulk solar purchases to include requirement for project to be sited on previously impacted mine lands during solicitation process for Power Purchase Agreements (PPA)

- Alignment with Environmental, Social, and Governance (ESG) goals – avoid conversion of agricultural or forested lands
- Analyzed in context of long-term kWh pricing
- Additional cost borne by defined end-user of energy

Municipal Information, Tools, and Resources

Education & Outreach

Feedback: *"Municipalities often push back on these types projects due to the lack of knowledge and understanding of solar development impacts"*

Recommendation: Incorporate content specific to solar development on previously mined sites into ongoing municipal outreach activities

- Continue to educate counties and municipalities on the solar development process and develop resources specific to previously mined sites.
- Encourage adoption of ordinance language that would allow solar on previously mined lands with well defined conditional use requirements that are different from other zoned areas.
- Ensure solar will be allowable use before reclamation activities begin

Investment of BIL / IRA Funds

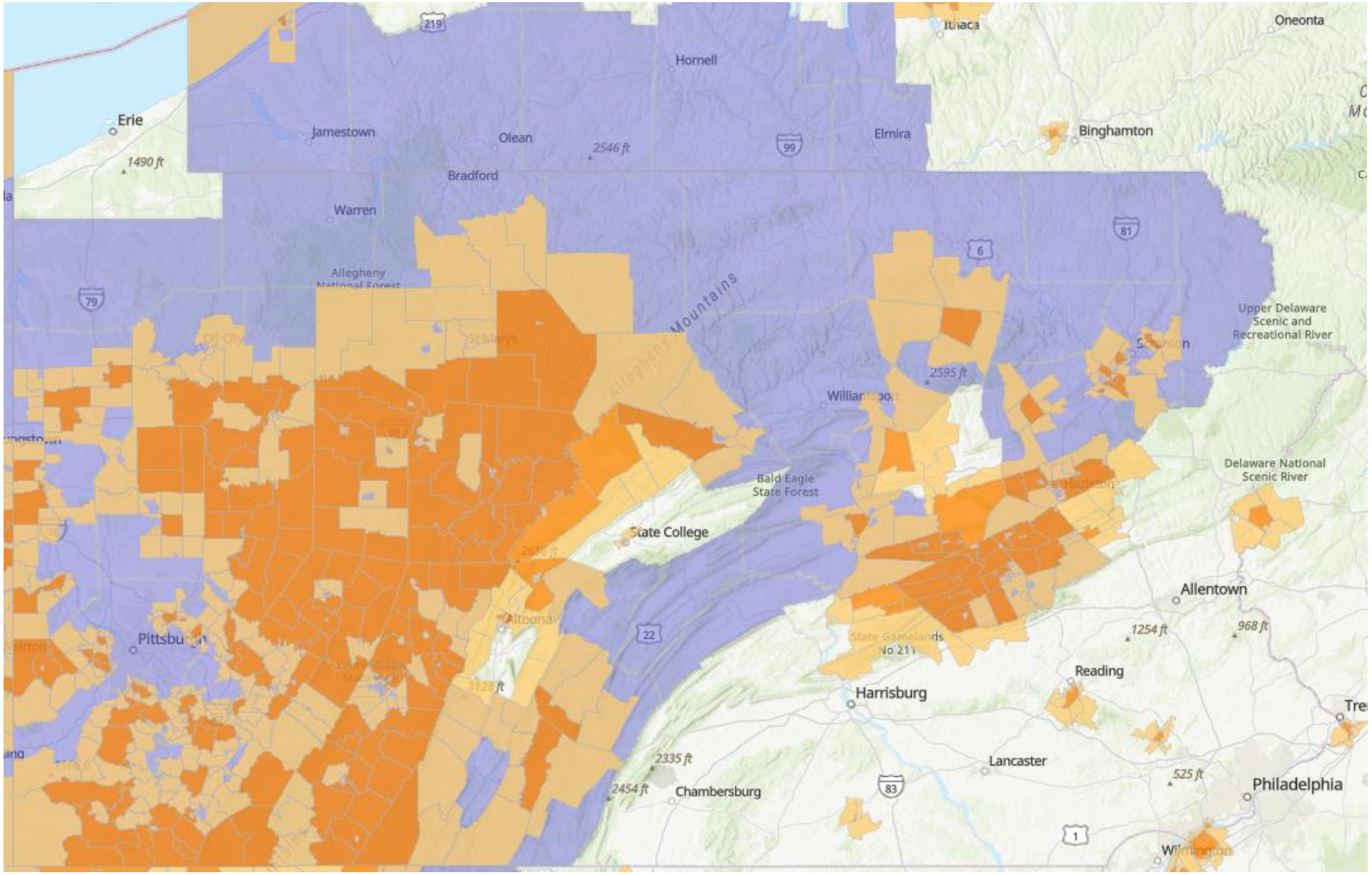
Investment of BIL/IRA Funds

Feedback: *"BIL / IRA Legislation provides a once in a lifetime opportunity to further both reclamation goals as well as renewable energy development"*

Recommendation: Incorporate assessment findings into planning activities around use of BIL / IRA funding

- Consider previously impacted mine sites with favorable solar characteristics for investments in transmission and distribution infrastructure upgrades
  - Contingent on parcel information and "Build Ready" program recommendations
- Prioritize BIL AML funding for reclamation projects that have solar component
  - Alignment with following Process Recommendations
- Promote availability Energy Communities Tax Credit Bonus

Energy Community Tax Credit Bonus



MSA/Non-MSAs that are Energy Communities

Status

MSAs/non-MSAs that meet both the Fossil Fuel Employment (FEE) threshold and the unemployment rate requirement

Coal Closure Energy Communities

Tract Status

Census tract directly adjoining a census tract with a coal closure

Census tract with a coal closure

One-Stop-Shop for Permitting Process

Process Improvements

Feedback: *"There is a need to streamline the permitting process and provide a single point of contact to address multiple regulatory requirements"*

Recommendation: Centralize Solar Application and Review in Single Office

- To make the review process more streamlined there should be internal regulatory changes, such as a division dedicated to solar development that reviews E&S and stormwater related to it, similar to how ESCGPs are set up for oil and gas activities.
- A sub-group within PADEP Bureau of Mining that works specifically on solar development for previously mined lands would also be effective, especially to help with reclamation and land use challenges.

Expedite Review Periods

Process Improvements

Feedback: *"Based on all of the other uncertainties around solar development (interconnection, project financing), more certainty is needed around review and approval process"*

Recommendation: Expedite the permitting review process for solar development on previously mined lands.

- Consider modification to NPDES to allow for a simplified application for solar development on previously mined lands.
- Allow the permitting review to be moved "up the stack" when solar development is proposed on previously mined lands.

Mitigate Legal Liability for Violations of Environmental Law

Process Improvements

Feedback: *"Legal liability related to previous mining activities and compliance with federal and state Clean Water Act is a barrier to investment."*

Recommendation: Remove liability for solar development on previously mined lands.

- Create a program similar to NYS Build-Ready, where the state prepares sites prior to solar development in order to "de-risk" them.
- Insurance from a federal or state authority could support a project owner in the event that a site requires cleanup from its previous mining activities.

Update Existing Permitting and Review

Process Improvements

Feedback: *"Due to the unique nature of solar development activities, modifications to existing policies and procedures could allow for more development to occur"*

Recommendation: Review and modify existing policies and procedures

- Update DEP FAQ sheet to allow for solar development/grading practices for slopes greater than 15%
- Update Module 20 for Bituminous and Anthracite Mining Permits to include solar development as a Postmining Land Use.
- Allow the review time and bond release to be expedited for solar development projects (i.e., 2 years instead of 5 years).



Panel Discussion and Q&A