

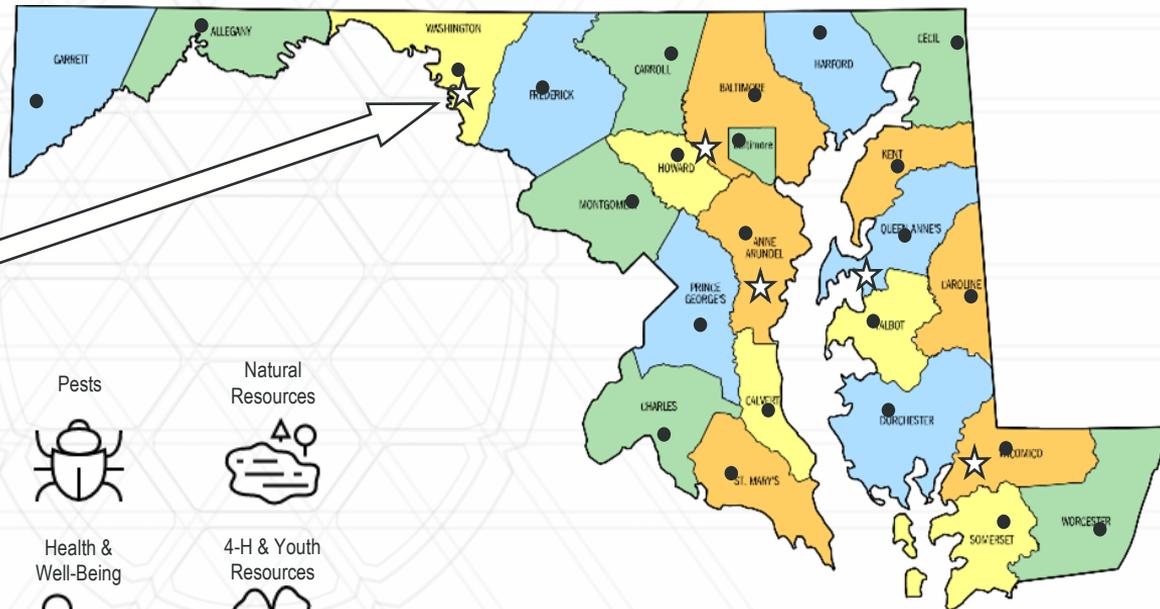
Considering solar installation? community and utility-scale



Drew Schiavone, PhD
University of Maryland Extension

January 23, 2023

University of Maryland Extension



Animal
Agriculture



Plant
Agriculture



Yard &
Garden



Pests



Natural
Resources



Environment
& Energy



Agribusiness
Management



Food &
Nutrition



Health &
Well-Being



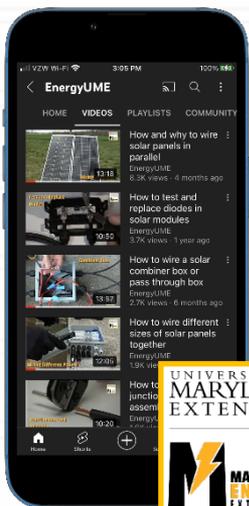
4-H & Youth
Resources



extension.umd.edu

University of Maryland Extension

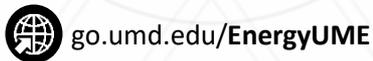
VIDEO



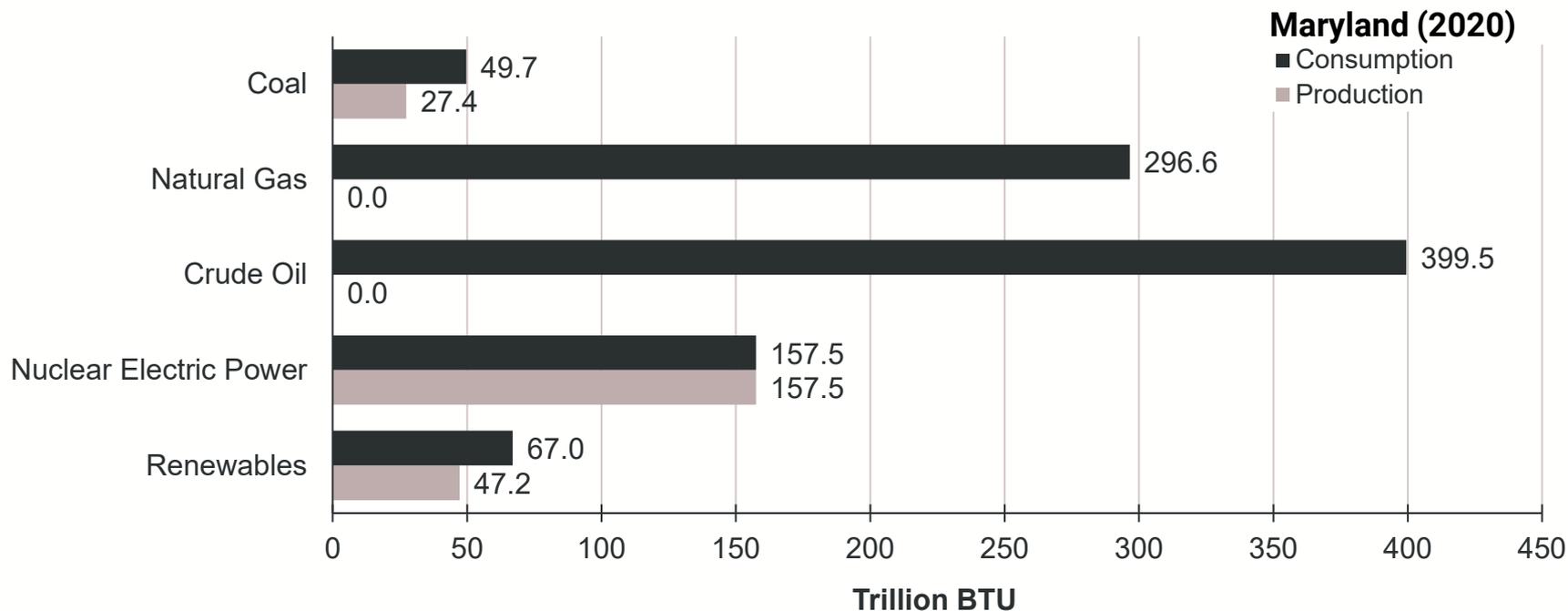
PUBLICATIONS



NEWSLETTER

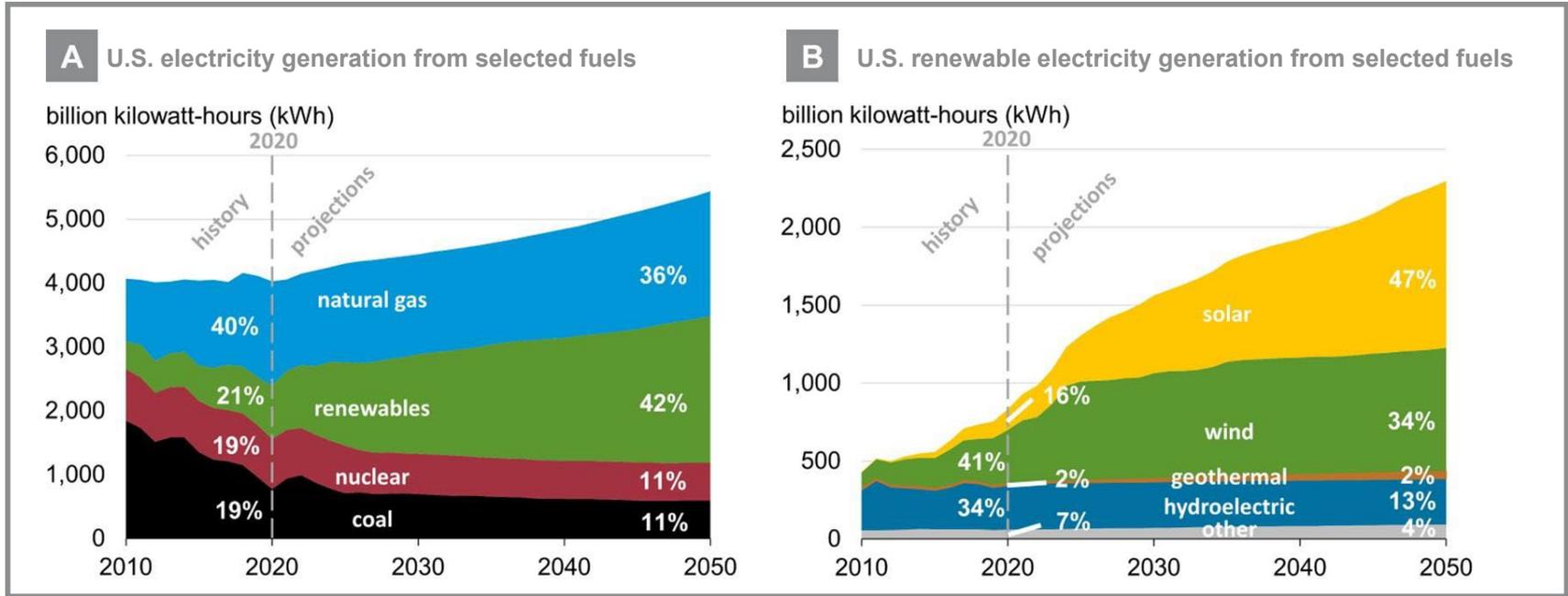


What role does solar play?



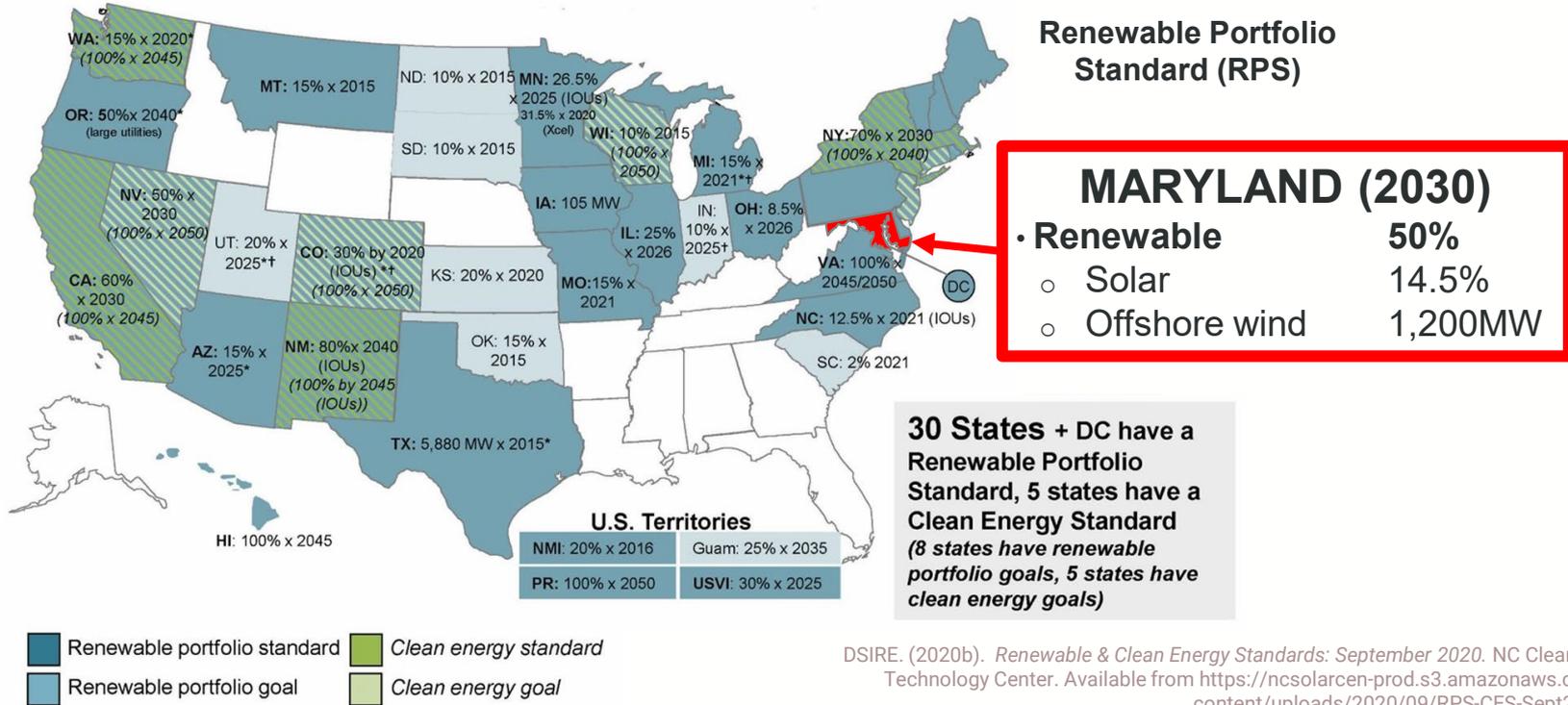
EIA. (2021). *State Energy Data System (SEDS): 1960-2020 (complete): Table PT2 - Primary Energy Production Estimates in Trillion Btu, Maryland, 1960-2020*. U.S. Energy Information Administration. Washington, DC. (June 25, 2021). Retrieved from <https://www.eia.gov/state/seds/seds-data-complete.php?sid=MD>

What role does solar play?



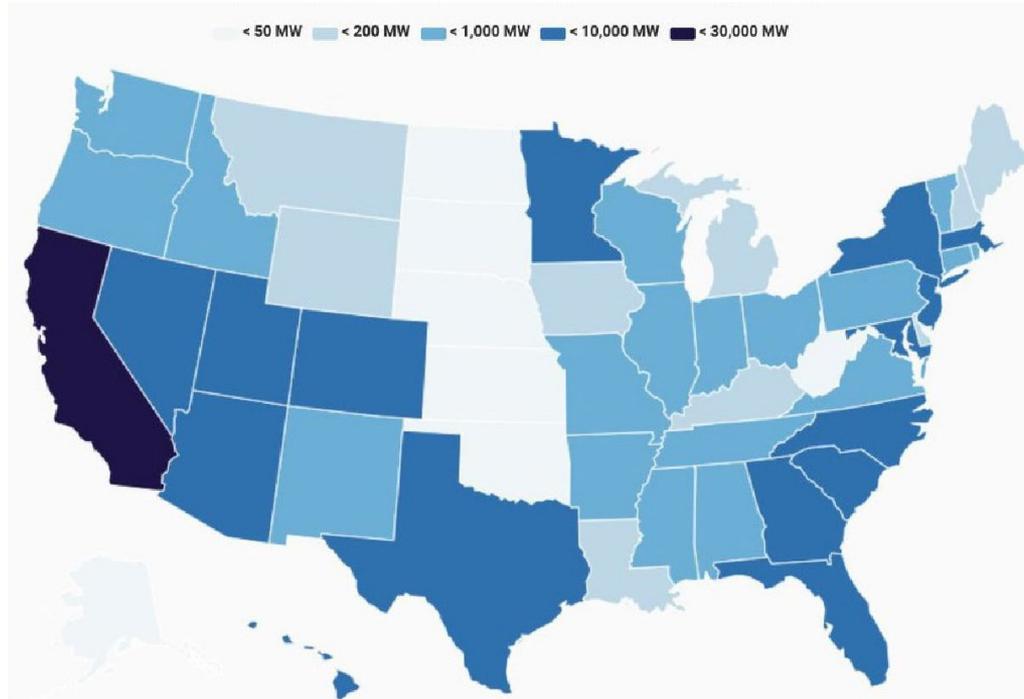
EIA, (2021a). *Annual Energy Outlook 2021: With Projections to 2050*. U. S. Energy Information Administration. Washington, DC. (February 3, 2021). Retrieved from <https://www.eia.gov/outlooks/aeo/>

What role does solar play?



DSIRE. (2020b). *Renewable & Clean Energy Standards: September 2020*. NC Clean Energy Technology Center. Available from <https://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2020/09/RPS-CES-Sept2020.pdf>

What role does solar play?



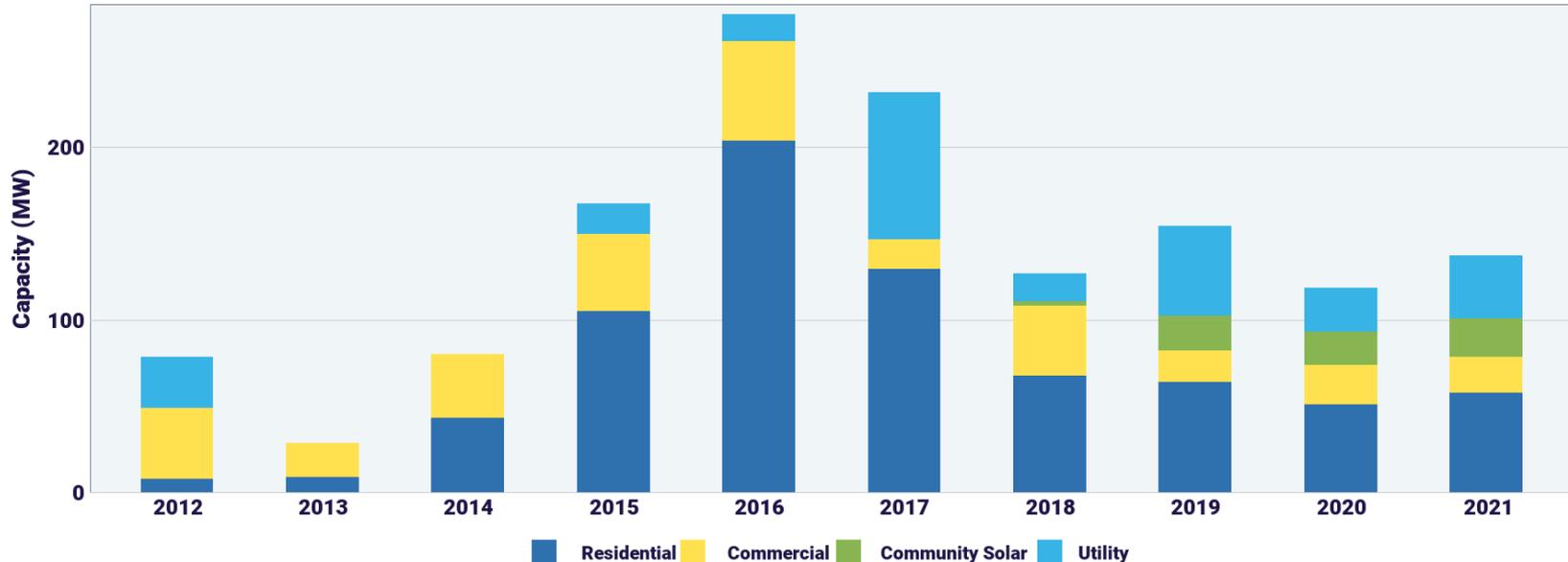
Cumulative solar installations for top 20 states in terms of installed capacity

Rank	State	MW Installed	# Installations
1	CA	35,950	1,500,495
2	TX	13,947	161,046
3	FL	9,012	130,260
4	NC	7,935	30,821
5	AZ	5,743	219,336
6	NV	4,967	82,995
7	GA	4,299	6,396
13	CO	2,236	97,670
14	SC	1,936	26,956
15	MN	1,700	11,803
16	HI	1,477	97,683
17	IL	1,465	41,846
18	MD	1,459	81,006
19	IN	1,366	6,505
20	OR	1,293	30,473

SEIA. (2021b). Solar State by State. Solar Energy Industry Association. Washington, DC.
Available from <https://www.seia.org/states-map>

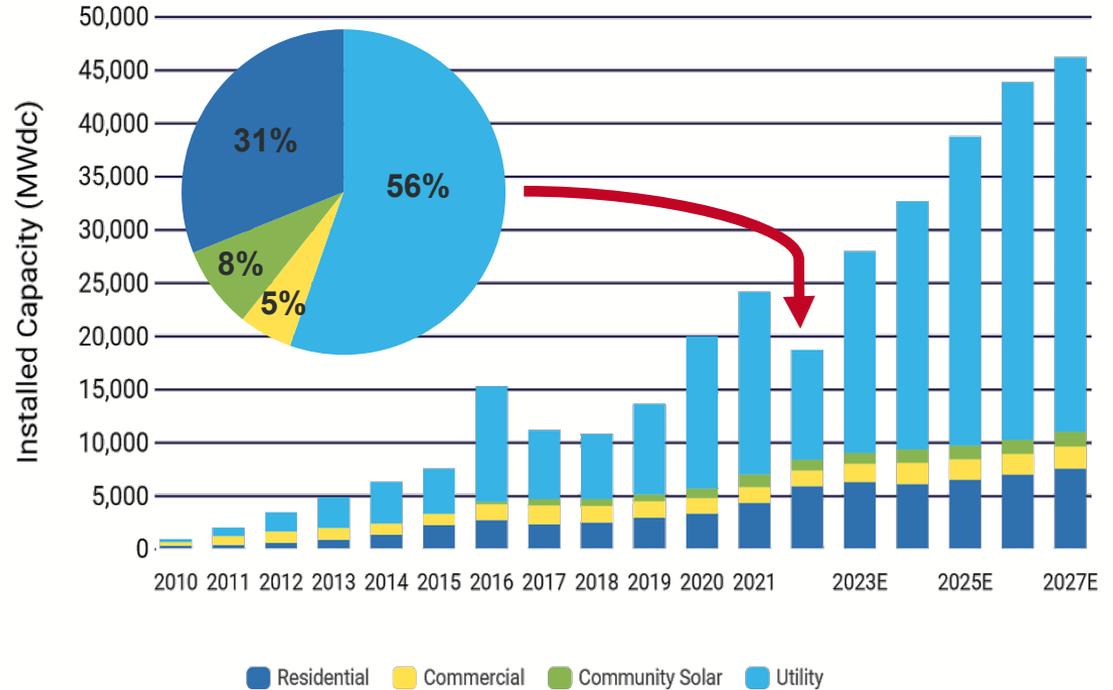
What role does solar play?

Maryland Annual Solar Installations

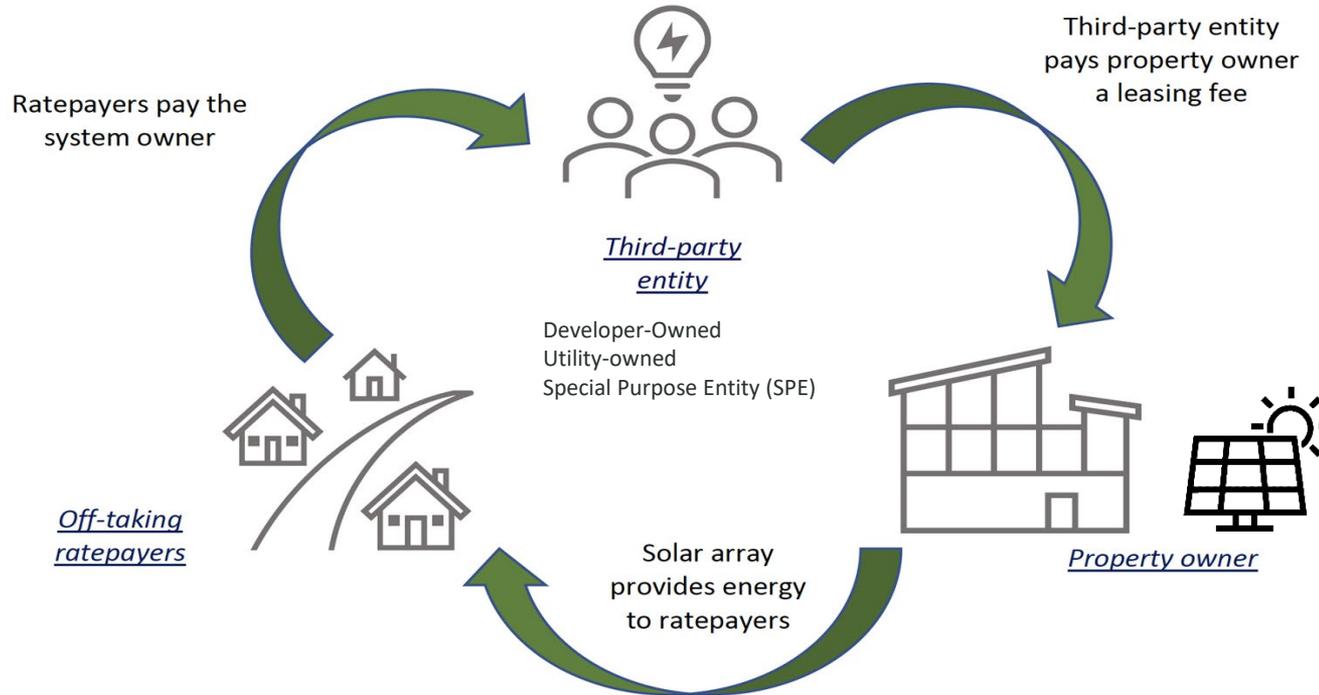


SEIA. (2021c). State Solar Spotlight: Maryland Solar. Solar Energy Industries Association. Washington, DC. (August 2021). Available from <https://www.seia.org/state-solar-policy/maryland-solar>

What role does solar play?

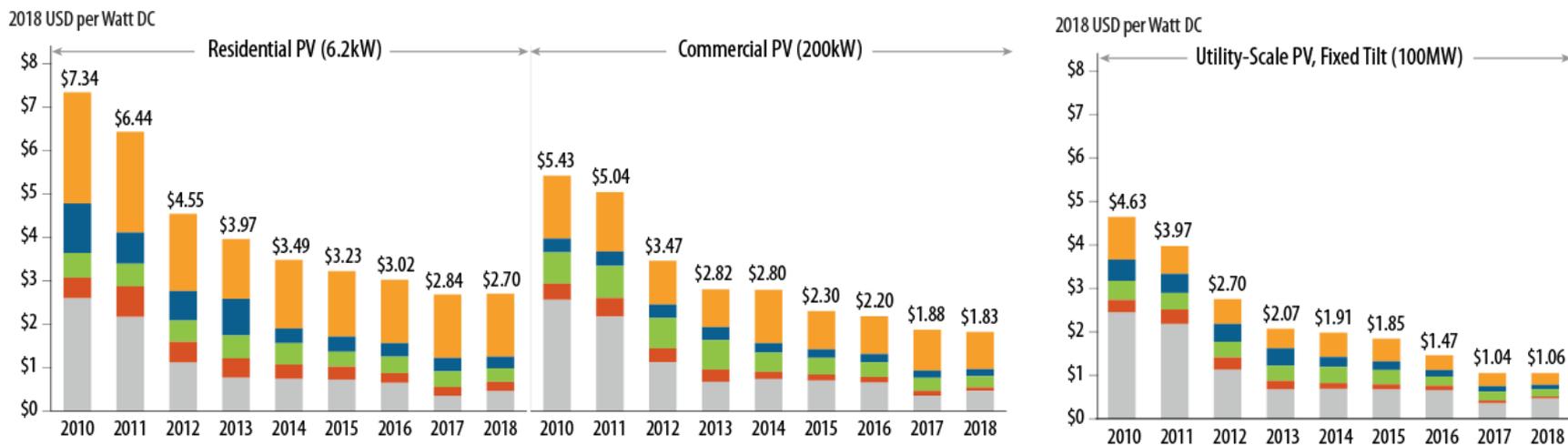


What role does solar play?



What role does solar play?

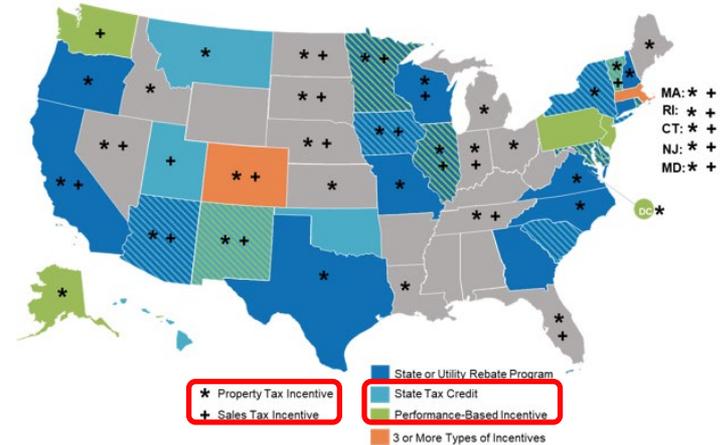
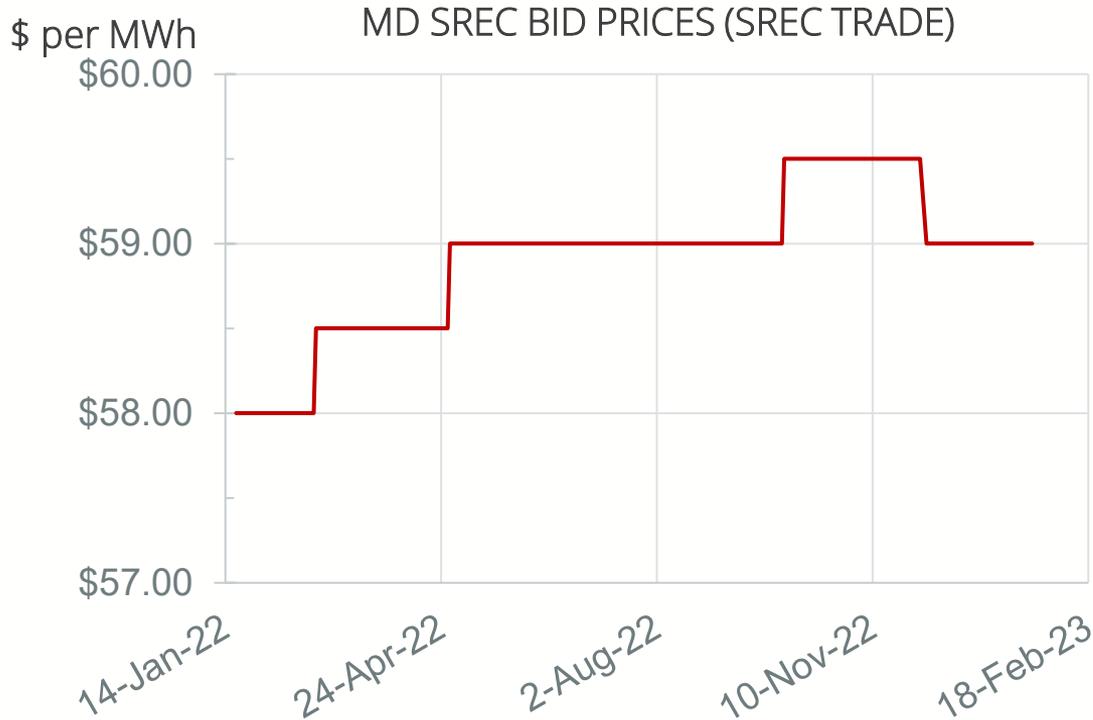
NREL PV system cost benchmark summary (inflation adjusted), 2010-2018



NREL (2018). Solar Installed System Cost Analysis [via [NREL.gov](https://www.nrel.gov)]

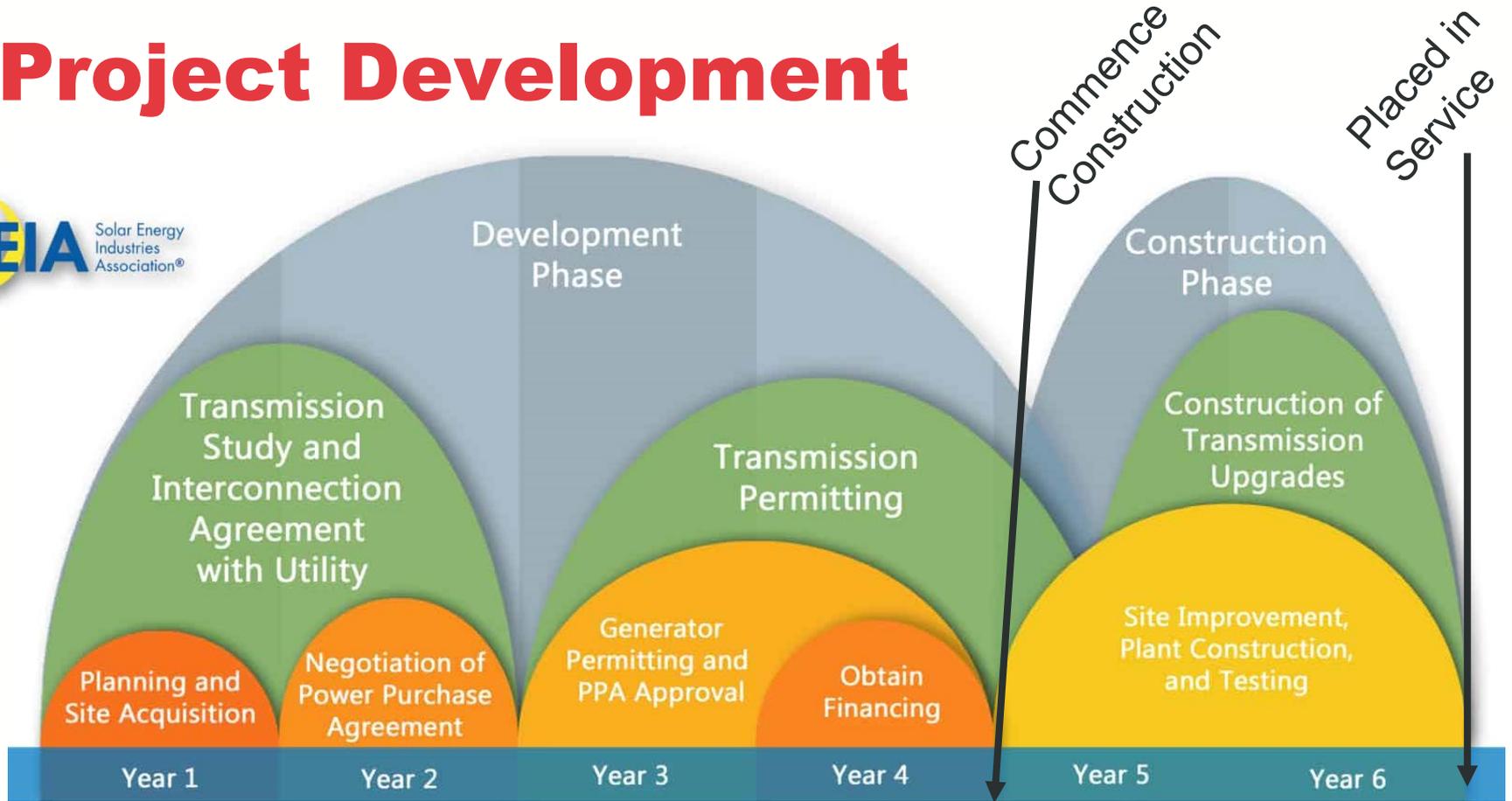


What role does solar play?

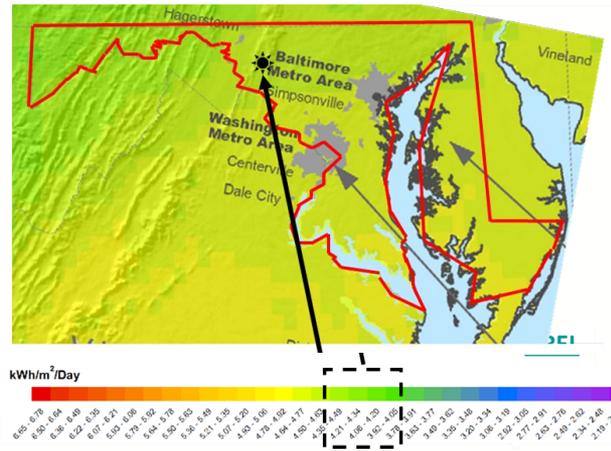
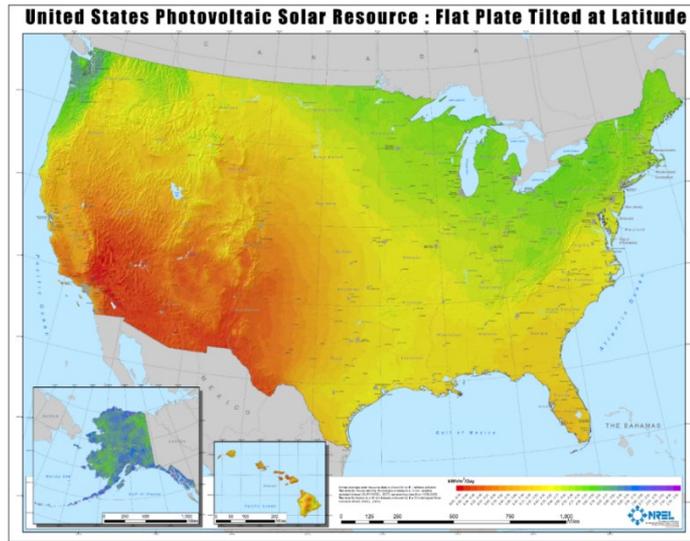


- SRECs
- 30% FITC
- Bonus Depreciation
- Tax Exempt (*property, state sales*)

Project Development



Project Development



kWh/m ² per	day	year
Phoenix, AZ	6.39	2,336
San Diego, CA	5.56	2,044
Orlando, FL	4.88	1,781
Annapolis, MD	4.65	1,697
Richmond, VA	4.27	1,559
New York City, NY	4.22	1,642
Wilkes Barre, PA	4.03	1,470
Frostburg, MD	3.89	1,420

NREL. (2020). Solar Resource Data, Tools, and Maps [via [NREL](https://www.nrel.gov/solar/rooftop/)]

Project Development

Identify
Site

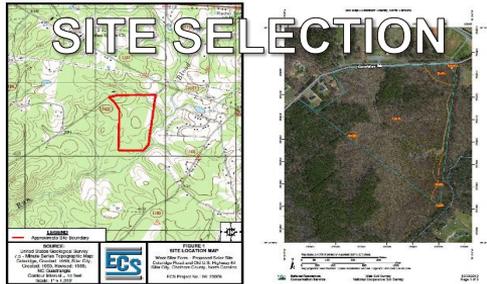
Land
Acquisition

Engineering
& Design

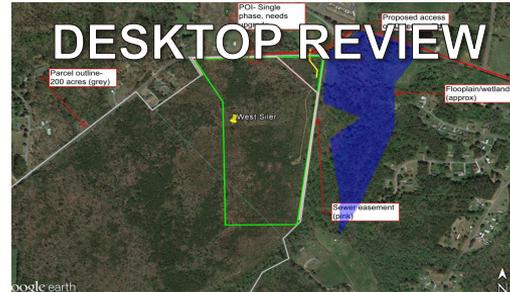
Due
Diligence

Construction

Monitoring,
O&M



- Utility infrastructure
(distribution/transmission)
- Usable acreage
(~4 to 8ac/MWdc)
- Substation capacity
(~4.0 kV to 46.0 kV)



- Constraints Map
(GIS, parcel, USGS quad map, ...)
- Topography/Vegetation
(LIDAR, wetlands, soil survey)
- Ecosystems
(ecosystems, historical, ...)



- Willing Landowner
(option to purchase or lease)

Project Development

Identify
Site

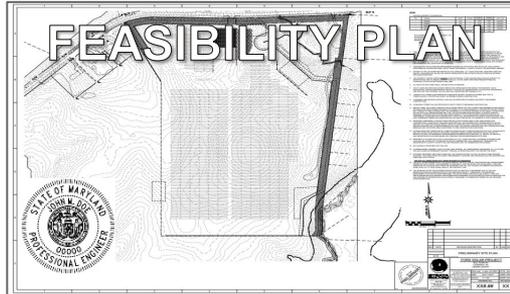
Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

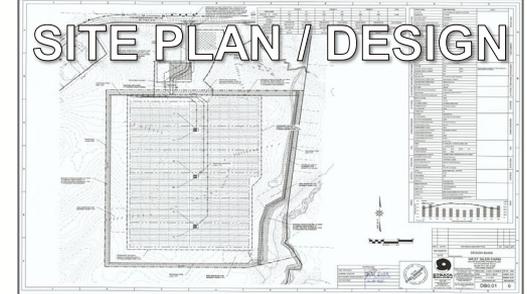
Monitoring,
O&M



- Site Plan
(interconnection, access, staging, ...)
- Geotechnical Analysis
(borings/pile load testing)
- Preliminary System Estimates
(equipment, system size, energy, ...)



- Entitlements/Permits
(disturbance, zoning, public hearing)
- Submit Interconnection Request
(Utility)
- Apply for CPCN
(Public Service Commission)



- Detailed Site Plan
(constraints map, layout, design, ...)
- Electrical Design
(building/electrical permit from AHJ)
- Structural Engineering

Project Development



Project Development

Identify
Site

Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M

STAGING / FENCING



GRADING



SURVEY



Project Development

Identify
Site

Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M



Project Development



Project Development



Project Development



Project Development



Array Assembly



Rails



Top-Down or Under Clamps



End Caps & Wire Management



Sub-Structure Assembly



Steel Pipe or Tubing



Top Caps
connect plies to cross pipes



Rail Connectors
Connect rails to cross pipes

Project Development

Identify
Site

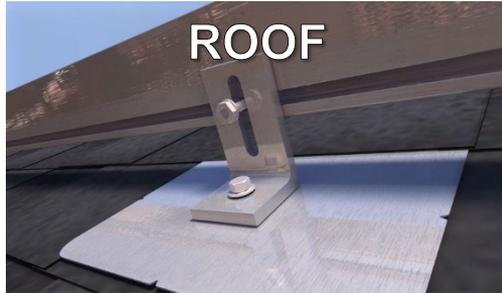
Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M



Project Development

Identify
Site

Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M

DC WIRING



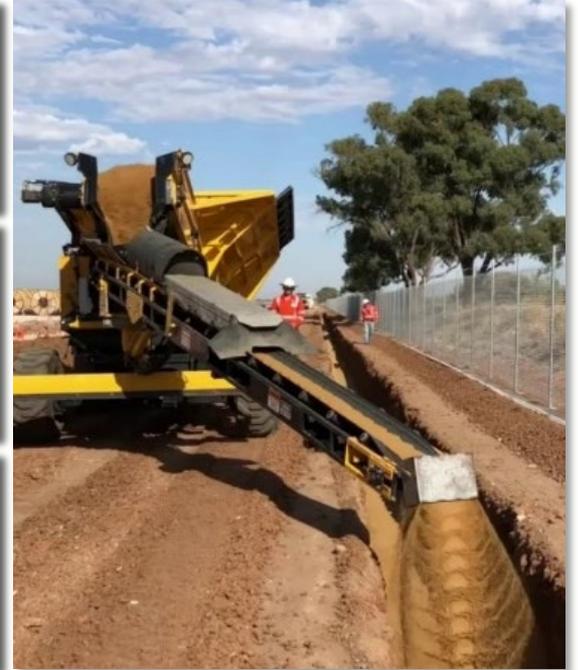
GROUNDING



TRENCHING



Project Development



Project Development

Identify
Site

Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M



Project Development



Project Development



Project Development



Project Highlights



199.43kW
System Size



278 MWh
Annual Generation



[youtube.com/watch?v=_usGN9H2NeQ](https://www.youtube.com/watch?v=_usGN9H2NeQ)

Project Development

Identify
Site

Land
Acquisition

Engineering
& Design

Due
Diligence

Construction

Monitoring,
O&M

VEGETATION

- Mow Grass
- Spray Weeds
- Cut Hedges



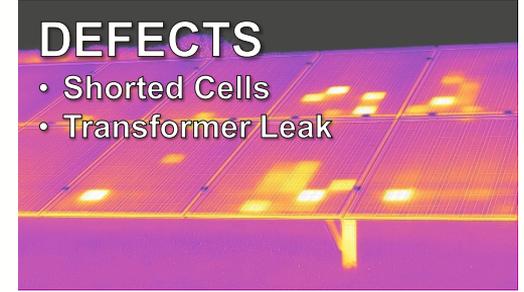
DAMAGE

- Vandalism
- Frost Heave
- Storms

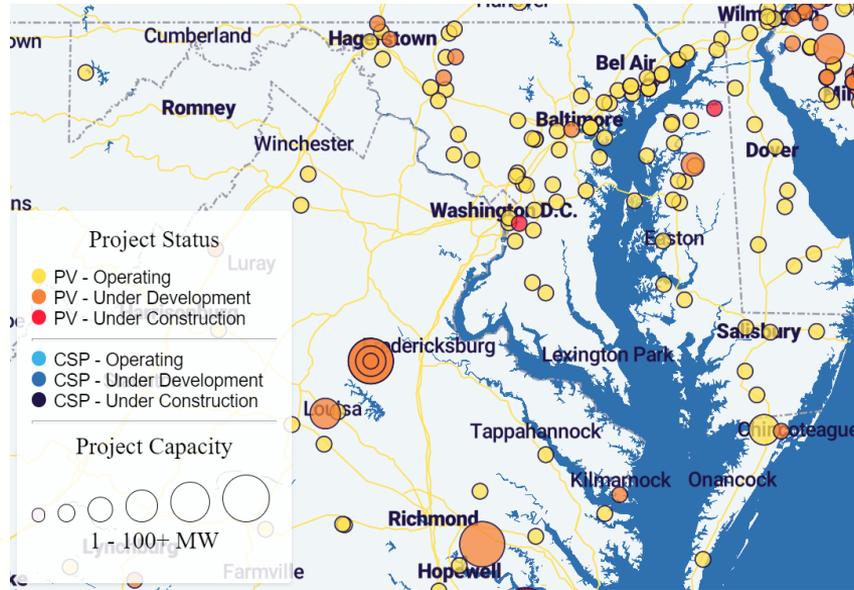


DEFECTS

- Shorted Cells
- Transformer Leak



Regional Projects



SEIA. (2022). Project Location Map

www.seia.org/research-resources/major-solar-projects-list

Regional Projects

Leigh Friend Solar Project

Location

Friendsville, MD

Total Installed Capacity

3.2 MWdc

Site

15 acres

Completion

2021



Regional Projects

Potomac Edison GA29

Location

Accident, MD

Total Installed Capacity

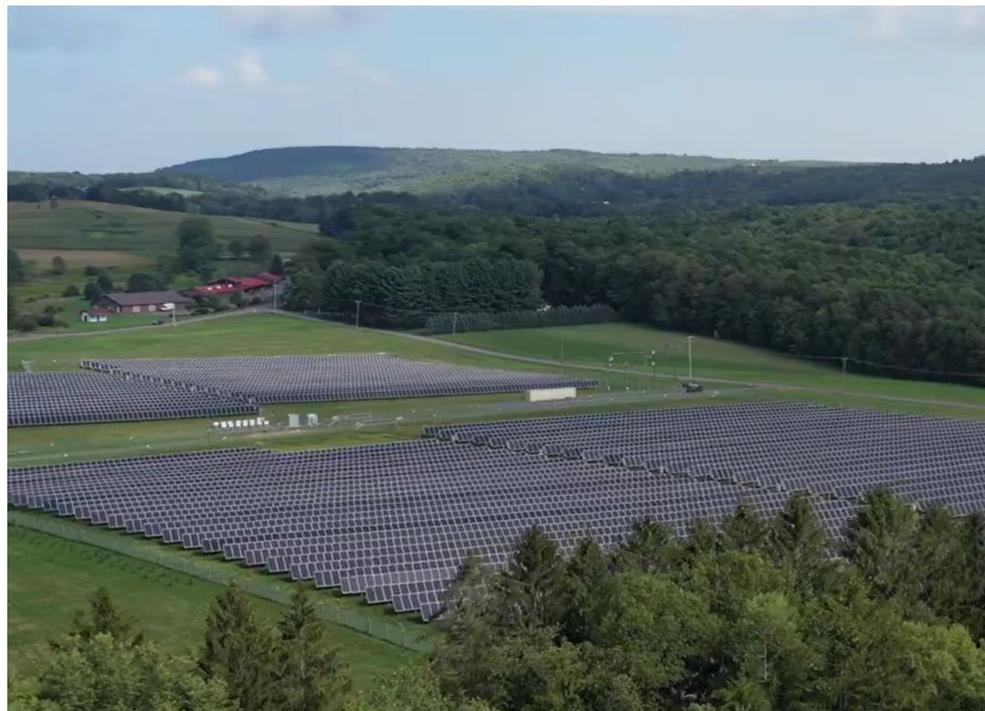
3.2 MWdc

Site

15 acres

Completion

2021



Projects

CPV Backbone Solar

Location

Kitzmillers, MD

Total Installed Capacity

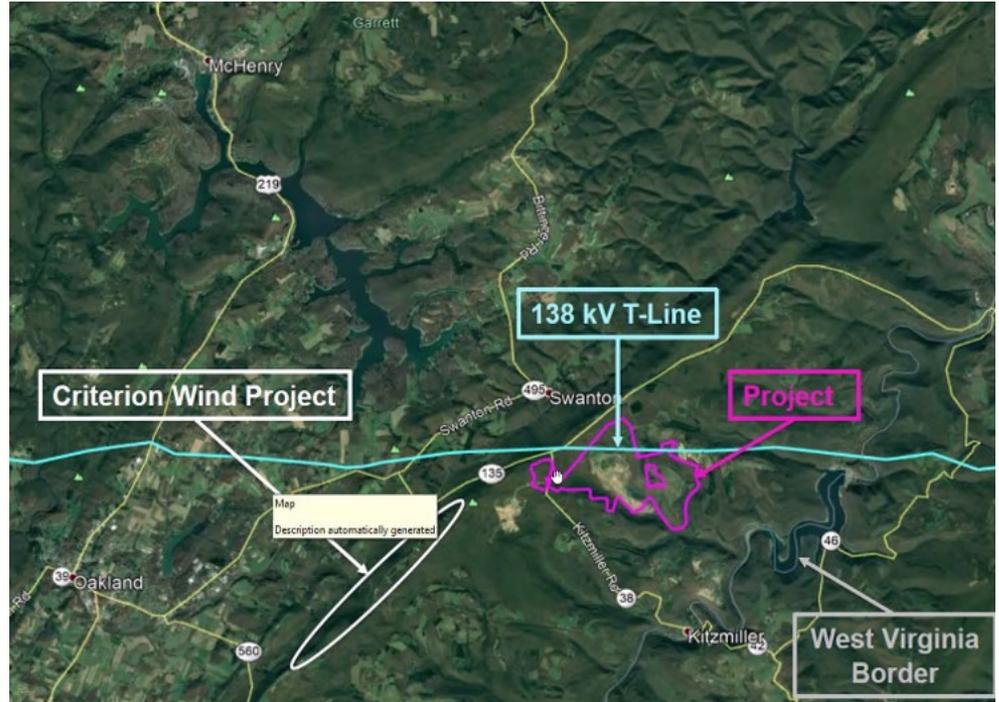
200 MWdc

Site

1,170 acres

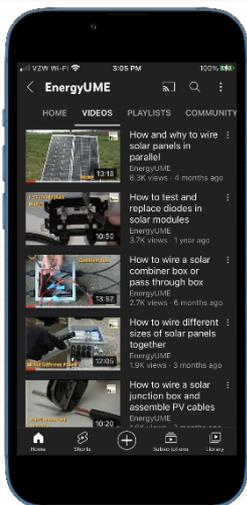
Commissioning Year

2023



University of Maryland Extension

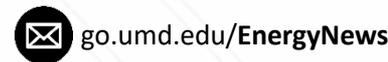
VIDEO



PUBLICATIONS



NEWSLETTER



The logo features the text 'UNIVERSITY OF MARYLAND EXTENSION' in a white, serif font, centered within a circular emblem. The emblem is composed of multiple overlapping, rounded rectangular shapes that create a complex, geometric pattern. The background of the entire slide is a solid red color with a subtle, repeating pattern of these same rounded rectangular shapes, creating a textured effect.

UNIVERSITY OF
MARYLAND
EXTENSION

CONTACT INFORMATION

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