Solar Energy in Montgomery County

FEBRUARY 2020

Overview

1. Framing questions
2. Exploring the data
3. Barriers to widespread solar implementation
4. Up-and-coming solar technologies

Framing Questions

How much solar is already installed in the County?

How much electricity does Montgomery County need under different scenarios, and how does that translate to solar acreage?

How much solar capacity does Montgomery County have?

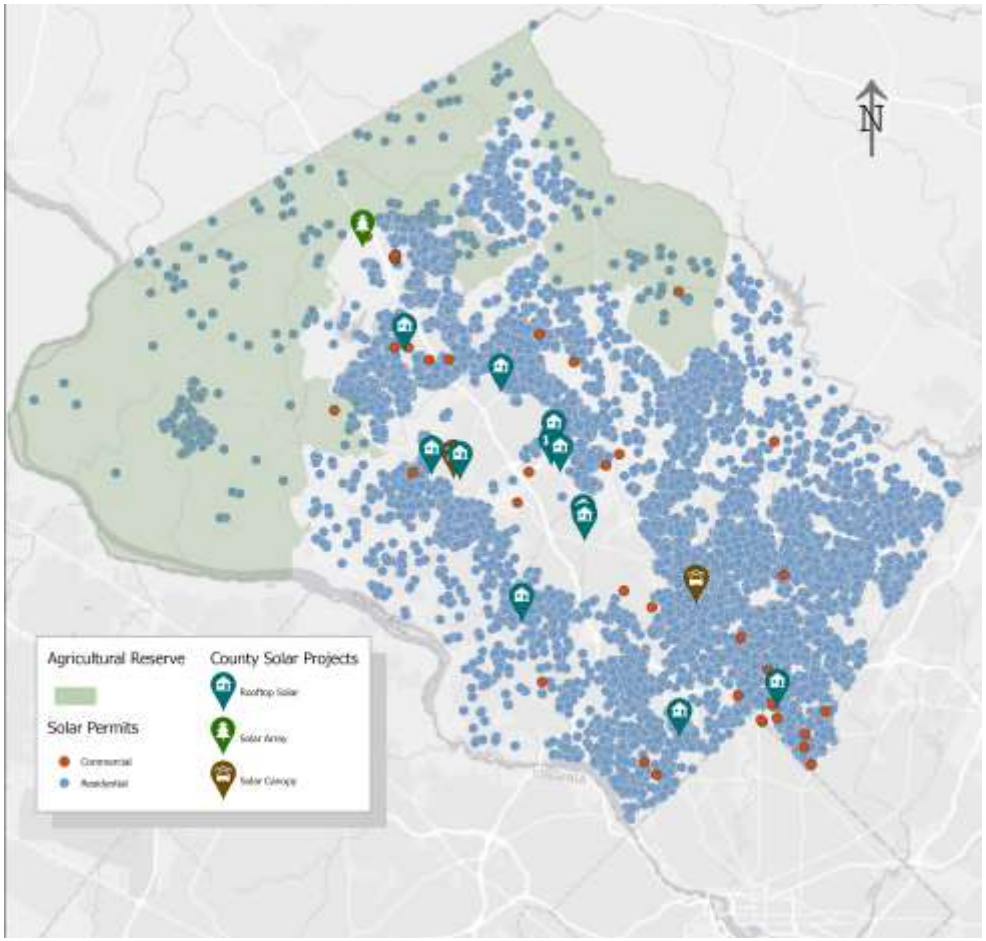
Exploring the Data

How much solar is already installed in the County?

The short answer is that we don't have a complete picture of amount of solar energy currently being generated in the county.

What we do know:[1]

- 16 County Solar Projects
- 9,295 Residential Solar Permits
- 66 Commercial Solar Permits



[1] Data based on permits from the County's Department of Permitting Services and does not include permits issued through Rockville or Gaithersburg. This accounts for the large "hole" in the middle of the County.

Exploring the Data

How much electricity does Montgomery County need under different scenarios, and how does that translate to solar acreage?

Electrification Scenarios Explored:*

Scenario 1

- All current electricity needs produced by solar.

23,000 acres – 70,000 acres

Scenario 2

- All current electricity needs produced by solar.
- Electrification of transportation.

30,000 acres – 100,000 acres

Scenario 3

- All current electricity needs produced by solar.
- Electrification of transportation and natural gas appliances.

43,000 acres – 170,000 acres

*Scenario estimates are based on two independent estimates of how much solar is necessary to power the county. These are “back of the envelope” calculations subject to further refinement.

Exploring the Data

Production per Acre

= ?

<u>Based on Average Annual Production</u>

- 438,000 kWh per year
- Powers 42 houses

<u>Based on Winter Months (Dec. and Jan) Only</u>

- 25,000 – 60,000 kWh over the two winter months
- Powers 6-14 houses.

Exploring the Data

How much solar capacity does Montgomery County have?

Typical Locations

- Ground mounted systems on open land
- Parking lots & garages
- Rooftops

Atypical Locations?

- Transmission lines
- Building facade
- Window replacement
- Noise walls

This analysis focuses on the theoretical area available for locating solar on typical locations. It does not incorporate limitations due to solar orientation, roof condition, competing uses of the space, etc. As such, this analysis is a "theoretical ceiling" of the acreage is available for solar in the County.

Theoretical Area of "Open" Land

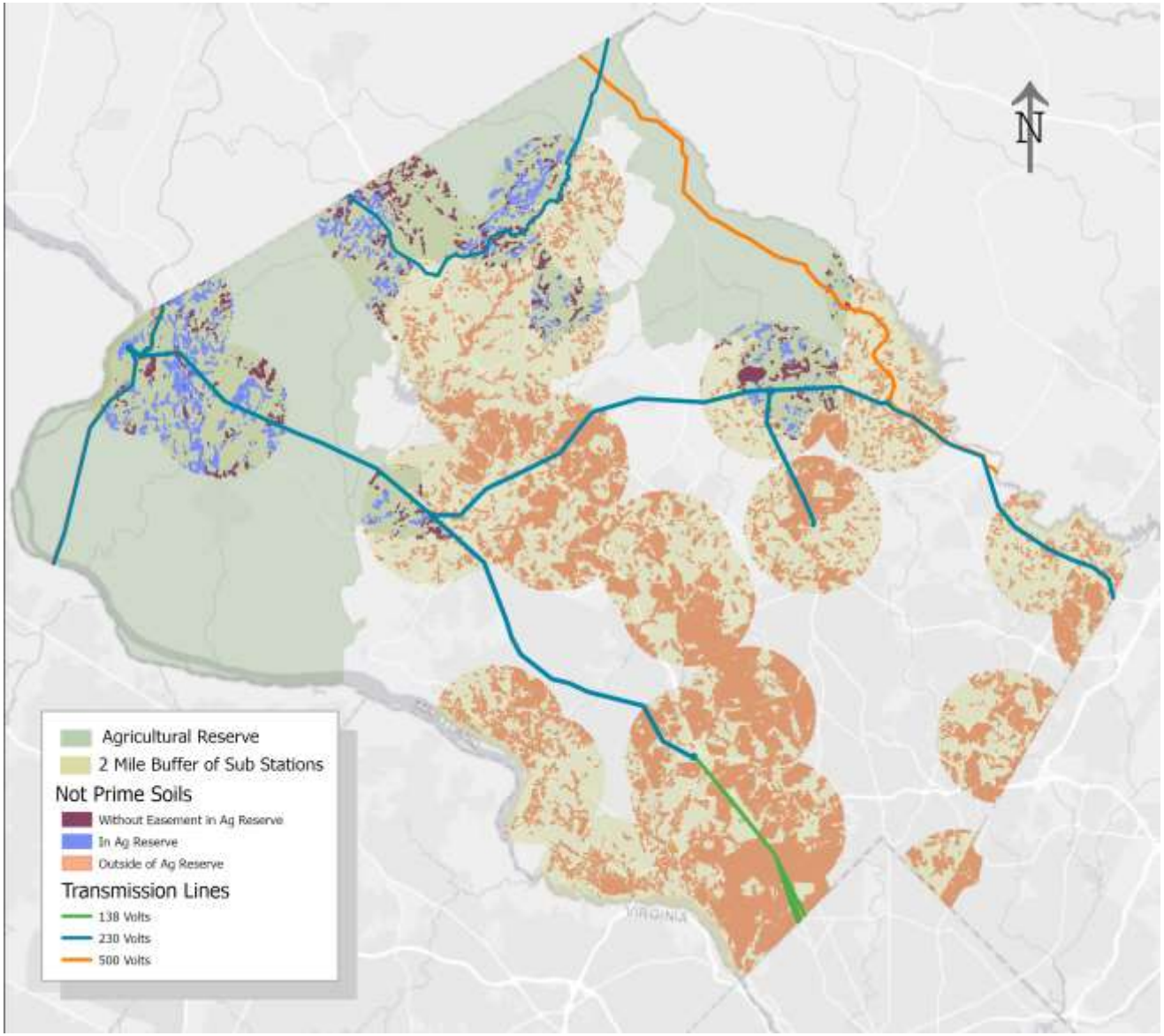
- **Applied filters to open land area in County to determine theoretical area available for ground mount solar installations on open land**
- **Does not factor in:**
  - Parcel configuration (i.e., adds all land area regardless of shape)
  - Slope of land (i.e., may slope toward north)

Category	Acreage
Total land area in County	~320,000
Subset not on "prime" soils[1]	~127,900
Subset without trees and impervious area; outside 150' buffer from hydrologic feature	~20,900
Subset within two miles of utility substation[2]	~12,100
Subset within Agricultural Reserve	~2,500
Subset without Agricultural Easement	~900

[1] Prime soils = Class I – III; non-prime soils = Class IV-VII.

[2] Utility-scale solar projects are usually located near substations to avoid costs of new transmission infrastructure. Acceptable distance from substations depends on the project size and site-specific details. Such details are not included in this analysis.

Theoretical Area of “Open” Land



Theoretical Area of “Open” Land in a Rural Area

Theoretical Area of “Open” Land in an Urban Area

Theoretical Area of Parking Lots & Garages

- Calculated total area of parking lots and garages in County
- Does not factor in:
  - Lot/garage configuration (i.e., adds all parking area regardless of shape)
  - Orientation of parking lot and potential obstructions (e.g., trees, buildings, etc.)

Property Type	Acres of Parking Lots	Acres of Parking Garages
Housing Opportunities Commission	13.20	-
Montgomery County	343.00	16.47
Montgomery College	37.38	1.09
Schools	372.93	-
Volunteer Fire Departments	13.06	-
Agricultural	140.30	-
Multi-Family Residential	290.72	1.03
Townhomes	7.27	-
Single Family Homes	92.37	-
Non-Profit	442.63	1.35
Non-Residential	2,948.93	42.66
Veteran's Organizations	1.07	-
WMATA	61.00	8.38
WSSC	20.21	-
MNCPPC	123.26	-
Gaithersburg	628.79	11.06
Rockville	559.50	11.01
Takoma Park	60.66	0.64
Embassy	4.57	-
Federal	259.88	8.49
Maryland	57.44	0.13
Total	6,478.15	102.34

Theoretical Roof Areas: Commercial & Industrial

- **Calculated total area of roofs in County.**

- **Does not factor in:**
  - Roofs less than 5,000 sq.ft. in area.
  - Shape of roof, orientation, and potential obstructions (mechanical equipment, outdoor amenities, etc.)

Landuse	Sum of Roof Areas ≥ 5,000 sqft	Acres
Industrial	5,576,716.48	128.02
Office	23,846,036.33	547.43
Retail	31,634,999.99	726.24
Warehouse	10,536,055.16	241.87
Total		1,643.57

Theoretical Roof Areas: Residential & Institutional

- **Does not factor in:**
  - Roofs associated with Housing Opportunities Commission, Montgomery College, Volunteer Fire Departments, municipal buildings, state government buildings, federal buildings, WMATA, MNCPPC, WSSC

Property Type	Acres of Rooftop	Acres of Rooftop w/ Solar Permit
Montgomery County	222.86	
Schools	430.53	
Multi-Family Residential	501.72	-
Townhomes	854.34	25.36
Single Family Homes	7,527.71	366.04
Total	9,537.15	391.40

Theoretical Area Under Transmission Lines

- **Total area available under transmission lines: 1,415 Acres.**
- Includes area that is:
  - Pepco owned
  - Without trees
  - Impervious
  - Outside of 150 ft buffer from hydrologic features.

Photo: Charlie Ban, Oct. 2018

Summary: Total Theoretical Land Available

Type of Land	Total Available Area (acres)
Open Land	12,100
Parking Lots and Garages	6,580
Building Roofs (Commercial)	1,644
Building Roofs (Residential & Institutional)	9,146
Transmission Lines	1,415
Total	**30,885**

Potential Barriers to Widespread Solar Implementation

- **Maryland Net Metering Law**
  - Net metering allows sale of excess power to utility at retail rates; critical to economics of many solar installations
  - Current cap on total net metered capacity = 1,500 MW (772 MW installed as of June 30, 2018)
  - Current cap on single project = 2 MW

- **Local zoning and land use laws and practices**
- **Upfront costs**
- **Access to unbiased information**

Up-and-coming Solar Technologies

- Solar roads and sidewalks.
- Solar windows.
- Solar skin.
- Solar fabric.