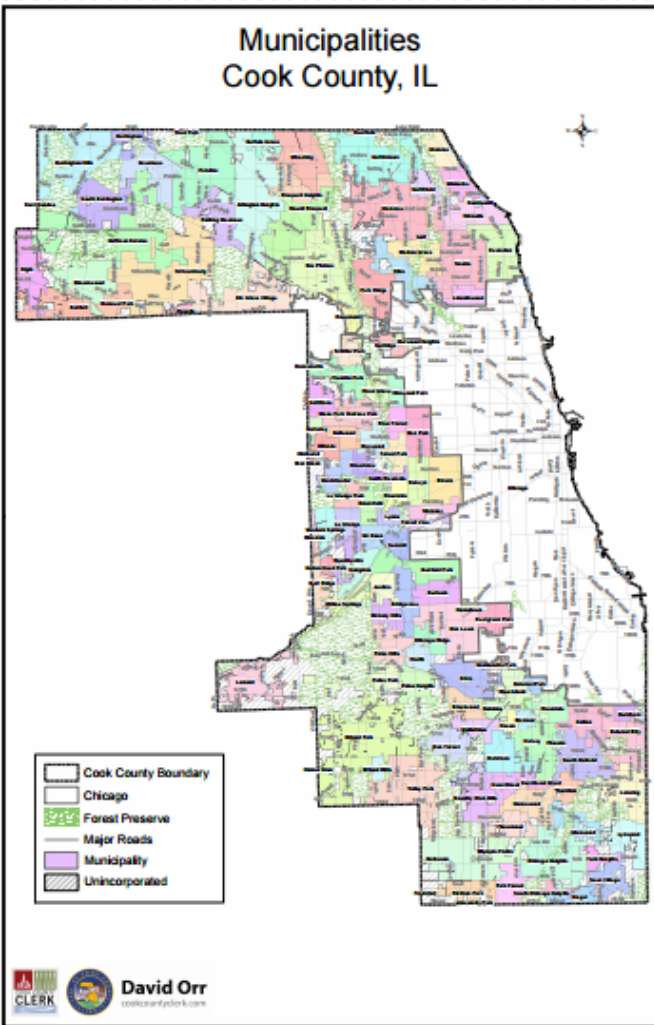




Community Solar in Cook County: Opportunity Assessment

June 2015





The U.S. Department of Energy SunShot Initiative is a collaborative national effort that aggressively drives innovation to make solar energy fully cost-competitive with traditional energy sources before the end of the decade. Through SunShot, the Energy Department supports efforts by private companies, universities, and national laboratories to drive down the cost of solar electricity to \$0.06 per kilowatt-hour. Learn more at energy.gov/sunshot.

About the SunShot Initiative



“Cook County should be a world-class model of sustainability. We are working not only to boost sustainability practices throughout County government, but also to join forces with local governments, nonprofits and business, to accomplish more than we could separately in making each of Cook County’s communities sustainable.” – Toni Preckwinkle, President, Cook County Board of Commissioners

This project to advance community solar in Cook County is undertaken cooperatively by Cook County, the City of Chicago, ComEd, Elevate Energy, Environmental Law and Policy Center, and West Monroe Partners.



SunShot
U.S. Department of Energy



Overview

- Goals of Opportunity Assessment
- Cook County Housing Demographics
- Opportunity Assessment
- Conclusions and Next Steps

SunShot Initiative Seeks to Make Solar Energy Cost-Competitive

- U.S. Department of Energy SunShot Initiative is a national collaborative effort to make solar energy cost-competitive with other forms of electricity by the end of the decade
- The SunShot Initiative's Solar Market Pathways Program will support 15 projects, including the Cook County Community Solar Project, over the next two years that are advancing solar deployment across the United States

The Cook County Community Solar Project will identify and establish models for community solar and ways to eliminate barriers to implementation



Goals of Opportunity Assessment



Goals of This Opportunity Assessment

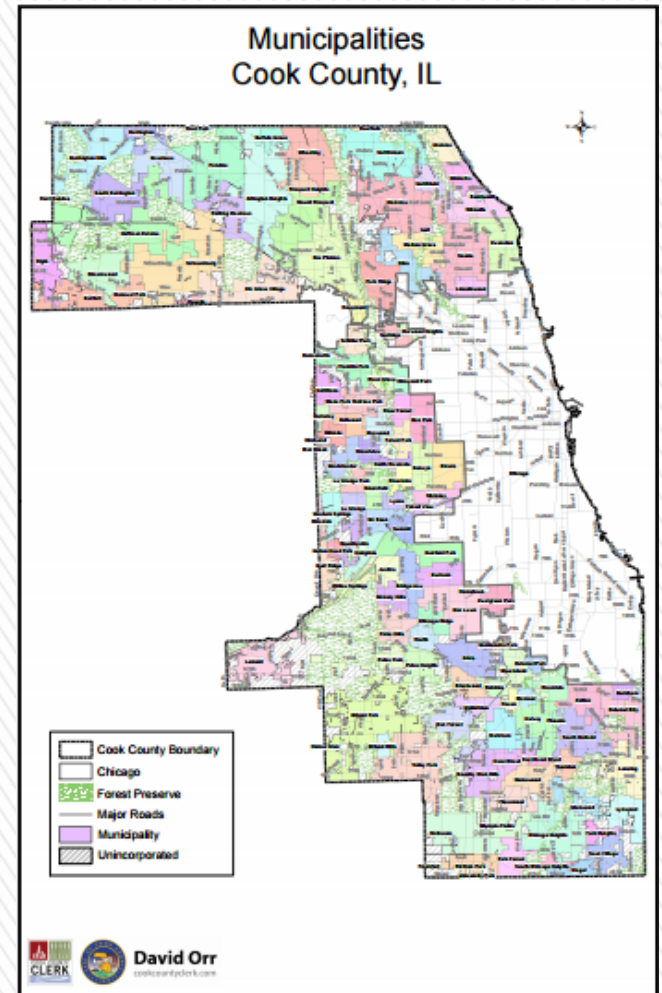
- Quantify community solar customer potential by analyzing Cook County housing demographics
- Assess and quantify market potential for community solar installations by analyzing physical characteristics of vacant land and buildings in Cook County
- Identify the number of sites suitable for community solar installations and potential combined solar energy capacity for these sites
- Identify most suitable vacant land and buildings to streamline community solar development
- Help inform the project's pilot site selection process in Fall/Winter of 2015

Cook County Housing Demographics



Cook County Overview

- 5.2 million people - second most populated county in the U.S.
- 1.925 million housing units
- 1,635 square miles
- 132 municipalities



Source: Cook County Clerk.

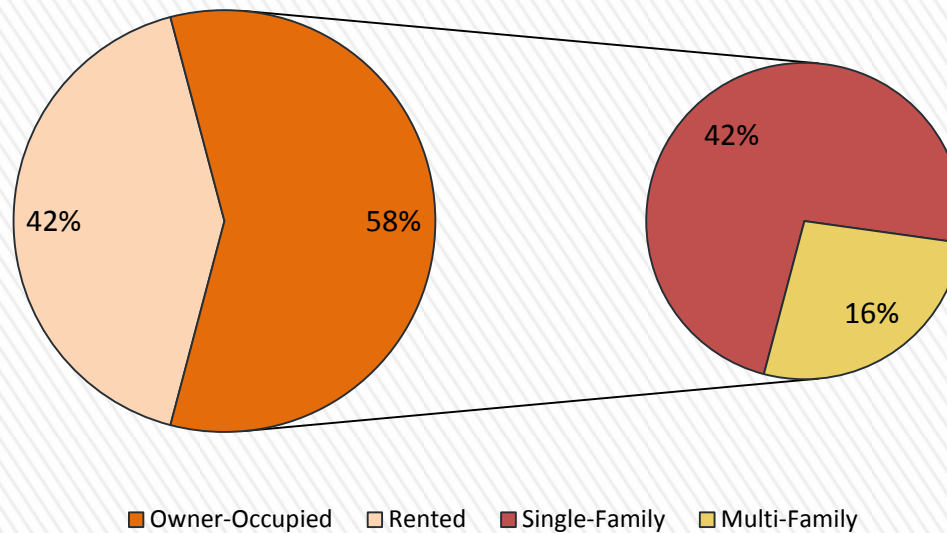
<http://www.cookcountyclerk.com/aboutus/maproom/Documents/Countywide/Municipalities.pdf>

Cook County Housing Characteristics

42% of Cook County households cannot invest directly in solar photovoltaic systems due to lack of roof ownership; of the owner-occupied units, over one-quarter cannot install solar photovoltaic systems due to shared roof ownership

Owned vs. Rented Households

Single vs. Multi Fam. Owned



- 1.925 million occupied housing units in Cook County
 - 1,115,000 owner-occupied households
 - 800,000 renter occupied

Cook County Overview

- Majority of Cook County residents cannot invest in, install, and benefit from solar photovoltaic systems because:
 - They do not own their roof (renters)
 - They co-own their roof (condo owners)
 - Home/roof is not structurally sound
 - Shading on roof
 - Financial barriers and up-front costs of installation

- Community solar has potential to allow nearly all Cook County utility customers to invest in and benefit from solar photovoltaic energy

Opportunity Assessment



Opportunity Assessment Overview

- Data Utilized
- Data Limitations
- Data Aggregation
- Electrical Grid Data
- Site Screening Criteria

Objective: Quantify the community (shared) solar market potential in Cook County

Data Utilized for Opportunity Assessment

- Acquired local and national data:
 - Cook County/local property assessor
 - Building characteristics and land use type
 - Light Detection and Ranging (LiDAR) data
 - Geographic Information System (GIS) data
 - Cook County Land Bank Authority
 - Property list/tax delinquent
 - National Housing Preservation Database
 - Public and subsidized multifamily properties
 - U.S. Environmental Protection Agency (U.S. EPA)
 - Brownfields, landfills, superfund, and Resource Conservation and Recovery Act (RCRA) sites
 - National Renewable Energy Laboratory (NREL)
 - Best practices for solar site development, solar radiation potential

Data Limitations

- Geographical Information System (GIS) data, including vector polygons representative of building footprints, is essential for the analysis of available rooftop space
 - Building footprint data is required to calculate the area and boundary of the rooftop surface
 - This data is not available for suburban Cook County
 - Without the area and boundary of the rooftop surface analysis of the rooftop slope, orientation, and total usable area (minus obstructions) cannot be performed
- As a result, no suburban rooftops were included in this analysis
- The analysis presented in this document will be updated when the data for suburban Cook County becomes available

Data Limitations, cont.

- Inconsistencies between property data sets due to different data collection years
 - City of Chicago building footprint data is from 2010
 - Cook County Assessor data is from 2013
 - Cook County LiDAR and topographic data is from 2008
- Lack of comprehensive building characteristics data
 - Roof age
 - Building modifications including demolition and new development

Data Summary

Datasets	Geography	
	Chicago	Suburban Cook County
<p>LiDAR – Digital surface model of land and roof topography</p> <p>Source: Cook County 2008 LiDAR and Topographic Data Services</p>	Yes	Yes
<p>Building Footprint – GIS vector file to identify rooftop surface and area</p> <p>Source: City of Chicago Data Portal 2010</p>	Yes	No
<p>Parcel – GIS vector file used to identify vacant land surface and area</p> <p>Source: Cook County GIS 2015</p>	Yes	Yes
<p>Property Assessor – Building Characteristics and Use</p> <p>Source: Cook County Property Assessor 2013</p>	Yes	Yes

Aggregated Data into Single Dataset

- In order to create a master list of potential sites and buildings, all of the data was aggregated into a single database
 - Building characteristics and use type joined with physical characteristics that were modeled from LiDAR data and then analyzed using ESRI ArcGIS software
 - Different date ranges in datasets required manual manipulation
 - Time needed for QA/QC, data cleaning, and verification of results
- The team then filtered all of the vacant land and buildings through the site selection criteria to find the list of suitable sites and buildings in Cook County
- This list is incomplete because building footprint data is not available in suburban Cook County

Transparent Electrical Grid Information Is Critical for Pilot Site Selection

- Solar photovoltaic systems generate electricity that is distributed to the electrical grid and are required to go through an “interconnection” process with ComEd to ensure that each system can be integrated safely into the existing infrastructure
- Community solar energy developers and other organizations interested in developing solar energy projects in their communities need to know where the best locations are in relation to the electrical grid
- Detailed grid data is not currently available, but the project team is working to incorporate electrical grid information into the opportunity assessment analysis



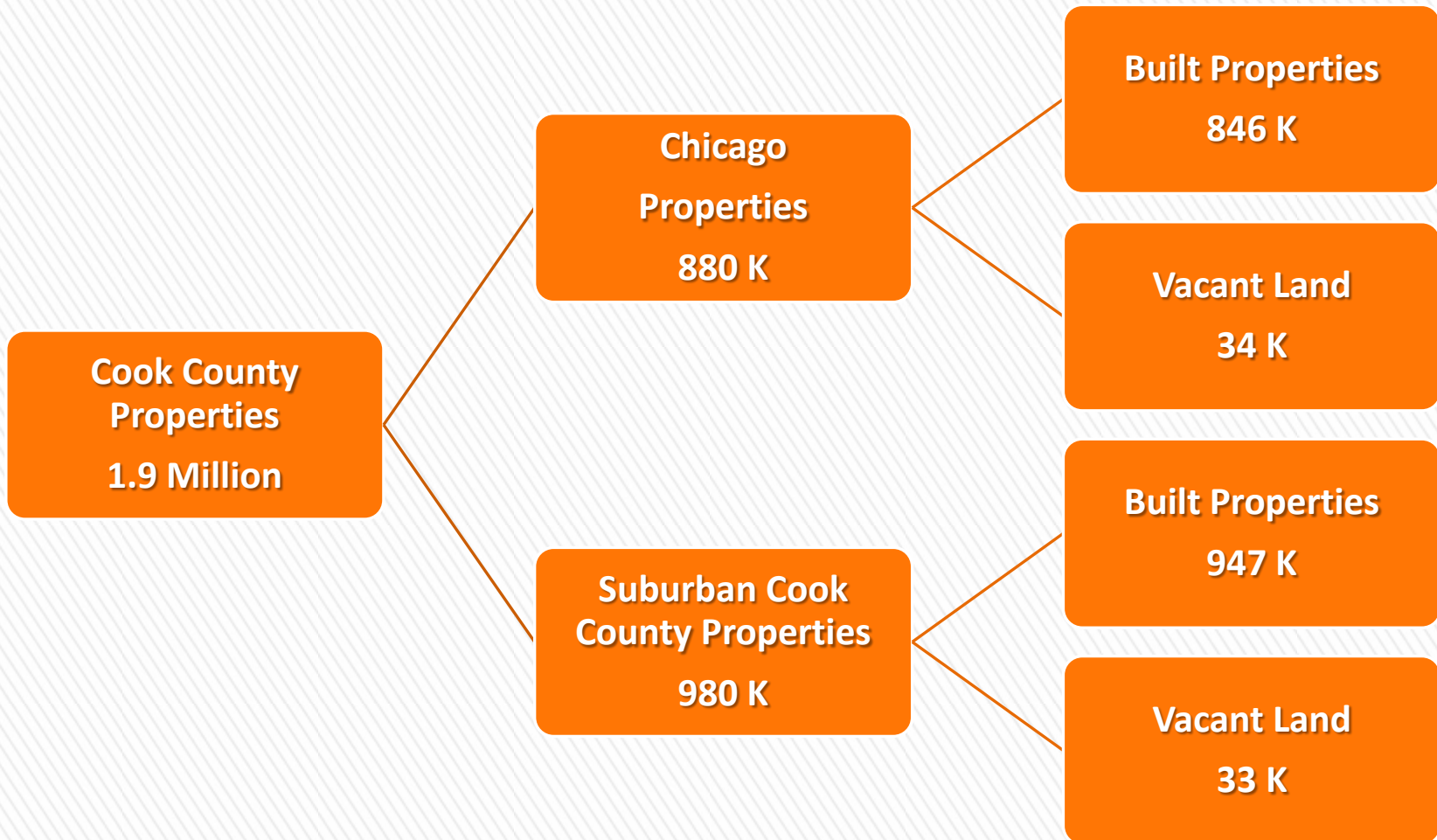
Photo source: <http://www.elp.com/articles/2013/03/comed-switches-on-smart-substation-in-chicago.html>

Site Screening Criteria



- Utilized national best practices for solar photovoltaic site screening
- Additional criteria not yet applied
 - > Grid infrastructure data, site sensitivity, energy usage, building longevity, zoning, prioritized use, site ownership, and other qualitative criteria

Cook County Land Parcels, Built and Vacant



Cook County Vacant Land Site Screening



Vacant Land Site Screening Guidelines

- System Size $\geq 300\text{kW}$
- Suitable sites must meeting the following criteria:
 - Land size $\geq \frac{1}{2}$ acre
 - Distance to roads < 1 mile
 - Distance to power infrastructure $< \frac{1}{2}$ mile
 - Shade – not in shade and in sunlight for ≥ 3.7 hours per day
 - Obstructions – no major visible obstructions that cannot be moved
 - Land Slope < 6 Degrees
- Community solar installations are on average significantly larger than minimum criteria metrics

Cook County Vacant Properties Site Screening

**Total Vacant Properties
in Cook County:**

67,122

**With adequate
area of available space:**

6,679

**Close to necessary infrastructure
(roads and transmission):**

6,162

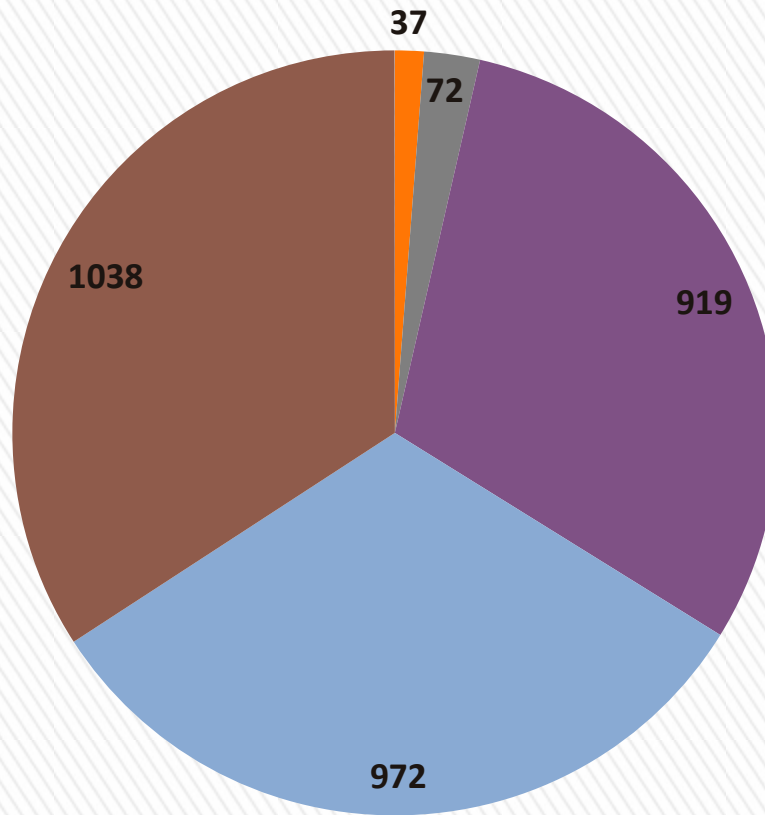
**With adequate solar
potential (not in shade):**

4,977

**Properties with adequate
surface (topography and obstructions):**

3,038

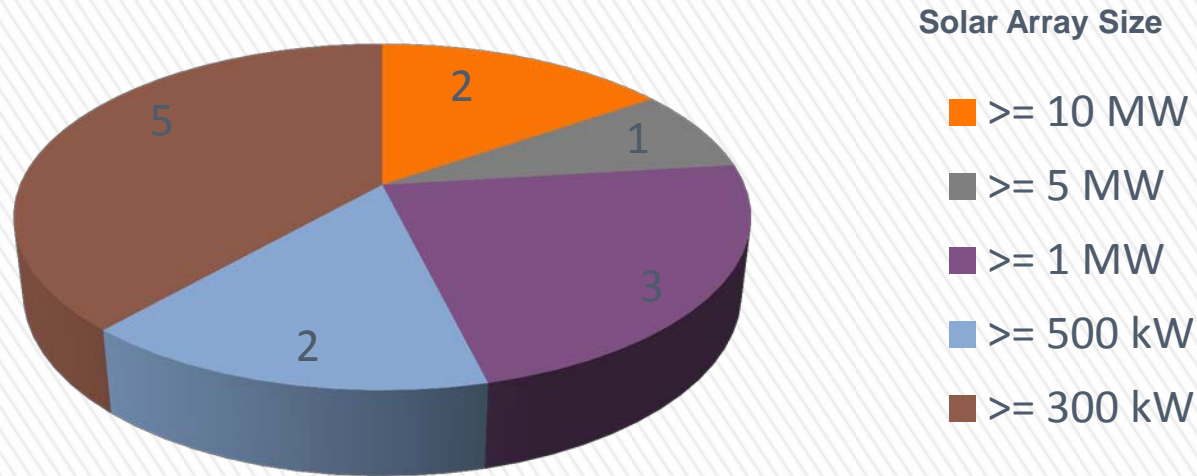
Vacant Properties with Adequate Surface



Solar Array Size

- >= 10 MW
- >= 5 MW
- >= 1 MW
- >= 500 kW
- >= 300 kW

Known Landfills in Cook County: Breakdown of Potential Sites



- Landfills are one type of parcel classified as vacant. 13 Cook County landfill sites appear to be good candidates for community solar
- There are 6 landfill sites that could house a solar array over 1 MW
- The majority of suitable landfills would be good-sized hosts for projects between 300 and 500 kW

City of Chicago Rooftop Site Screening

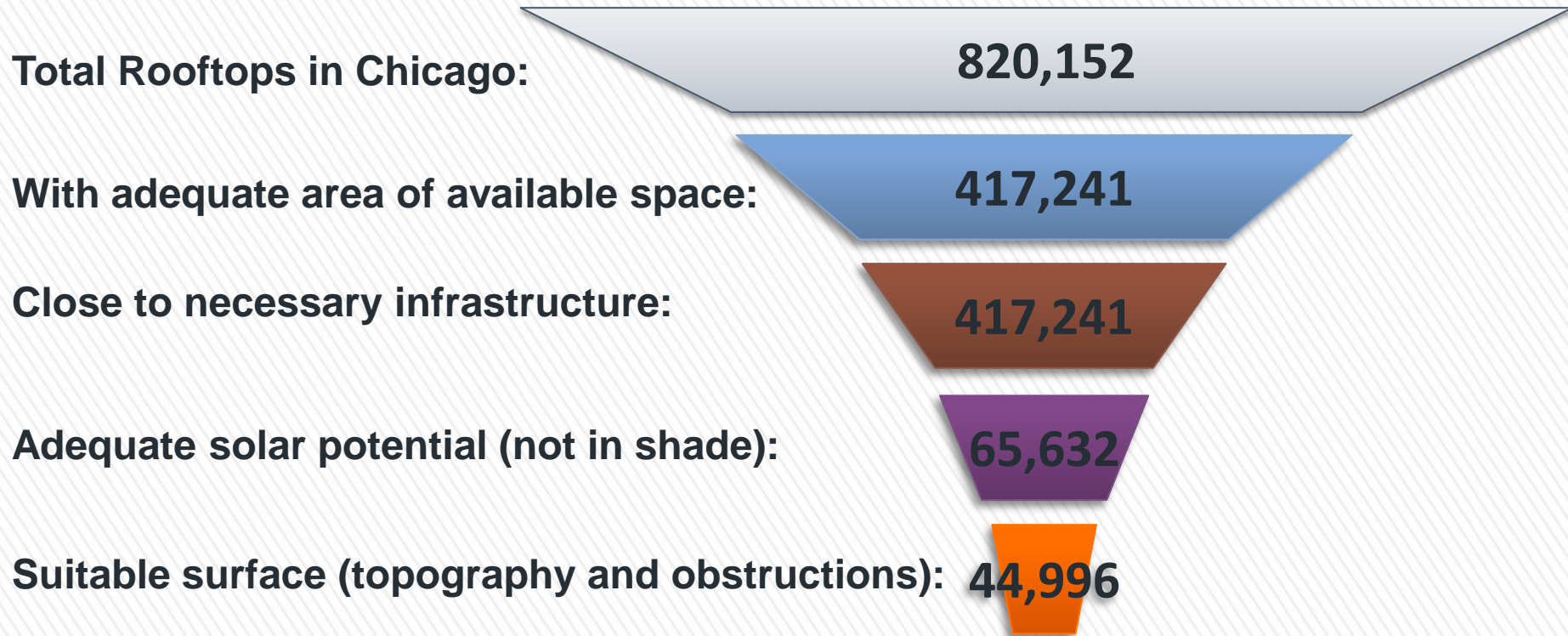


Building Site Screening Guidelines; Rooftop Data Not Available for Suburban Cook County

- System Size \geq 25kW
- Suitable sites must meeting the following criteria:
 - Rooftop size \geq 1794 Square Feet
 - Distance to roads $<$ 1 mile
 - Distance to power infrastructure $<$ $\frac{1}{2}$ mile
 - Shade – not in shade and rooftop in sunlight for \geq 3.7 hours per day
 - Obstructions – no major visible obstructions that cannot be moved
 - Rooftop Slope - flat or pitched $<$ 60-degrees and facing south, southwest, or southeast
- Community solar installations are on average significantly larger than minimum criteria metrics

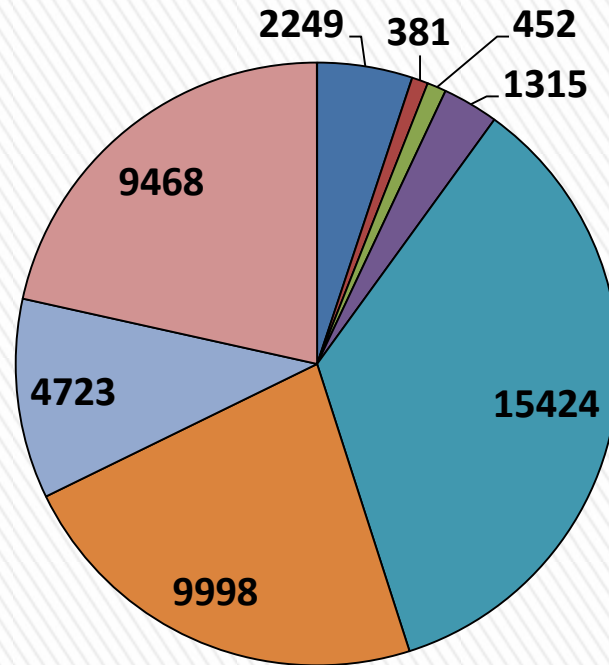
The following data only represents building rooftop for City of Chicago due to data limitations for suburban Cook County

Rooftops in City of Chicago Screening: Sites \geq 25 kW



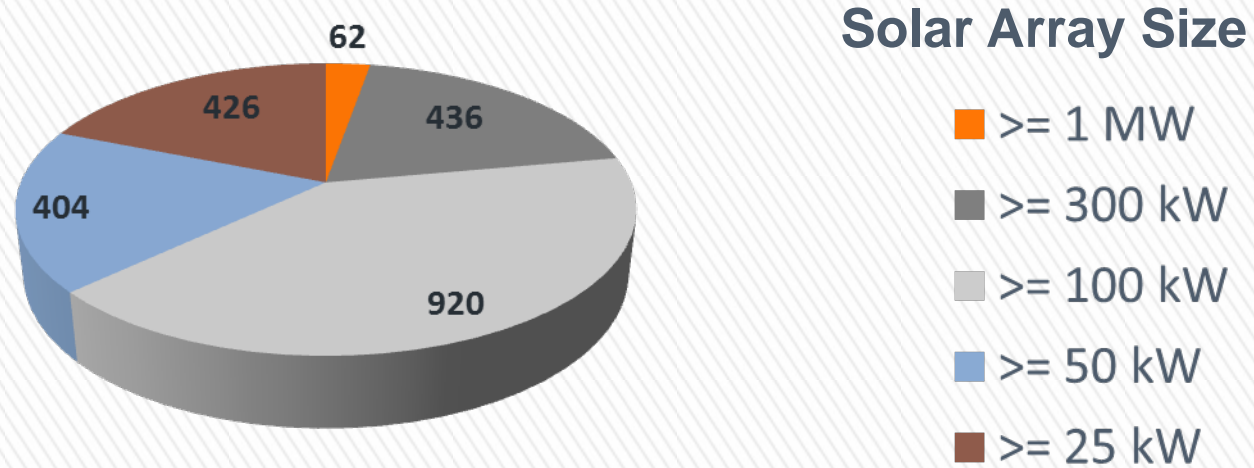
Number of suitable rooftops will be larger once analysis for rooftops in Suburban Cook County is added.

Chicago Buildings with Adequate Surface



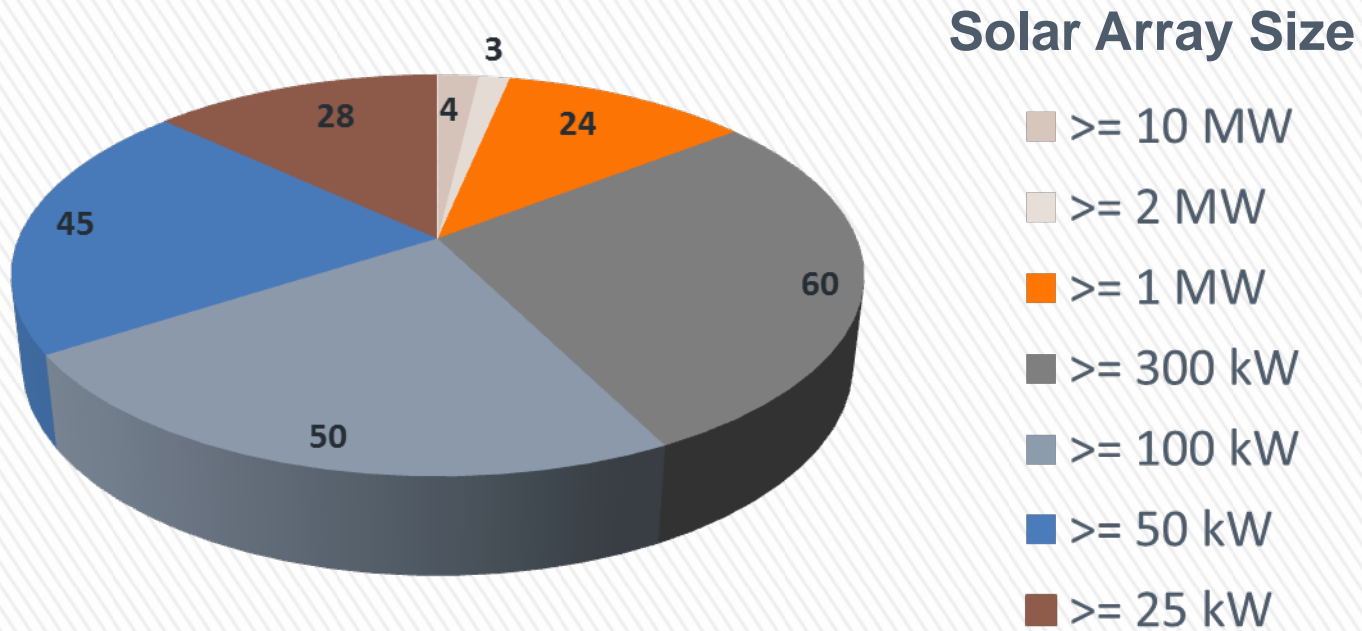
- School
- Public/Subsidized
- Apartment
- Industrial
- Municipal/Non-Profit/Church
- Condo
- Commercial
- Unclassified

School Buildings in City of Chicago: Breakdown of Potential Sites



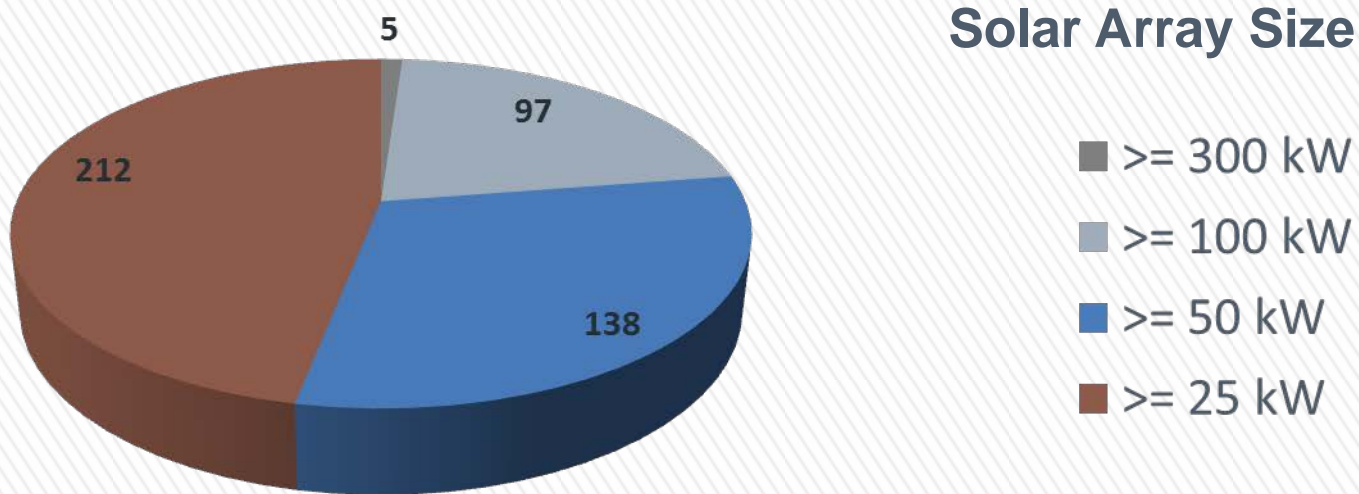
- A total of 2,249 schools appear to be good candidates for community solar
- There are 62 school buildings that could house rooftop solar arrays over 1 MW
- The majority of suitable school rooftops would be good-sized hosts for 100-300 kW projects

All Municipal Buildings in City of Chicago: Breakdown of Potential Sites



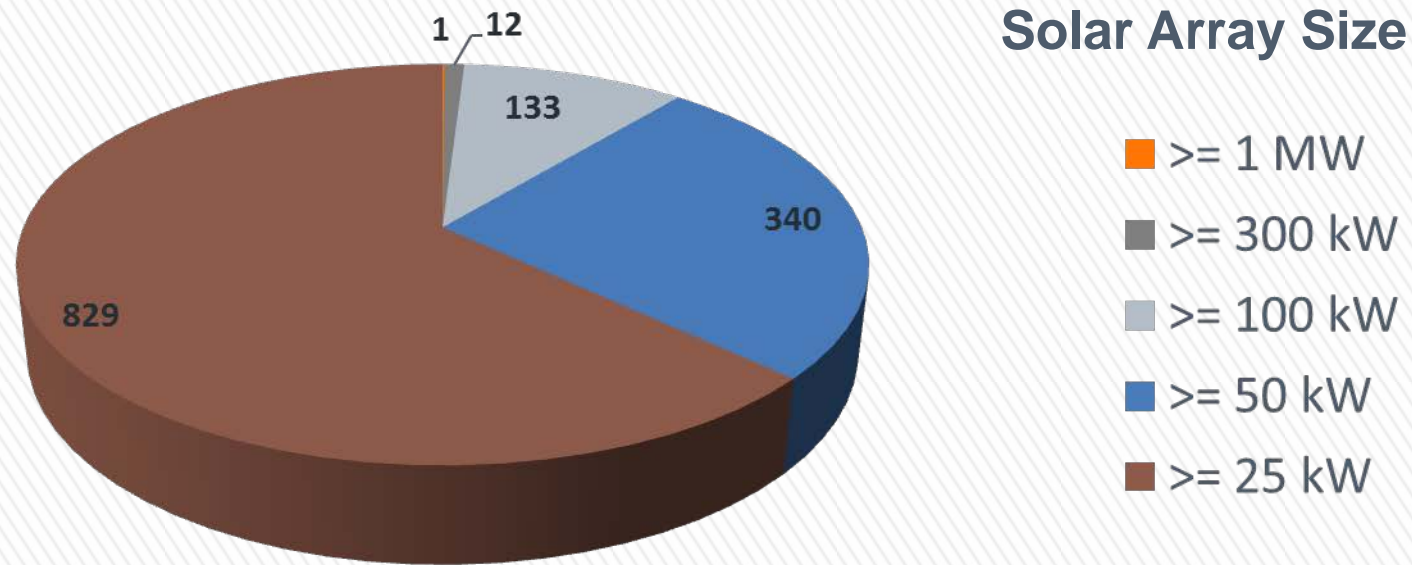
- 214 municipal buildings appear to be good candidates for community solar, based on our screening criteria
- 31 buildings could house a rooftop solar arrays over 1 MW

Public/Subsidized Housing Buildings in City of Chicago: Breakdown of Potential Sites



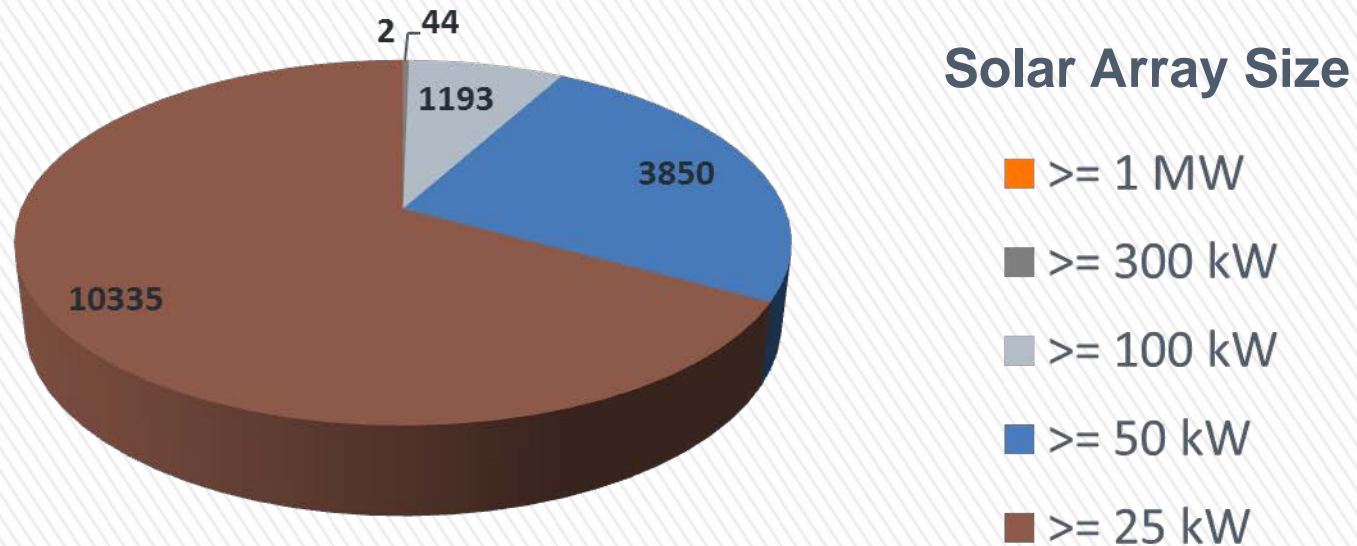
- 452 public or subsidized housing buildings appear to be good candidates for community solar
- There are 102 buildings could support rooftop solar arrays in the 100 - 300 kW range

Condo/Townhome Buildings in City of Chicago: Breakdown of Potential Sites



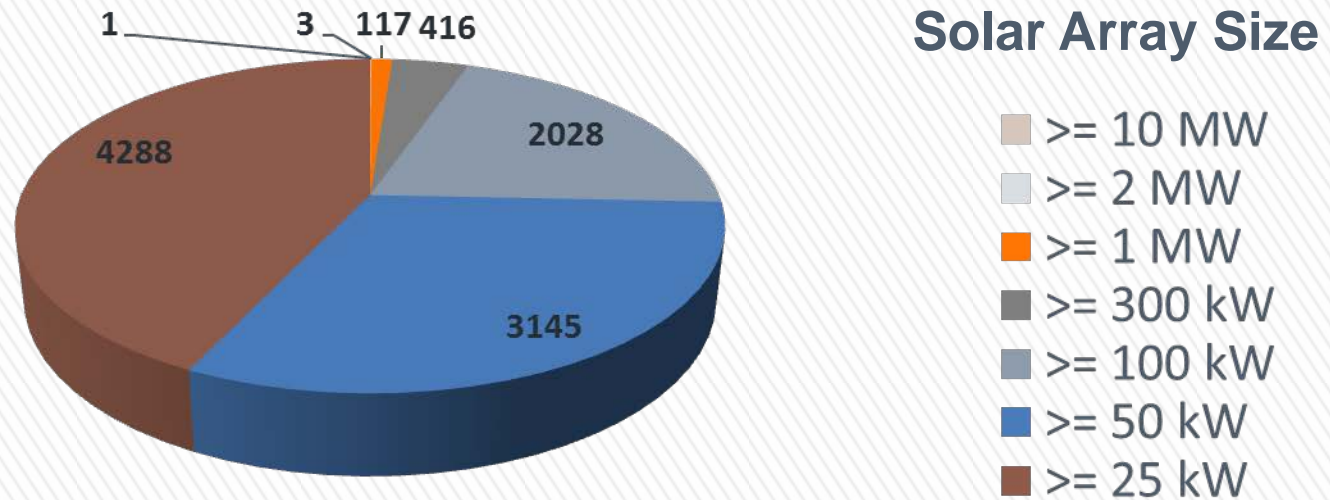
- 1,315 condominium/ townhome buildings appear to be good candidates for community solar
- 13 buildings could support rooftop solar arrays between 300 kW to 1 MW

Rental Apartment Buildings in City of Chicago: Breakdown of Potential Sites



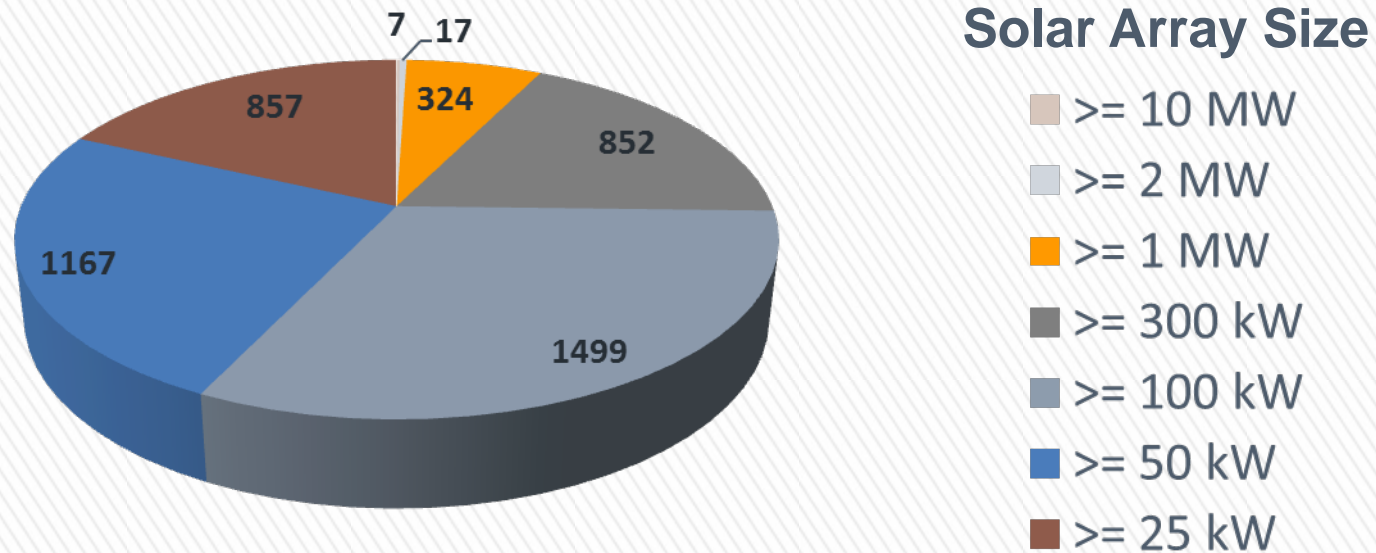
- A total of 15,424 rental apartment buildings appear to be good candidates for community solar
- 2 apartment building could house a rooftop solar array over 1 MW
- The majority of suitable apartment rooftops would be good-sized hosts for 25 – 50 kW projects

Commercial Buildings in City of Chicago: Breakdown of Potential Sites



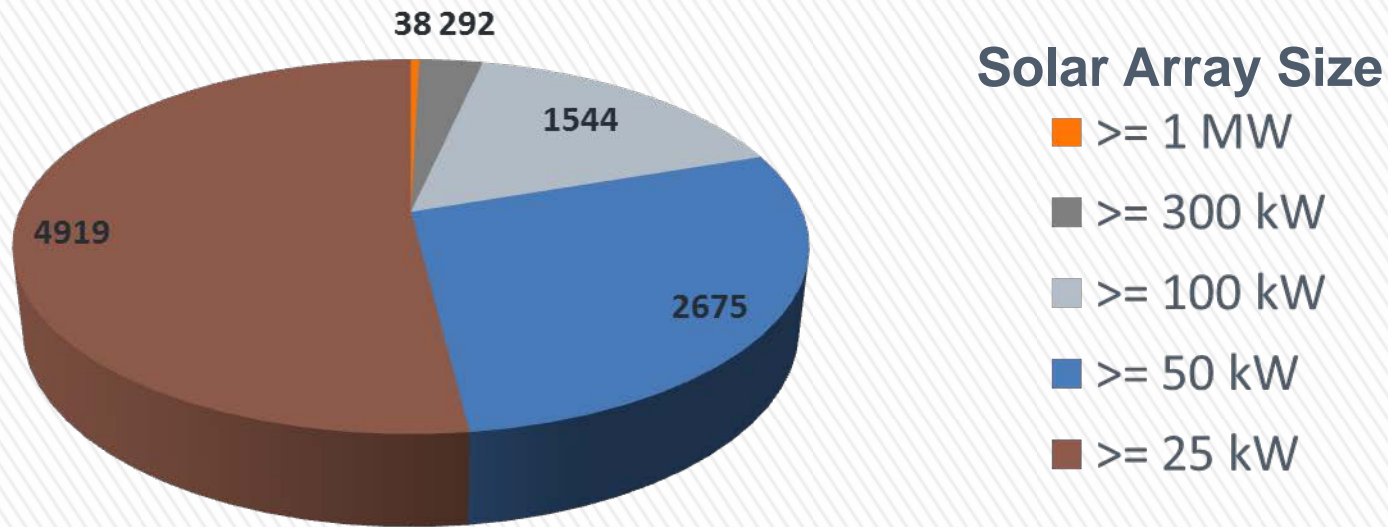
- A total of 9,998 commercial buildings appear to be good candidates for community solar
- 121 buildings could house a rooftop solar array over 1 MW
- The majority of suitable commercial rooftops would be good-sized hosts for 25 - 100 kW projects

Industrial Buildings in City of Chicago: Breakdown of Potential Sites



- A total of 4,723 Industrial buildings appear to be good candidates for community solar
- 348 industrial buildings could house a rooftop solar array over 1 MW
- The majority of suitable industrial rooftops would be good-sized hosts for 100 - 300 kW projects

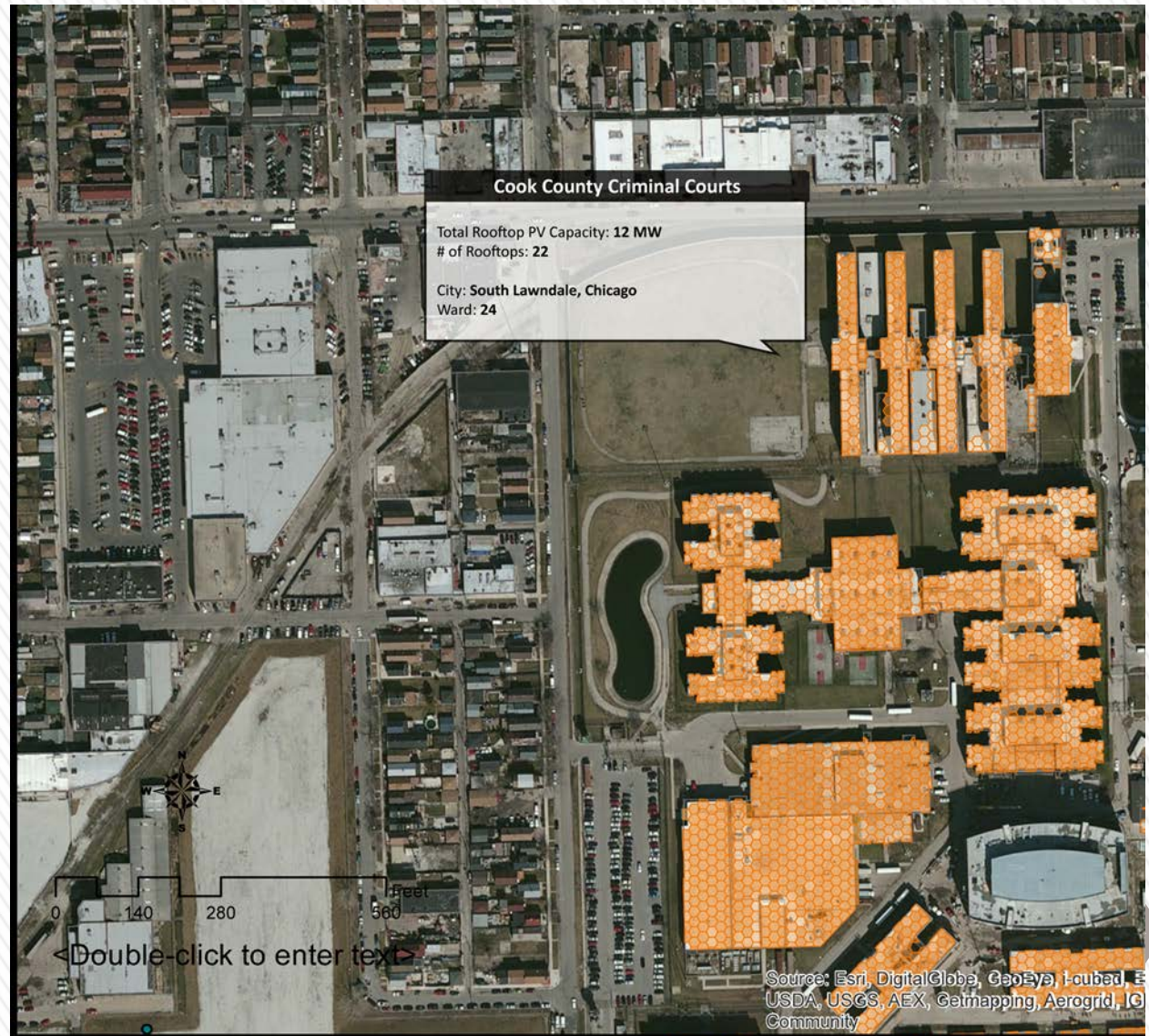
Other Buildings in City of Chicago: Breakdown of Potential Sites



- There are 9,468 unclassified buildings that could house a rooftop solar array over 25 kW
- 38 of these sites could support an array above 1 MW

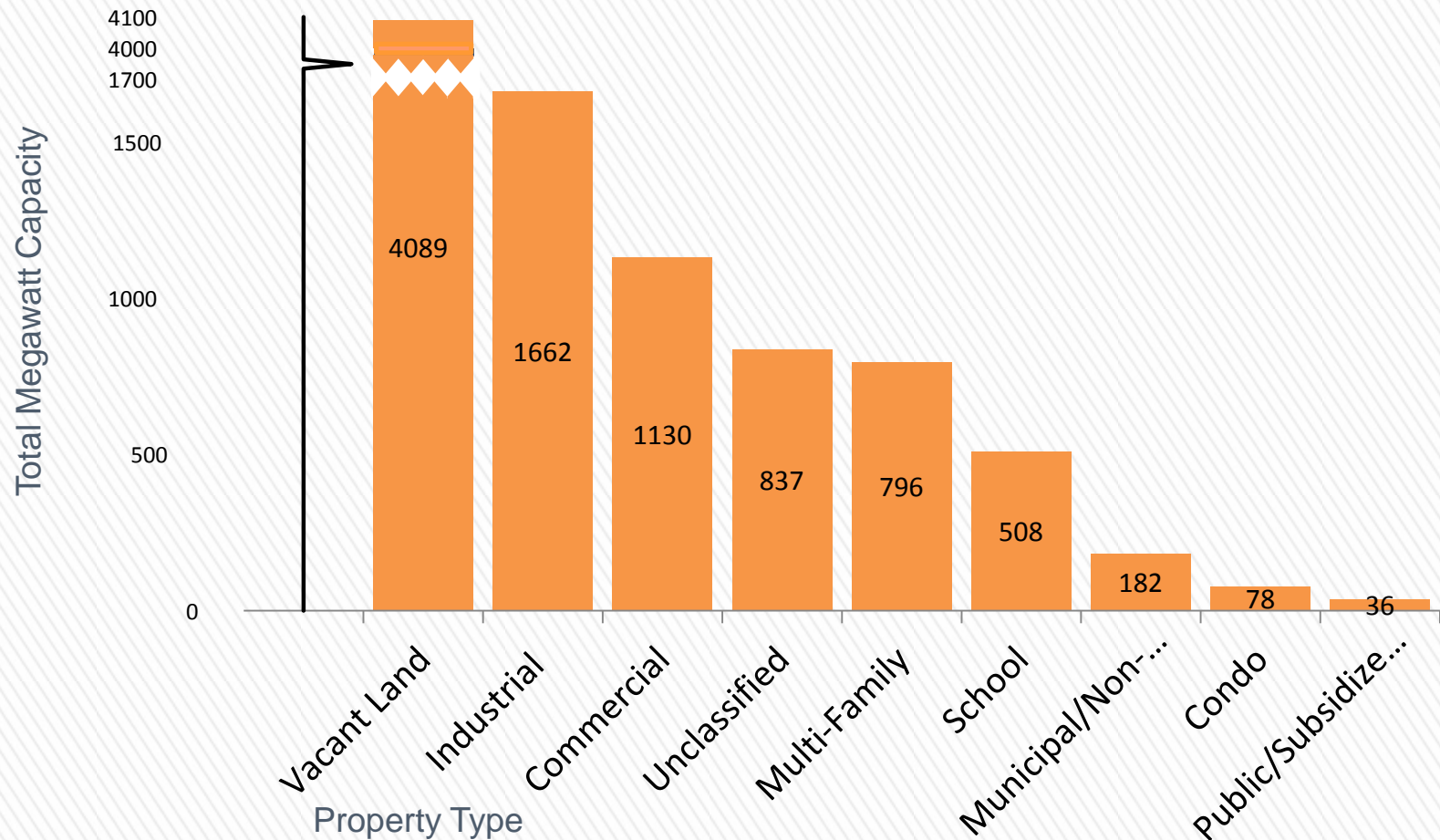
Screenshot of Potentially Suitable Site

- Cook County Criminal Courts
- Located at 2650 S California Ave
- 22 buildings on this property have suitable rooftops for systems ≥ 25 kW (6 buildings shown in example)
- Majority of the buildings at this site can hold a system between 300 kW to 1 MW



Megawatts of Solar Electric Site Capacity \geq 300 kilowatts in Cook County Vacant Land and \geq 25 kilowatts on City of Chicago Rooftops

There is over 9,000 megawatts worth of site capacity available for community solar projects in Cook County, which is nearly enough to offset all of Cook County's residential electricity use



Conclusions and Next Steps



Opportunity Assessment Conclusions

- 45,000 rooftops in the City of Chicago are suitable to host at least a 25-kilowatt solar electric system
 - > Properties that are not classified by the Cook County Property Assessor require further review to identify building use type
 - > Number will be larger when suburban Cook rooftop data is analyzed.

- 3,000+ vacant land sites in Cook County that are suitable to host at least a 300 kilowatt solar electric system

- Total Cook County Community Solar Capacity is over **9,000 megawatts**, enough to power 100% of the annual electricity consumption of:
 - 2,700,000 apartments in Cook County or
 - 1,250,000 single-family households in Cook County

Next Steps

- Integrate additional electric grid site selection criteria into dataset as information becomes available
- Stakeholder working group sessions
- Research community solar best practices and business models
- Begin localized pilot site selection process

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