Community Shared Solar

Rural Site Screening Overview

PROJECT SIZING

It is important to note that every project is different based on site specific considerations. This shouldn't, however, prevent us from providing general estimates of how these projects come together. This tool is intended to help community groups and landowners better understand the process of siting large scale solar projects in rural landscapes.

Commercial Scale Project Example		
Size - Direct Current (DC) Electrical Capacity	1,300 kW (DC)	= 1.3 MW (DC)
Size - Alternating Current (AC) Electric Capacity	1,000 kW (AC)[1]	= 1 MW (AC)
Number of Panels	4,561	*Assumption: 285 W / panel*
Footprint	5.5 Acres[2]	*Assumption: Range is 5-6 acres*
Annual Energy Output	1300 * 8760 * 13.4%[3] = **152,599,200 kWh**	*Assumption: PV System DC rating (kW) * 8760 hrs/yr * Designated Capacity Factor = PV System Estimated Annual Energy Production (kWh)*
Market Lease Payment	$9,000 - $13,000 / yr[4]	*Assumption: 1 MW (AC). Compensation ratio goes down substantially for smaller projects*

[1] The size of a solar system is usually communicated in kilowatts (kW) or megawatts (MW) DC (DC means direct current). DC power is produced by the panels and it must be converted to AC power by an inverter in order to feed into the utility grid system.
[2] Land Use Requirements for Solar Power Plants in the United States (NREL, 2013)
[3] Capacity Factor varies based on the rating / quality of the selected panels and the solar potential for the project's climate. Fixed ground-mounted arrays with Tier 1 panels in the Northeast can assume 13.4%, tracking arrays get 16%.
[4] The value of the lease payment varies based on the solar quality of the parcel - projects that are more desirable based on attractive site characteristics cost less to develop, which leaves more space in the budget for payments to landowners.

COMMERCIAL SCALE SOLAR RATIOS

- Footprint
    - ~180 kW / acre
    - ~5.5 acres / MW (AC)
- Lessee Compensation as of 2016
    - Low End: $1,600 / acre
    - High End: $2,363 / acre

LAND OWNERSHIP

1. **Privately-owned** land is ideal for community shared solar because there is one signer who can move quickly and make unilateral decisions with a project developer. This is viable for individuals, businesses, and nonprofits. The most significant consideration for private landowners is the potential change in tax status as a result of solar development.[5]
2. **Publically-owned** land may be able to be used for community shared solar, but the town / municipal owner will need to put the project out to bid through a formal RFP process, which can extend the project timeline significantly. Traditionally, these municipal projects send power to other municipal buildings and are not generally used to send power out to private homeowners.
3. **Land Trust / Other** not typically workable because of long-term conservation easements.

PHYSICAL SITE CONSIDERATIONS

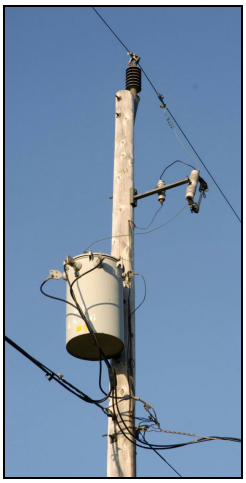
1. Good southern exposure
2. No wetlands
3. Relatively flat, south-facing slopes (less than 15% grade)
4. Preferably cleared or able to be cleared
5. 24/7/365 access road available (new / existing) to the facility if it's built
6. Few and/or friendly neighbors and abutters

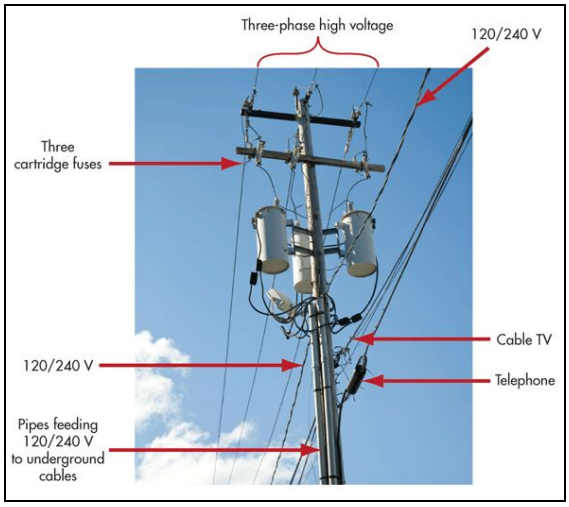
[5] Note: any parcels with agricultural or managed-forestry tax statuses will likely experience an increased tax burden and / or change penalty as a result of the addition of the solar farm. Land lease payments to the landowner should compensate for this change, while also providing additional payment.

7. No conservation restrictions. Key environmental issues include: the extent of wetlands / vernal pools, existing rights-of-way, zoning envelope / lot-line setbacks, endangered species / wildlife habitat, historical artifacts, etc.

POWER LINES / PROXIMITY

1. **Cost:** Roughly $125 / ft for utility to extend service
2. **Rule #1:** Projects over 200 kW should be within 1/4-mile of 3-phase power. The smaller the project, the closer it needs to be in order to be economically feasible.
3. **Rule #2:** Projects under 200 kW should be within ⅛-mile of single-phase or 3-phase power.

Common Types of Power Lines	
Single Phase Power Lines • **Visual:** 1 line running across the top of the utility poles. 1 transformer bucket located periodically. • **Capacity:** Can site projects up to 150 kW in size *maximum*. Not suitable for commercial scale projects.	

3-Phase Power Lines • **Visual:** 3 lines running across the top of the utility poles - separated by spreader bars. Multiple transformer buckets located periodically. • **Capacity:** Can site projects 2 MW+ in size. Suitable for commercial scale projects. • **Consideration**: Projects will be more affordable where there is significant electric load and limited electric production (ex. other distributed generation on the same circuit).	
Transmission Lines • **Visual:** Large transmission lines in utility corridors, supported by large steel structures. • **Capacity:** Not suitable for smaller commercial solar projects. • **Consideration:** Ownership of the lines often does not lie with local utility providers; voltage is much higher than distributed generation produces at.	

UTILITY CONSIDERATIONS

1. Who the is utility that owns power lines?
    a. Note: project subscribers who wish to receive financial benefit from a project through virtual net metering must be located in the same load zone and pay an electric bill to the same utility as the project in question. Load zones are geographic territories that break up the areas in which utilities operate (they often are split up based on historical utility zones from utilities that have since been bought by larger companies. Ex. National Grid purchase of NSTAR utility in Boston, MA metro area).

2. Avoiding the System Impact Study: Peak output of solar array needs to be less than half of the load on the circuit, otherwise you trigger costs for upgrading a substation or adding protective relays, which are often cost-prohibitive.
    a. **Good Example:** Industrial Park with open land. Circuit has a lot of manufacturing load but almost no distributed generation feeding the circuit. A 1 MW proposal will likely require a system impact study due to its size, but will likely not incur upgrade costs.
    b. Bad Example: Rural farm site where farm is the only significant load on the circuit. 3-Phase distribution lines built to serve needs of farming, but not for electric generation. A 1 MW proposal will likely incur a system impact study and could require an upgrade to the local substation and other protective measures, which could costs over $250,000.