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# SOLAR COMMONS™ SCALABILITY AND CONSTRAINTS ANALYSIS

SOLAR COMMONS PROJECT ANALYSIS PHASE 2 OF 2

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## ABOUT ROCKY MOUNTAIN INSTITUTE

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## INTRODUCTION

Solar Commons is a broadly scalable model, that could be applied to most behind-the-meter or community solar project in the US. This report starts by defining the total addressable market for the Solar Commons model then defines constraints that may limit Solar Commons growth. It finds that:

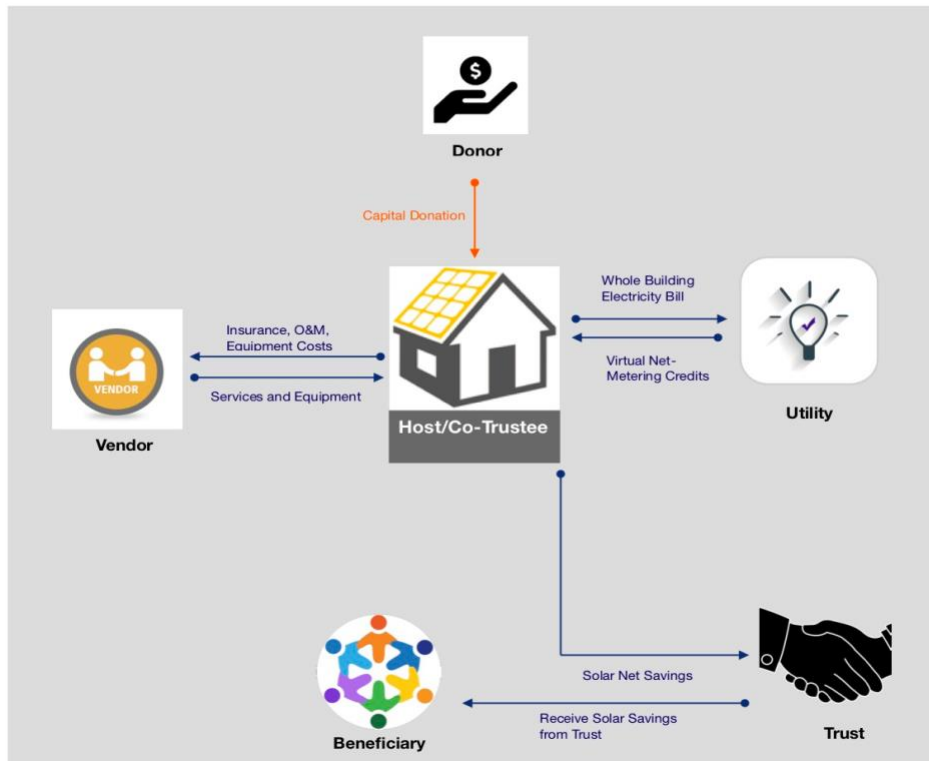
- The total addressable market for Solar Commons is 600 GW or more
- Availability of willing hosts and access to positive economics are most likely to constrain the potential market for Solar Commons
- Even considering binding market constraints, the total market potential for Solar Commons could be 10 GW or more

## TOTAL ADDRESSABLE MARKET

The Solar Commons model can be expanded to any location where the following actors can undertake the following actions:

- A **donor** can give money to pay for a project.
- A **host/ co-trustee** can donate the right to directly capture solar bill credits.
- A **vendor** (or qualified co-trustee) can build and maintains a project.
- A **utility** will provide some credit (net metering or otherwise) to a solar project.
- A **trust** can manage a project and distribute benefits.
- A **beneficiary** can capture benefits.

FIGURE 1: ACTOR AND RESOURCE FLOW IN SOLAR COMMONS MODEL



The Solar Commons model is broadly applicable and is not dependent on any specific policies (*e.g.*, community solar legislation). Since hosts in the Solar Commons model are generally commercial or industrial energy users, the **total addressable market** for the Solar Commons model will be linked to the potential market for commercial and industrial (C&I) solar.

By targeting commercial customers, Solar Commons has the potential to install larger scale solar projects compared with existing philanthropic models that tend to target residential customers. In 2016, NREL found the total **Technical Potential** for distributed commercial PV to be 600GW. This technical potential considers system and topographic constraints, land-use constraints and system performance. According to NREL's Report, the **Economic Potential** for midscale Commercial and Industrial solar was greater than 100 GW. The economic potential further considers projected technology costs, as well as available versus required revenue for renewable energy projects.

This report will consider the distributed commercial technical potential (600 GW) to be the **total addressable market** for Solar Commons projects. Solar Commons potential market will be analyzed based on constraints on the total addressable market.

## CONSTRAINTS TO SOLAR COMMONS SCALING

While the total addressable market for Solar Commons projects is 600 GW, several things must be true for a Solar Commons project to come into existence and therefore impact the model's market potential:

- *Hosts are willing to donate the right to capture solar credits*
- *Solar can provide net economic benefit<sup>i</sup>*
- *Donors are willing to provide capital*
- *Marketing and administration capacity is available*

The ability of the Solar Commons model to scale will be constrained by to what extent each of the factors above are true nationwide.

### Hosts are willing to donate the right to capture solar credits

The most significant constraint to scaling the Solar Commons model will be convincing commercial and industrial hosts to participate in projects.

First, a potential host must decide it wants to pursue solar. To get to that decision, the host must be aware of the opportunity and evaluate the opportunity in light of alternatives (*e.g.* alternate use of a rooftop for behind-the-meter solar; alternate participation in a Solar Garden where benefits are kept). Conversion of potential solar hosts is very low in the US solar industry: of 100 GW economically, beneficial C&I solar projects only 8% or 8 GW have been installed to date<sup>1</sup>. These statistics demonstrate that convincing hosts to pursue solar can be challenging.

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<sup>i</sup> Net economic savings are not strictly necessary for Solar Commons projects





Once a host decides it is interested in solar, the host must decide to participate in a Solar Commons project instead of directly capturing solar credits on its electricity bill. That decision will be determined in part by the host's belief that the project beneficiary is a worthy long-term recipient of the host's participation. Corporate donations (which totaled \$20 bn<sup>2</sup> in the US in 2017) for Solar Commons are tax deductible. Therefore, a host who participates in a Solar Commons project by donating funds to build a solar array on their rooftop or land (ground-mount) in a behind-the-meter system will be able to deduct that donation for tax credit. On the other hand, a host who participates in a Solar Commons project by allowing their rooftop or land (by lease or other arrangement) to be the site of an array donated to the trust by another entity will neither be eligible for a tax deduction nor subject to a tax liability. Such a host will see all costs of a Solar Commons project (i.e. insurance and Operations and Maintenance) deducted from their bill savings before the remainder is sent to the trust for distribution to the beneficiary. A host who participates by subscribing to a solar garden and sending their bill savings to the trust will likewise not be eligible for a tax deduction nor be subject to a tax liability. Solar Commons hosts who participate without tax deductions will be motivated primarily by marketing, or altruistic considerations.

It is difficult to estimate the likelihood that a host will participate in a Solar Commons project. Many potential hosts (particularly corporate or for-profit hosts) would prefer to directly capture bill credits from solar. Hosts may be motivated by the opportunity to benefit local non-profits while also demonstrating their green credentials by hosting a solar array<sup>ii</sup>. That said, even if one assumes that 10% of the 600 GW of potential hosts would be willing to donate the right to capture solar credits, the potential addressable market is 60 GW.

### Solar can provide net economic benefit

Assuming that capital donors want their donations to result in net positive economic benefits, Solar Commons projects need to provide a net economic benefit. Note that this condition is not strictly necessary, donors may be willing to donate to projects that do not provide savings, but they are more likely to donate to projects that provide net economic benefit.

As described above, according to NREL the total economic potential for US C&I rooftop solar is 100 GW of a 600 GW total potential market. This implies that one sixth of potential US projects provide net economic benefit. The portion of projects that provide net economic benefit will depend on local rates, policies (e.g. net metering), and solar costs, and are subject to change over time.

### Donors are willing to provide capital

Availability of willing donor capital is unlikely to meaningfully constrain Solar Commons scaling potential. In 2017, Giving USA estimates Americans donated more than \$410 billion to philanthropic causes (top causes supported were religion, education, and human services)<sup>3</sup>. Since any deserving organization could be a Solar Commons beneficiary, much if not all of that \$410 billion could *in theory* be redirected from a direct donation to a long-term contribution via a Solar Commons trust.

Unlike other philanthropic gifts, a Solar Commons donation will also lead to the creation of a solar array. Therefore, a Solar Commons donor must also support solar. Since 89% of Americans support solar, a large portion of the \$410 billion potential could be directed through solar projects<sup>4</sup>.

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<sup>ii</sup> Host may not be able to claim to be powered by solar power unless they claim and retire renewable energy credits.



Unlike other gifts, a Solar Commons beneficiary will receive small gifts over many years instead of a lump up-front payment. Donors, therefore must be patient contributors who are confident in the long-term value of the beneficiary.

Of the \$410 billion annual giving figure, if we assume 89% are willing to support solar and 30% are amenable to multi-year gifts, there is still more than \$100 billion potential giving for Solar Commons projects. \$100 billion could be used to fund 50 GW or more annually.

### **Marketing and administration capacity is available**

Finally, the model's ability to scale will be constrained by the ability of the Solar Commons project, non-profit and affiliated organizations to acquire hosts, secure donations, and administer projects that prototype standardized processes and decentralized structures for Solar Commons to grow as a publicly available tool of community empowerment.

Starting from a base of 1 MW per year, Solar Commons would need to sustain a new install growth rate of 246% over ten years to meet the total 100 GW addressable market. To meet just 1% of the total addressable market (1 GW) within 10 years, Solar Commons would need to double new installations each year.<sup>iii</sup>

While there are certainly many examples of organizations sustaining multi-year exponential growth, marketing and administrative capacity could meaningfully constrain the ability of the Solar Commons model to scale.

## **SOLAR COMMONS POTENTIAL MARKET**

Figure 2 below demonstrates how from a total addressable market (technical potential) of 600 GW there could be a potential market of 10 GW. It shows that from a total addressable market of 600 GW, there may be 60 GW of willing hosts. From the 60 GW of willing hosts, approximately 10 GW will be able to participate in projects that provide net economic savings. If (as discussed above) \$100 billion annual donations could be available for Solar Commons projects, in theory potential funding will not be a binding constraint. Similarly, though scaling the model will present significant administrative challenges, administrative scaling will not necessarily bind Solar Commons market potential.

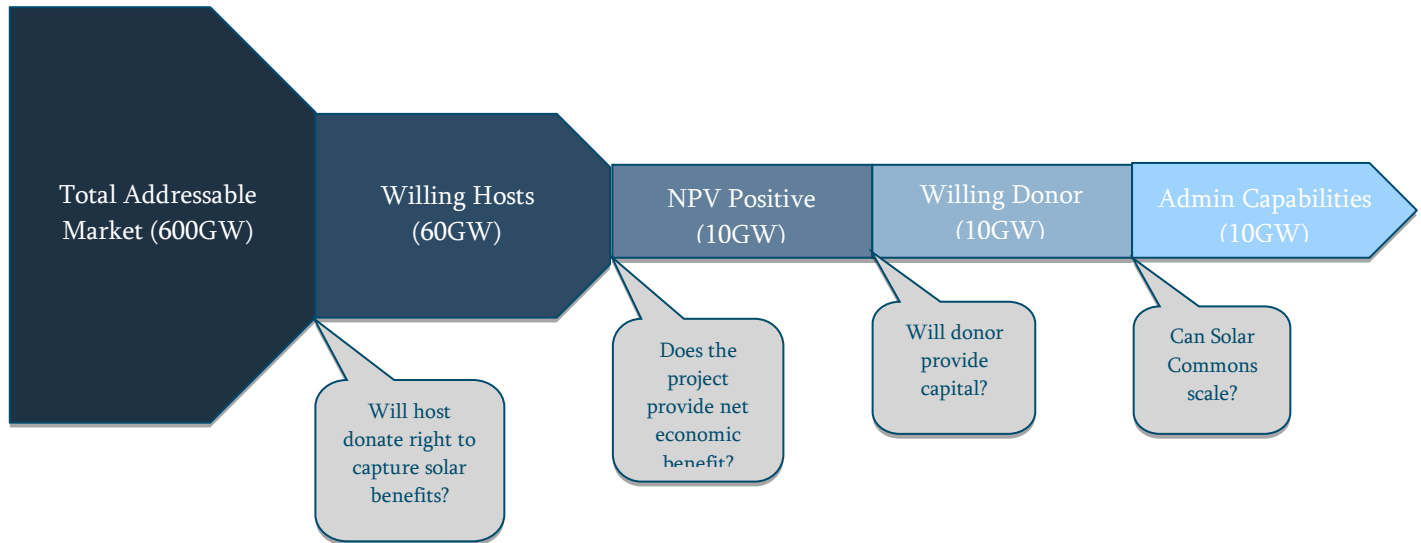
If Solar Commons captures just 1% of the identified market potential, it would lead to 100 MW of projects.

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<sup>iii</sup> See appendix for details



FIGURE 2: SOLAR COMMONS MARKET POTENTIAL



## CONCLUSIONS AND RECOMMENDATIONS

The Solar Commons model could serve a large (100 GW) total addressable market. Three key challenges to scaling the model will be: securing motivated hosts, finding projects that provide net economic savings, securing willing donors, and scaling capabilities to meet demand. Even given these constraints, market potential could be 10 GW or more.

Meeting a large portion of the potential market will not be easy. Below are several recommendations to enable rapid-scaling of the Solar Commons model:

- Focus on non-profit hosts and community-based organizations as potential hosts
- Identify and target beneficiaries who are highly compelling to both hosts and donors.
- Focus on a few target geographies to increase awareness of and comfort with the model. Initial target geographies should be regions where commercial solar is likely to provide net economic benefit.
- Standardize and streamline processes to reduce administrative requirements.



## APPENDIX

### Growth Required to Capture Total Addressable Market

*Annual Growth Rate: 246%*

Installed Growth Rate	1	2	3	4	5	6	7	8	9	10
MW Installed	1	3	12	41	143	496	1,716	5,938	20,548	71,100
Cumulative Installed (MW)	1	4	16	58	201	697	2,413	8,352	28,900	100,000

### Growth Required to Capture 1% of Total Addressable Market

*Annual Growth Rate: 99%*

Installed Growth Rate	1	2	3	4	5	6	7	8	9	10
MW Installed	1	2	4	8	16	32	63	126	250	499
Cumulative Installed (MW)	1	3	7	15	31	62	125	251	501	1,000





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<sup>1</sup> Bloomberg New Energy Finance, H1 2018 Renewable Energy Outlook, Commercial PV

<sup>2</sup> Barrons, 2017, <https://www.barrons.com/articles/u-s-charitable-giving-tops-400-billion-1528828278>

<sup>3</sup> Giving USA, 2017, <https://givingusa.org/giving-usa-2018-americans-gave-410-02-billion-to-charity-in-2017-crossing-the-400-billion-mark-for-the-first-time/>

<sup>4</sup> Pew Research, 2016, <http://www.pewresearch.org/fact-tank/2016/10/05/americans-strongly-favor-expanding-solar-power-to-help-address-costs-and-environmental-concerns/>





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