Community Solar Power

Obstacles and Opportunities

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All shortcomings, of course, are my own responsibility.

Cover photo: Greenhouse Solar Project, NC

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A program of ILSR, the New Rules Project helps policy makers to design rules as if community matters.

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Executive Summary

Community solar power can offer unique benefits in the expansion of solar power, from greater participation and ownership of solar to a greater dispersion of the economic benefits of harnessing the sun's energy. But community solar faces significant barriers in a market where the "old rules" favor corporate, large-scale development. New rules – better community solar policy and regulations – are needed to remove these barriers.

We define community solar as a solar PV project with multiple individual owners living in geographic proximity to the solar project, and sharing the costs and benefits of ownership of the solar project.

In this report, we explore whether community solar can:
- Overcome financial and institutional barriers to collectively-owned solar.
- Increase the number of people who can invest in and own decentralized solar power.
- Offer an affordable opportunity to "go solar."
- Disperse the economic benefits of solar power development.
- Tap unused space on existing structures rather than open ground for solar modules.
- Replicate.

Existing community solar projects have overcome barriers to get electrons flowing, but most fail to meet the remaining goals. However, their failure comes as much from solar policy – the old rules – as from project design.

Recent community solar policies have tried to address these shortcomings, but with mixed success and in limited areas of the country. A Washington state community solar incentive offers significant cash flow, but for a limited time. A Colorado solar gardens law creates a legal structure for community solar but perhaps at the expense of rooftop solar development. A handful of states have community net metering that offers only a small reduction in the significant barriers affecting community solar.

Future community solar policy still must address the following issues:
- Lack of access to federal tax incentives.
- Onerous securities regulations of community solar entities.
- Ground-mounted versus rooftop solar installations.
- Subscription or lease versus ownership shares.


Greenhouse Solar Project, NC

Introduction

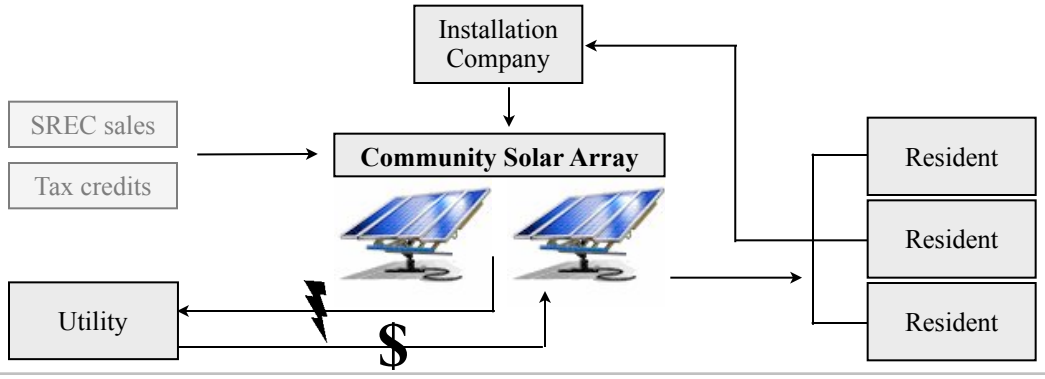
Solar energy is an attractive source of electric power. The sun shines everywhere and therefore solar energy can provide electricity in almost every corner of the country. Because solar is a distributed resource, it's also worth considering how more people can have a stake in producing the energy they consume and sharing in the economic benefits of a transition to clean energy.

Solar power can be developed by people with sunny rooftops or by big utilities or private companies. But should renters be able to invest in solar power? People with shady property or poorly orientated roofs? Should nonprofits and cooperatives be able to organize investors to reduce the cost of solar power? Should they receive the same incentives as commercial developers or utilities? Should the economic benefits of federal tax incentives and accelerated depreciation (funded by progressive income taxes) accrue to many, dispersed solar power generators rather than just a few large tax equity financiers?

Under the existing rules and incentives for solar power development, the answer is often 'no'. But a few emerging solar projects have overcome these barriers and in this brief we examine their business models and the potential for the "new rules" of community solar policy to create the opportunity for not only more distributed solar to come online but for more people to be able to participate in that development.

We define community solar as a solar PV project with multiple individual owners living in geographic proximity to the solar project, and sharing the costs and benefits of ownership of the solar project. **Figure 1** below provides a basic illustration of a community solar project.[1] Local residents create a community solar entity that hires a third party to install the panels. The entity may collect tax incentives and solar renewable energy credits (SRECs). Electricity is sold to the local utility, and the proceeds allocated by providing credits on the residents' electricity bills.

Figure 1 – Sample Community Solar Project Structure



In this paper, we explore whether community solar can:

- **Overcome existing financial and institutional barriers to collectively-owned solar**. Financial barriers include barriers to accessing federal tax incentives (the 30% tax credit and accelerated depreciation), rules that make it hard to raise capital (e.g. securities laws), and rules that prohibit easy sharing of electricity generation among geographically dispersed owners.
- **Increase the number of people who can invest in and own decentralized solar power**. Increasing participation means opening solar investment to people who traditionally cannot (i.e. renters or those with shady property). Increasing ownership means that participants are legal owners of their share of the community solar project, rather than holding a license or lease.
- **Offer an affordable opportunity to "go solar."** Good community solar policy will make community solar projects cost the same or less than individual ownership and preferably offer participants a good return on investment.

- **Disperse the economic benefits of solar power development**. Dispersing the benefits means broadening participation and more importantly ownership of solar power, so that the economic benefits accrue to many, varied investors.
- **Tap unused space on existing structures rather than open ground for solar modules**. Solar PV is uniquely suited among renewable energy technologies to claim unused roof-space and tap into the grid inexpensively in areas of high demand. Using open space for solar cedes one of its major technical advantages.[2]
- **Replicate**. Community solar can only accomplish the first five goals if it's easy to duplicate a project model.

The arrangement in **Figure 1** is common for community wind and a few community solar projects. In other cases, the community solar array is owned by the local municipal or cooperative utility and the local residents "subscribe" via a lease or power purchase agreement. But developing a community solar project often requires a special set of new rules to enable the business structure.

For example, community solar projects are often hindered by a barrier imposed by traditional net metering (***see inset***), which provides a bill credit and/or payment for net excess electricity generation for an individual on-site renewable energy project. For a community solar project, without a change in net metering law, it would be difficult to easily share the electricity credits with each of the owners or participants, even if they all lived in close proximity to the project. Community solar is enabled when net metering rules are revised to allow a group of meters to come together under a single project so that renters and shade dwellers can share the electricity output and value from the off-site solar array.

Net Metering

Net metering policy establishes standards for connecting small, on-site renewable energy generation. It allows the individual owner to essentially roll their meter backward when their system is generating electricity, hence the "net" metering of their consumption and production. Excess electricity is sold back to the utility at varying rates depending on the state.

Community solar can also be hindered by the structure of federal tax incentives. Rural cooperative and municipal utilities are good entities to do community solar – they are member-owned or -governed and have experience in managing the grid, building electricity generators, and handling the financing. But these entities don't pay taxes and therefore cannot use federal solar tax credits. Community solar could get a boost from a bill by Colorado Senator Mark Udall, that would change the federal solar tax incentive to allow it to be collected if a person owns *or leases* solar equipment for their primary residence.[3] This means a community solar project owned by a municipal utility and leased by residents could get federal tax credits passed through to the individual investors.

Ultimately, community solar policy can help disperse the economic benefits of transforming to a clean energy economy by expanding participation in and ownership of solar power generation.

The next section of this brief – Operational Community Solar Projects – provides a case study of nine existing community solar projects, and the succeeding section examines a few Other Models of Community Solar.

We then provide an Analysis of Existing Community Solar Projects and an analysis of Community Solar Policy, profiling two community solar policy recently enacted in Colorado and Washington and examining whether they overcome the barriers of existing solar policy rules.

The final section examines the shortcomings of existing community solar projects and community solar policy and explores what policy is yet needed.

Operational Community Solar Projects

Under the existing rules for solar power development, it's a complex process to proceed from a conceptual model of community solar electricity to an actual working system. Fortunately, a few projects have employed a variety of methods to overcome the barriers to community solar. This section profiles nine projects in seven different states (Colorado, Florida, Maryland, North Carolina, Oregon, Utah, and Washington), detailing the effort required to organize and finance a community solar project that creates a viable return on investment for participants. In this section we also evaluate and comment on whether these emerging community solar projects are effective and replicable models for breaking down barriers to solar development, expanding local ownership, and attaining affordability/profitability. We also compare them to the most appropriate non-community solar model: a solar lease or individual solar array ownership.

The route to a community solar project requires several complex steps:

1. Identifying an organizational format for pooling capital and accessing financing. Existing entities such as municipal utilities or rural electric cooperatives account for four of the five featured community solar projects.
2. Choosing an organizational format that allows for access to federal solar incentives including the 30% Investment Tax Credit (ITC) and accelerated depreciation. These incentives are only available to tax-paying individuals or entities. This means that the four projects developed by municipal utilities were not able to use federal solar incentives, but had to seek alternatives such as federal Clean Renewable Energy Bonds (CREBs), with zero percent interest, but limited by annual Congressional appropriations and IRS disbursement rules. The federal stimulus program has briefly allowed solar projects to take a cash grant in lieu of the ITC, but this program expires at the end of 2010.
3. Defining investor's rights to solar output. Investors in community solar can own specific solar modules, have ownership shares, or lease a part of the solar project and receive access to its electricity output. Most of the community solar projects described the participant's access as a lease, license, or subscription – a term-limited right to the electricity output from a certain amount of panel capacity, e.g. output from a 210 Watt module for 20 years.

Clean Energy Collective's Community Solar Project

Colorado – Clean Energy Collective

The solar installation by the Clean Energy Collective (CEC) is touted as the "first community-owned solar garden."[4] The 77.7 kW system was developed by CEC and is owned collectively by 18-20 customers of Holy Cross Energy, the local electric cooperative. The project leases land from the local wastewater treatment plant near El Jebel, CO.[5]

The cost of the system was $466,000 ($6 per Watt), in line with the expected installed costs (including maintenance) of $5-6 per Watt.[6] The final cost to customers is reduced by the 30% federal tax credit and was also reduced by a rebate from the utility and upfront sales of the renewable energy credits (RECs), a combined value of $1.50 per Watt.[7]

Owners of the panels paid $725 per panel (230 Watts) or $3.15 per Watt.[8] The 18-20 owners purchased as few as 1 panel and as many as 80 of the 340 total panels, although each owner could purchase no more than would supply 120% of their electricity consumption.[9] The price includes all applicable rebates and tax credits (all processed by the CEC).[10] Each owner will receive 11 cents per kWh produced by the panels, slightly higher than net metering because CEC negotiated a PPA with Holy Cross for the electricity.[11] The contract provides ownership rights for 50 years.

Figure 2 compares the ownership of a 2.1 kW share in CEC's El Jebel project with individual solar ownership. The individually owned system (also 2.1 kW) is expected to have an installed cost of $8 per Watt. Although no electricity price inflation figure was given, the national historic average of 2% was used. Our calculations show a 15-year payback, compared to the CEC projections based on a 5% inflation rate.

For this figure and all of the similar ones following, the figure does not show incentives claimed by the project owner or installer, but rather just the cost and incentives that can be claimed by the customer.

Figure 2 – CEC Solar Ownership Compared with Individual Solar Ownership

Share Ownership	
Customer Investment	**$6,615**
Net Installed Cost	**$6,615**
25-year value of electricity	
Net metered	**$18,267**
Simple payback	*13 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$4,095
State Rebate @ $1.50/W	-$3,150
Net Installed Cost	**$9,555**
25-year value of electricity	
Net metered	**$15,343**
Simple payback	*19 years*

The CEC's solar project gets high marks for overcoming barriers to investment and federal tax incentives, expanding participation and ownership, and at an affordable price. The location of the array gets an average grade for being ground-mounted but on "otherwise unusable land." The Clean Energy Collective seems to have a replicable model (based on the Colorado Solar Gardens legislation).

Community Solar Scorecard:	CEC
Overcome Barriers	**A**
Expand Participation	**A**
Expand Ownership	**A**
Affordable	**A**
Location	**C**
Replicable	**A**
CEC Overall	**A-**

Colorado – United Power's Sol Partners

The Colorado rural electric cooperative, United Power, recently completed a 10 kW solar project in Brighton, CO. The Sol Partners solar farm was financed in part with a one-time grant from the governor's office, and is owned by the utility. United Power's member-owners may lease a share of the solar farm in exchange for the solar output.

The Sol Partners solar array was constructed for $120,000 ($12 per Watt – a figure that reflects high module costs as well as metering, security, monitoring equipment). The utility was unable to receive the federal tax credit (that would have been worth $15,000).[12] Instead, United Power received a $50,000 grant from the Colorado governor's Energy Office and the utility provided an in-kind donation for the labor to construct the modules.[13] Lower module costs should make expansions of Sol Partners possible at $5.50 per Watt (if the utility installs them) or $4.50 per Watt if installed by a contractor that can capture the federal tax credit.[14]

The cost for participants is $1,050 for a 25-year lease (or "license") on a 210 Watt panel ($5 per Watt). The contract specifies that United Power can buy back the license at any time and that the buyback cost is the full value of the panel less 4% per year.[15]

The utility estimates that a single solar panel will generate $32 per year in electricity credits or a 3% return on investment based on expected electricity cost escalation of 5%. Historical national electricity price escalation (2% per year from 1990 to 2008) suggests this may be optimistic. Using 2% instead of 5% cuts the return on investment to zero. In the project FAQ, the utility responds that customers should contact a tax advisor about the federal tax credits, but it's doubtful this arrangement would qualify.[16]

Figure 3 compares a 10-share lease (equivalent to 2.1 kW) to individual ownership of solar. The individually owned array is the same size (2.1 kW) and expected to cost $8 per Watt installed, before federal and state tax credits.

The figure calculates the payback period with the more modest assumption about price inflation (2%). The payback for the original assumption of 5% (not shown) was 20 years for the SolPartners Lease, 19 years for individual ownership.

Figure 3 – Sol Partners Solar Lease Compared to Individual Ownership

SolParters Lease	
Customer Investment	**$10,500**
Federal tax credit	$0
Net Installed Cost (with credit)	**$10,500**
25-year value of electricity	
Net metered	**$10,250**
Simple payback	*26 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$4,095
State Tax Credit $1.50/W	-$3,150
Net Installed Cost	**$9,555**
25-year value of electricity	
Net metered	**$10,250**
Simple payback	*24 years*

The business model used by Sol Partners was successful in developing a collectively owned project without utilizing the federal tax incentives, but is not creating an attractive return on investment because of strikingly high capital costs. The project overcame the barriers of tax liability and securities laws by using the existing rural cooperative structure and finding a one-time grant from the governor's office. Being only 10 kW, it helps expand participation modestly (though not ownership), but at a price that is no better than individual solar ownership (and offers no payback with a more conservative inflation estimate). The solar array is an open field design that required additional investments to secure the system (perhaps avoidable with a roof-mounted system). The project has good prospects for expansion, but is scarcely replicable given the one-time grant and high initial cost.

Community Solar Scorecard:	Sol Partners
Overcome Barriers	**B**
Expand Participation	**C**
Expand Ownership	**F**
Affordable	**C**
Location	**F**
Replicable	**D**
Sol Partners Overall	**D+**

Florida Keys Electric Cooperative (FKEC) Simple Solar Program

The FKEC Simple Solar Program is a solar leasing program for members of the cooperative. The cooperative completed construction of a 96.6 kW solar array in 2008 financed with federal clean renewable energy bonds (CREBs).[17]

The leasing program allows customers to pay $999 to lease a 175-Watt panel for 25 years (a cost of $5.71 per Watt), entitling them to the retail value of the electricity produced by each panel for 25 years. The utility retains control of the renewable energy credits.[18]

With the co-op's assumption of 3% inflation in electricity prices (slightly above the historical average of 2%), the customer would see their investment pay back (in nominal dollars) in 21 years, receiving approximately $1,280 from the value of the solar electricity over 25 years.[19] **Figure 4** provides a comparison to individual ownership of a similarly size solar array (2.1 kW). Electricity price inflation is calculated at 2% for consistency with other project financial analyses; using 3% reduces payback time by 2 years for Simple Solar customers and 1 year for the individually owned system, respectively.

Customers who move within the utility's service territory can continue to receive the electricity value from the panels. Those who move outside the territory can assign the value to another cooperative customer.

Figure 4 – Simple Solar Program Share Ownership Compared to Individual Ownership

Share Ownership	
Customer Investment	**$11,991**
Net Installed Cost	**$11,991**
25-year value of electricity	
Net metered	**$13,837**
Simple payback	*23 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$5,040
Net Installed Cost	**$11,760**
25-year value of electricity	
Net metered	**$13,837**
Simple payback	*22 years*

The FKEC leasing program overcomes traditional financial and securities law barriers to investment, in part by getting CREBs in lieu of federal tax incentives. It also helps expand participation in solar. It provides a taste of solar ownership by providing a connection between a specific solar installation and the customer, but it doesn't provide the same producer relationship as does individual ownership. It does make solar more affordable, with an upfront cost significantly below individual ownership and a simple payback within 21 years. The solar array doesn't use existing structures, and would be hard to replicate given the dependence on CREBs, which require annual Congressional appropriation and an IRS allocation.

Community Solar Scorecard:	Simple Solar
Overcome Barriers	**A**
Expand Participation	**A**
Expand Ownership	**D**
Affordable	**A**
Location	**F**
Replicable	**D**
Simple Solar Overall	**C+**

Maryland – University Park Solar

The University Park Solar community solar project is a private membership limited liability company (LLC) whose 22 kW solar array was dedicated in June 2010. The LLC structure is quite common for community wind power but is new to community solar power, and selling the electricity to a local church is also a unique feature.

The $126,000 ($5.75 per Watt installed) solar array is financed by over 30 members, with investments largely in the $2,000-4,000 range.[20] The project LLC will also receive the federal tax credit and accelerated depreciation (the effective cost per Watt to investors is $2.27).

The solar array is installed on a local church and members are Maryland residents.[21] The investors in University Park LLC are full owners, with no expiration on their rights to a share of the project revenues.

The LLC will generate revenue from the sale of electricity to the church (at an initial rate of $0.13 per kWh). The project will also sell the solar renewable energy credits (SRECs) worth $0.25 per kWh.[22] These tradable credits have market value of around $0.36 per kWh, but the community solar LLC will sell them to the solar installer (Standard Solar Inc) at a discount to avoid having to participate in the market.[23] The project's financial statement expects a 5-year payback on the initial investment.

Figure 5 compares the economics participation in the community solar project to individual ownership. The individual solar array (2.1 kW) is assumed to cost $8 per Watt installed and to generate $0.119 per kWh under net metering and $0.25 per kWh for solar RECs. Both solar arrays are assumed to generate 2,919 kWh per year (15.9% capacity factor). The customer investment for the LLC is factored to match the 2.1 kW capacity used in the individual analysis. The LLC did not factor inflation into its cash flow estimates, so an assumption of modest inflation (2%) was used.

Figure 5 – University Park Community Solar Share Compared to Individual Ownership

Investment in LLC	
Customer Investment	**$4,767**
Net Installed Cost	**$4,767**
20-year value of electricity	
Net meter @ $0.12	$9,220
SRECs @ $0.25	$17,731
	$26,951
Simple payback	*5 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$5,828
State Grant $1.25/W	-$2,625
Net Installed Cost	**$8,348**
20-year value of electricity	
Power sale @ $0.13	$8,440
SRECs @ $0.25	$17,731
	$26,171
Simple payback	*9 years*

It should be noted that the solar renewable energy credit value will likely fall over time as the falling price of new solar power converges on the rising retail electricity price, but since this would affect both scenarios equally, the value was assumed to remain constant.[24]

The one complication for the University Park Solar project is that, being a private enterprise, they have to comply with the Securities and Exchange Commission's regulations for investors. Although they avoided

the costs of full registration (in the hundreds of thousands of dollars) by restricting themselves to in-state investors, it limited the project in other ways. They can have no more than 35 "unsophisticated" (non-wealthy) investors, are not allowed to advertise other than by word of mouth, and each member must complete a 10-page financial disclosure form for the state of Maryland.[25] This issue is discussed in greater detail later in this paper.

The University Park project is a well-executed community solar project. It impressively overcame financial and securities barriers and did not use one-time grants. This business model certainly expands participation and ownership in solar power. The economics are very good for participants, provide less cost and risk than individual ownership and the investment is affordable in its own right. The project can be replicated, but the securities regulations surrounding the number and location of investors will make it a bit more complicated.

Community Solar Scorecard:	University Park
Overcome Barriers	**A**
Expand Participation	**A**
Expand Ownership	**A**
Affordable	**A**
Location	**A**
Replicable	**C**
University Park Overall	**A-**

North Carolina – AIRE Greenhouse Solar Project

This 2.4 kW solar project was put together by the Executive Director of the Appalachian Institute for Renewable Energy (AIRE), Steve Owen, as a private LLC. It was funded by investments from 7-10 individuals and the electricity is sold to the AIRE building under a power purchase agreement and its not grid-connected.

The total installed cost including LLC operation expenses was $8.34 per Watt, but this price was reduced substantially by federal and state tax incentives (NC has a 35% state tax credit). It was designed as a teaching project, so most installation costs were zero. The project receives close to $0.10 per kWh under the annual contract with the building. If it does get an interconnection agreement, it would be able to sell its power plus RECs to NC Green Power for $0.15 per kWh. **Figure 6** compares ownership of 2.1 kW in the Greenhouse Solar project to individual solar ownership of a 2.1 kW array. The individual system is expected to cost $8 per Watt installed and receive net metering at $0.078 per kWh (we assume that if the Greenhouse Solar Project could not interconnect, neither will the individual system).

Figure 6 – Greenhouse Solar Investment Compared to Individual Solar Ownership

Share Ownership	
Customer Investment	**$4,010**
Net Installed Cost	**$4,010**
25-year value of electricity	
Net metered	**$9,197**
Simple payback	*13 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$3,276
State Tax Credit (35%)	-$5,880
Net Installed Cost	**$7,644**
25-year value of electricity	
Net metered	**$7,395**
Simple payback	*26 years*

Because module prices had peaked around the time this project was installed, project owners expect expansions to feature lower module prices but also no free labor. Overall, they are anticipating lower costs for future installs ($7 per Watt).[26]

The Greenhouse solar project does a good job of overcoming barriers to community solar and provides access to federal tax incentives for investors. It expands participation in solar, although only in a small project (so far). It gets high marks for ownership, but a middling grade for affordability because it was near the same cost as individual ownership. With the array on a local building it gets an 'A' for location, but is probably not very replicable because much of the financial return depends on the building owner's willingness to accept green pricing.

Community Solar Scorecard:	Greenhouse Solar
Overcome Barriers	**A**
Expand Participation	**C**
Expand Ownership	**A**
Affordable	**C**
Location	**A**
Replicable	**D**
Greenhouse Solar Overall	**B**

Oregon – Solar Pioneer I and II

The city of Ashland, OR, has developed two community solar projects through its municipal utility, Solar Pioneer I and II. The first phase was a 30 kW solar installation split between the Shakespeare Festival, Southern Oregon University and the Civic Center. This first phase project did not allow community members to buy shares, but was built as an educational tool on four separate sites.[27]

The second phase is a 64 kW community solar system installed on the covered parking area of the city service center and owned by the municipal utility. The 363 175-Watt panels cost $442,000 (~$7 per Watt) and the solar array provides electricity for the municipal utility.[28] The project was funded with clean renewable energy bonds (CREBs) that Bank of America purchased at 1.25% interest. The Oregon

Business Energy Tax Credit Pass-Through allowed the Bank of the Cascades to buy a tax credit worth 35% of the system value – at the discounted price of 25.5% of the system value – and to take the credit over five years.[29]

Citizens of Ashland can purchase the output of a panel for 20 years, in 44 Watt increments for $207 ($4.71 per Watt).[30] In this respect, the Ashland community solar project allows investors to buy a 20-year block of electricity at a fixed rate insulating themselves from future cost increases in their utility's electricity rates (currently at $0.06 per kWh).

The economics for Ashland's community solar project are not as favorable for some (maybe most) participants as individual ownership would be, given the available incentives. The city provides rebates for solar PV, with a $2.25 per Watt residential rebate and a $1.00 per Watt commercial rebate, both capped at $7,500 per customer.[31] But since residents can get both a 30% federal tax credit and an $3 per Watt state solar PV rebate ($6,000 cap), the payback on ownership happens twice as fast as an investment in the community solar project (**Figure 7**). The ownership calculations do not include the sale of the renewable electricity credits (RECs), which would make payback even faster. The RECs for Solar Pioneer II are being held by the utility as a hedge against a possible renewable energy standard policy being adopted. Both forms of ownership get revenue in the form of a net metering credit.

The assumed inflation factor of 3% is slightly above the historic average of 2% and the latter was used for the calculations in **Figure 7**. Using 3% would subtract approximately 4 years from the payback for the Solar Pioneer II investment and 1 year from the payback for the individually owned system.

Figure 7 – Investment in Solar Pioneer II Program Compared to Individual Ownership

Investment	
Customer Investment	**$9,900**
Share (%)	0.3%
Electricity price inflation	3.0%
20-year value of electricity	
Net meter @ $0.06 inflated at 2%/yr	**$5,209**
Simple payback	*34 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
City Utility Rebate	-$4,725
State Tax Credit	-$6,000
Federal Tax Credit	-$1,823
Net Installed Cost	**$4,253**
20-year value of electricity	
Net meter @ $0.06 inflated at 2%/yr	**$5,209**
Simple payback	*17 years*

Ashland overcame barriers to community solar in the same fashion as Ellensburg, even receiving funds from one of the same organizations (the Bonneville Environmental Foundation). It was also not able to access federal tax incentives. The project is expanding participation in solar, not ownership, but the cost to participants is nearly twice that of individual ownership. This is because the generous incentives from the city and state are only available to individuals and not Ashland Solar Pioneer participants. Furthermore, since panel subscriptions expire after 20 years, participants will never get their up-front investment money back, making this a pre-pay green pricing scheme. The Ashland project is clever use of existing space, covering a city parking area with solar panels. Overall, the project is not very replicable because it uses clean renewable energy bonds (CREBs) subject to annual appropriations of Congress as well as one-time assistance (marketing and monitoring) from the Bonneville Environmental Foundation.

Community Solar Scorecard:	Ashland
Overcome Barriers	**A**
Expand Participation	**A**
Expand Ownership	**F**
Affordable	**F**
Location	**A**
Replicable	**D**
Ashland Overall	**C+**

Utah – St. George's SunSmart

SunSmart in St. George, UT, is a 100 kW solar farm operated by The City of St. George Energy Services Department and Dixie Escalante Electric. Each entity provided half the capital for the solar farm, with plans to expand it up to 2,000 kW.[32] The two utilities split the renewable energy credits for the project, which are sold through a broker for about a half cent per kWh (a low price because Utah has no mandatory renewable portfolio standard).

Citizens of St. George can buy up to 4 kW of the solar farm, in half-share (0.5 kW) increments costing $3,000 apiece ($6 per Watt), with ownership lasting 19 years. The share is guaranteed to provide at least 800 kilowatt-hours (kWh) per year, although the expected generation is 1,680 kWh (and early results suggest the estimates were correct).[33] The state of Utah provides a 25% tax credit (maximum of $2,000) for the purchase and state law treats solar share ownership the same as owning your own solar panel. Federal tax credits are not available to participants because it only applies to people who have title to their solar investment and not just a share of output.[34]

The solar farm started operations in January 2009 and had sold 26.5 shares (about one-quarter of the output) by September 2009.[35]

Figure 8 compares the costs of private ownership with a subscription in the SunSmart program. Customer of either are expected to net meter the solar electricity, and to receive $0.068 per kWh (the residential electric rate for the St. George city utility; the rates in Dixie Escalante territory are lower, only $0.055 per kWh).[36] Payback was estimated over 20 years for consistency of comparison.

The project marketing does not include an estimate of electricity price inflation, which has historically been around 2%. Factoring this in to the estimate reduced payback times by 12-13 years (not enough for the subscription to pay back by the end of the 19 years).

Figure 8 – SunSmart Share Ownership Compared to Individual Ownership

Share Ownership	
Customer Investment	**$12,600**
State Tax Credit	-$2,000
Net Installed Cost	**$10,600**
20-year value of electricity	
Net meter @ $0.068	**$5,829**
Simple payback	*32 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
State Tax Credit	-$2,000
Federal Tax Credit	-$4,440
Net Installed Cost	**$10,360**
20-year value of electricity	
Net meter @ $0.068	**$5,829**
Simple payback	*32 years*

The SunSmart solar installation was relatively unique in combining the financing power of two local utilities without outside capital. While the project did not get federal incentives, it was designed to allow participants to get a Utah state tax credit. It will expand participation, though not ownership, of solar in St. George. The program ranks poorly on affordability because the program shares last only 19 years, less than half the time for an investor to make back their initial investment. This is another example of pre-paid green pricing. Compared to individual ownership the economics seem reasonable, but only because individual ownership is a uniquely poor investment in Utah compared to the other states with community solar projects. The project is an open-field array, so it scores poorly on using existing space. SunSmart is a replicable upfront capital financing model, but it depends on the altruistic nature of community residents to purchase shares.

Community Solar Scorecard:	SunSmart
Overcome Barriers	**B**
Expand Participation	**A**
Expand Ownership	**F**
Affordable	**F**
Location	**F**
Replicable	**C**
SunSmart Overall	**C-**

Washington – Ellensburg Community Solar Project

Interestingly, only two solar projects are receiving incentives under the state's community solar law and the Ellensburg Solar Project is one of them.[37] However the project was unable to receive federal tax incentives because it is owned by the Ellensburg public utility, a nonprofit entity that could not use the federal tax credits. The utility has constructed a 58 kW array in two phases.

The first phase – 36 kW – came online in November 2006 and cost $7.91 per Watt. It was financed with voluntary investments from 73 individual contributors (averaging $1,400), the Bonneville Environmental Foundation, and the Bonneville Power Administration's (BPA) Conservation Rate Credit. Phase Two – 22 kW – was financed with a grant from Central Washington University and a second grant from BPA's Conservation Rate Credit.[38]

The entirety of the electricity generated by Phase I is credited to the 73 contributing individuals in proportion to their contribution, for a term of "20+ years."[39] Their share of the array's electricity production is credited back on their electricity bills at the BPA wholesale rate, so it's as though each individual has their own small solar array generating on-site electricity. Because the net metering credit will be insufficient to pay off the initial investment for more than 50 years, investors would be unlikely to get a return on their investment.

Instead, the investors are buying a pre-paid block (20 years worth) of electricity. And since they are paying more than they will get in return, they are paying a premium. This appears to mimic traditional green pricing programs where customers voluntarily pay a higher rate for electricity from renewable resources. The original project could be fairly labeled "pre-paid green pricing."

However, after the passage of amendments to the state renewable energy production incentive in 2009, investors may be able to receive a $0.30 per kWh state incentive (until 2020) in addition to their credit from the public utility. This incentive program provides a base rate of $0.15 per kWh for renewable energy projects and provides a multiplier for community projects (2x), projects using an inverter manufactured in Washington (1.2x) and for solar modules built in Washington (2.4x).[40] This will make an enormous difference in the economics, as shown in **Figure 9**.[41] The split share value in the far right column is shown because the project gets the state incentive for the first 10 years, until it expires.

Figure 9 – Payback for Local Investor in Ellensburg Solar Project

	Original Credit	Credit with State Incentive
Customer Investment	$1400	$1400
Share (%)	1%	1%
BPA Wholesale Rate	$0.05	$0.05
Annual share value (kWh)	520	520
Annual share value ($)	**$26**	**$182 / $26**
Simple payback	***54 years***	***8 years***

While the state incentive significantly improves the economics for community solar projects, it does not do as much for individually owned ones. The base rate for individually owned projects is $0.15 per kWh, but a 2009 update to the production incentive raised the base rate for community solar to $0.30 per kWh. The following comparison (**Figure 10**) illustrates how a community solar subscription pays back much faster than private ownership. In both cases, the owner/investor is assumed to receive the state production incentive for 10 years.

Adding an inflation assumption for general electricity prices (the national historic average of 2%) makes almost no difference to the community solar investor, but shaved off approximately 14 years from the payback time for individual solar ownership.

Figure 10 – Investment in Ellensburg Community Solar Compared to Individual Ownership

Investment	
Customer Investment	**$8,167**
Net Installed Cost	**$8,167**
20-year value of electricity	
Wholesale @ $0.05	$3,685
Comm. solar incentive @ $0.30 for 10 yrs.	$9,100
	$12,785
Simple payback	*8 years*

Individual Ownership	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$5,040
Net Installed Cost	**$11,760**
20-year value of electricity	
Wholesale @ $0.05	$3,685
Ind. solar incentive @ $0.15 for 10 yrs.	$4,550
	$8,235
Simple payback	*34 years*

Ellensburg's community solar project was the result of innovative collaboration, bringing together many partners to overcome financial barriers (although it was unable to use federal incentives). It expanded participation, though not ownership, of solar power. In terms of price, the initial project was no more than a pre-paid green pricing program, costing investors more than conventional electricity and requiring them to pay up front. The state's community solar incentive of $0.30/kWh changes that significantly, but the project's grade on affordability will average the initial design and the result of state policy. The location is open space, but is graded up slightly because of its high visibility location adjacent to Interstate 90.[42] Given the significant grants and contributions from foundations, the project is not particularly replicable.

Community Solar Scorecard:	Ellensburg
Overcome Barriers	**B**
Expand Participation	**A**
Expand Ownership	**F**
Affordable	**C**
Location	**C**
Replicable	**D**
Ellensburg Overall	**C**

Washington – Solar for Sakai

This 5.1 kW system was built by Community Energy Solutions with a grant from Puget Sound Energy and charitable contributions from citizens in Bainbridge Island, WA. It is the second of two solar projects to receive the Washington solar production incentive and is installed on the Sakai Intermediate School on Bainbridge Island.

The total project budget was $50,000, with $30,000 from 26 contributions from individuals or organizations and the remainder from a Puget Sound Energy grant for solar in the schools. The 5.1 kW array produces about 6,120 kWh per year and the school receives a net metering credit in addition to the state's production incentive ($0.15 per kWh) for the electricity.

Contributors to the project are just donors, and the only financial value of their contribution is the charitable tax deduction. Therefore we provide no analysis of the value to the contributor.

The school's system will be expanded by Community Energy Solutions, who has obtained a $7,500 grant from the local Rotary Club and some sustainability money from the school. With this and other funds they hope to double the system size by the end of 2010.

Because the school is the project owner (and not one of the qualifying entities in the state's community solar initiative, the project does not get the higher community solar incentive (30 cents).[43]

The Solar for Sakai problem in an interesting model, using a utility grant for schools and the generosity of charitable contributions to get a small solar array built, but failing to get any federal tax incentives (or even the higher state community solar incentive). It expands participation, though only via a small array, and does not encourage solar ownership. The project was relatively expensive and offers little financial value to contributors. It receives high marks for location on the roof of the local school, but is a poor model with its dependence on altruistic solar donors.

Community Solar Scorecard:	Sakai
Overcome Barriers	**B**
Expand Participation	**B**
Expand Ownership	**F**
Affordable	**D**
Location	**A**
Replicable	**F**
Sakai Overall	**C-**

Other Models of Community Solar

Buying Groups and Cooperative Negotiations

Not all community solar projects involve a common solar array. Instead, some community efforts have focused on dispersing information about and reducing prices for individual ownership. One example is a cooperative buying group, like Ace Hardware stores use to collectively buy tools at lower prices than individual outlets could receive. A buying group negotiates reduced module and installation costs for a group of people who will individually install solar on their own property.

There are several examples of buying groups. The Solarize Portland cooperative succeeding in recruiting 145 members to install solar PV and negotiated the installed cost down to $6.80 from $9.00.[44] In San Jose, CA, the San Jose Credit Union partnered with the San Jose Solar America City program to offer group buying discounts on solar PV and solar thermal.[45]

A for-profit company called 1 Block Off the Grid (1BOG) operates in several states on a similar model, organizing group discounts in exchange for referral fees from installers. They typically achieve a 15% discount for members.[46]

Buying groups do not help overcome barriers to financing or organizing community solar projects, but they can expand participation and ownership of solar. They also help make solar more affordable. Since buying groups have no influence on solar installation location, they get a neutral grade, but the model is not only replicable but the core of a successful for-profit business. Overall, buying groups are an effective, if modest, tool for encouraging more distributed solar power and even ownership.

Community Solar Scorecard:	Buying Groups
Overcome Barriers	**F**
Expand Participation	**C**
Expand Ownership	**A**
Affordable	**A**
Location	**C**
Replicable	**A**
Buying Groups Overall	**B-**

Washington DC – Mt. Pleasant Solar Cooperative

The Mt. Pleasant Solar Cooperative in Washington, DC, is similar to a buying group, but instead of negotiating with a single installer, they negotiated with several "preferred" installers and those installers compete to offer the best price to each individual member.[47] The cooperative has 70 members, and 45 have already had solar arrays installed on their roofs by May 2010.[48]

The cooperative has done substantial work to improve the economics of individual solar PV. With a combination of the negotiations with preferred installers to get installed costs of near $5.50 per Watt, the federal tax credit, the District grant program and sale of solar RECs, the installations have a payback of

less than three years.[49] **Figure 11** offers a comparison of the Mt. Pleasant Solar Cooperative payback period to individual (non-cooperative) ownership. The 2.1 kW arrays are assumed to generate 2,682 kWh per year. The only difference between the two solar installations is that an individual acting alone would likely pay more to have their solar array installed ($8 per Watt).

Figure 11 – Individual Solar Ownership with and without Cooperative Membership

Cooperative Member	
Installed Cost (@ $5.50/W)	**$11,550**
Federal Tax Credit	-$3,465
District Rebate	-$6,300
Net Installed Cost	**$1,785**
25-year value of electricity	
Net metering @ $0.11	$18,660
SRECs (@ $0.37 for 5 yrs; $0.37 less retail rate thereafter)	$9,669
	$28,329
Simple payback	*2 years*

Non-Member	
Installed Cost (@ $8/W)	**$16,800**
Federal Tax Credit	-$5,040
District Rebate	-$6,300
Net Installed Cost	**$5,460**
25-year value of electricity	
Net metering @ $0.11	$18,660
SRECs (@ $0.37 for 5 yrs; $0.37 less retail rate thereafter)	$9,669
	$28,329
Simple payback	*5 years*

The Mt. Pleasant Co-op has also been an active advocacy group, helping to spawn eight other solar cooperatives in the District, lobbying for legislation to increase the value of SRECs, and establish (and maintain) a solar grant program funded by a small utility bill fee. They also do community meetings and consultations with individuals wanting to go solar. Going forward, they are also working on new policy including community net metering and a solar gardens bill.[50]

The Mt. Pleasant Cooperative receives the same grades as buying groups, because even though it has been incredibly successful at making individual solar ownership possible and affordable, it does not help people with shady property or renters make the shift to solar power.

Individual Solar Leasing

SolarCity is one of several companies that provide a lower risk model of individual solar power. Their lease arrangement allows a homeowner with a sunny roof to have a solar array installed with zero or little money down, and to have a lower monthly payment (lease plus remaining electric bill) than their current electricity bill. While individual solar leases are not available for folks with shady roofs or renters, they may offer another route to solar for those with sunny property but low cash on hand. However, solar leasing companies tend to operate only in states with generous solar incentives (SolarCity operates in fives states).[51]

Figure 12 illustrates the economics of a 20-year SolarCity lease for a 2.1 kW system, modeled on a property in Boulder, CO. It compares the SolarCity lease to individual ownership, assuming the individual solar array costs $8 per Watt installed and that both systems produce 3,200 kWh per year.[52] In both cases, grid electricity prices are expected to inflate at 5%, the price inflation mark for Xcel in Colorado, according to SolarCity.[53]

Figure 12 – SolarCity Lease Compared to Individual Solar Ownership

SolarCity Lease	
Customer Investment	**$1,104**
Net Installed Cost	**$1,104**
20-year value of electricity less lease costs	
Net metered @ $0.12 (5% inflation)	**$9,291**
Simple payback	*5 years*

Individual Ownership	
Installed Cost (@ $8/W)	**11,760**
Federal Tax Credit	-$2,268
Utility rebate @ $2/W	-$4,200
Net Installed Cost	**$5,292**
20-year value of electricity	
Net metered @ $0.12 (5% inflation)	**$12,697**
Simple payback	*16 years*

What's interesting about the SolarCity lease is that it offers the customer both a better upfront cost, but also a faster payback, and a better 20-year return on investment. This is partly because SolarCity will pay only $5.60 per Watt for the installed cost, compared to $8.00 per Watt for the individual (who lacks the negotiating power or large contracts of SolarCity).[54] If the individual could also get the modules installed at $5.60 per Watt, it would cut their payback time to 11 years.

Individual solar leasing can increase solar participation by making it easier for people with sunny roofs (and in states with generous solar incentives) to get solar installed affordably. It also helps overcome the barriers to using federal tax incentives. However, it does not enable people with shady roofs or renters to become solar investors. In the spectrum of ownership, solar leasing is a step up from a subscription like Sol Partners or SunSmart because the solar array is on the individual's roof. Third party leases often have a purchase option at the end of the lease term. The third party lease model also makes good use of space, using the homeowner's own roof.

Community Solar Scorecard:	Ind. Solar Lease
Overcome Barriers	**A**
Expand Participation	**C**
Expand Ownership	**C**
Affordable	**A**
Location	**A**
Replicable	**A**
Ind. Solar Lease Overall	**B+**

Green Pricing

In most models, ratepayers opt in to a green pricing program, voluntarily increasing their electricity price to provide their utility with funds to invest in renewable energy. The premise was that renewable energy was more expensive than traditional electricity generation sources and that environmentally-minded, altruistic ratepayers could help the utility invest in clean energy.

As the expansion of the renewable energy industry has shown, there's little rationale for such policy in 2010. In many cases, renewable energy is actually less expensive than traditional, fossil-fuel electric generators. In some states, green pricing programs are being retired on that basis.

Sacramento Municipal Utility District's solar array, supported by green pricing.

We mention green pricing because three of the community solar projects discussed in this report mimic this outdated form of collective renewable energy investment, but with a perverse twist. Not only will participants in Sol Partners, SunSmart, and Solar Pioneers pay more than non-participants for their electricity over their lease term, but they also are paying for this premium electricity in advance. This "pre-paid green pricing" is not only financially unattractive, but in every case the participant would be better off buying their own solar array.

For those without the option to buy their own solar panel, even a traditional green pricing program (typically "pay-as-you-go") would be preferable.

Community Solar Scorecard:	Green Pricing
Overcome Barriers	**A**
Expand Participation	**D**
Expand Ownership	**F**
Affordable	**F**
Location	**C**
Replicable	**A**
Green Pricing Overall	**C-**

Analysis of Existing Community Solar Projects

Community solar has no clear, uniform business model. Rather, each featured project has found a way to cobble together private capital with federal, state, or other incentives in order create a solar project. And while the existing community solar projects have in common that they overcame the barriers to community solar, many of the other goals for community solar remained unmet.

Overcoming Barriers

Every community solar project is faced with the challenges of raising capital and accessing federal and state incentives for solar. Two-thirds of the community solar projects missed out on federal tax credits and accelerated depreciation. In their place, two projects used federally subsidized clean energy bonds (Solar Pioneer and Simple Solar) and another (SunSmart) used no one-time money but was designed to let customers take a state tax credit. Three projects (Ellensburg, Solar for Sakai, and Sol Partners) found public or private grants. While this represents impressive work on the part of the utilities and individuals who developed the projects, it means that most of these projects will be hard to duplicate.

Participation

Every community solar project we examined increases participation in solar power, and typically relative to its size. Greenhouse Solar, Sakai and Sol Partners were the smallest, ranging from 2.4 to 10 kW, scarcely larger than a typical residential-scale solar array. The other projects ranged in size from 22 to 100 kW. The smallest projects still had relatively high participation (7-10 owners of Greenhouse Solar's 2.4 kW and 26 contributors to Solar for Sakai). The largest project – SunSmart's 100 kW array – could have 200 subscribers at the most.

In several cases, the community solar projects had plans for expansion, so these participation numbers could rise somewhat. To put the participation numbers in perspective, the 200 maximum participants in St. George's SunSmart come from a population of 72,000.

Ownership

In most cases, investors in community solar projects are not treated as owners, but rather as power purchasers via a subscription, lease or license. In general, the upfront investment of a subscriber buys them a right to the electricity for a fixed time (e.g. 20 years) but the project developer (usually a utility) maintains ownership rights. The limited access to the electricity generation had significant implications for project economics. The term limits for SolPartners, SunSmart, and Solar Pioneers are shorter than the payback period, leaving community solar investors in those towns in the red. The exceptions to the limited terms were the three ownership-based projects: University Park, Clean Energy Collective, and Greenhouse Solar, which all used an LLC model.

Overall, the ownership issue is complex. Individual or collective ownership has risks, from equipment failure (inverters are almost guaranteed to need replacement within 20 years) to ongoing maintenance (minimal). From the standpoint of risk, many people may prefer not to be responsible for their solar array. This is reflected in the popularity of residential third-party solar ownership programs such as SunRun, SolarCity, and others. Community solar may be similar, where participants prefer to have limited responsibility, although the Clean Energy Collective is pioneering the use of a maintenance escrow to minimize these concerns.

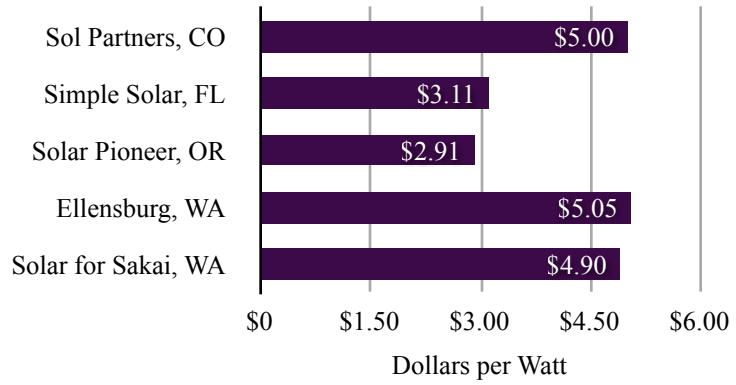
The danger of third-party ownership structures (whether for individual or community solar) is that they risk commoditizing solar electricity and making it feel no different than buying traditional electricity from the utility. Ownership provides a tangible sense of investment in energy production, shifting the owner's mindset from energy consumption to the balance between consumption and production. It also builds a constituency for distributed renewable energy in a way that buying solar-derived electricity as a commodity may not.

Affordability

In half of the examples we looked at, community solar projects helped to reduce the upfront cost of solar power compared to individual ownership. One factor was (modest) economies of scale, with community-based projects having installed costs of $5.75 to $8 per Watt, compared to the typical $8 per Watt seen on a home rooftop installation. SolPartners is the clear outlier, with an installed cost of $12 per Watt, although Solar for Sakai cost near to $10 per Watt.

Another factor in lower upfront costs was one-time money. The Sol Partners project in Colorado received a grant from the governor's energy office and the Ellensburg, Washington, municipal utility project received a one-time grant. The Florida Keys Electric Cooperative (Simple Solar) and Ashland, OR, (Solar Pioneer) tapped federal clean renewable energy bonds – the intended tool for non-taxable entities in lieu of tax credits – but these are subject to Congressional appropriations. The Solar for Sakai program got a "solar for schools" grant from the local utility. **Figure 13** highlights the significant value of these grants and incentives.

Figure 13 – Value of Grant or Subsidized Financing for Community Solar Projects ($/Watt)



Finally, a few projects were able to use some form of tax credits, typically with significant effect. The Clean Energy Collective tapped federal incentives, as did University Park, MD, and the Greenhouse Solar project in North Carolina. All three of these projects offer a far superior payback to individual ownership. The SunSmart project did not get federal tax incentives but was designed to allow individuals to claim the state's $2,000 tax credit. However, this was not enough to give a person simple payback before their lease expired.

The lesson is not that one-time money or federal tax incentives are inherently bad or good. The issue is that the less certain the money is for future projects, the less helpful it is for expanding the overall community solar market. Thus, a fixed price guarantee (e.g. feed-in tariff) would trump long-term federal tax credits or a one-time grant because the lower risk would reduce financing costs for community solar projects.

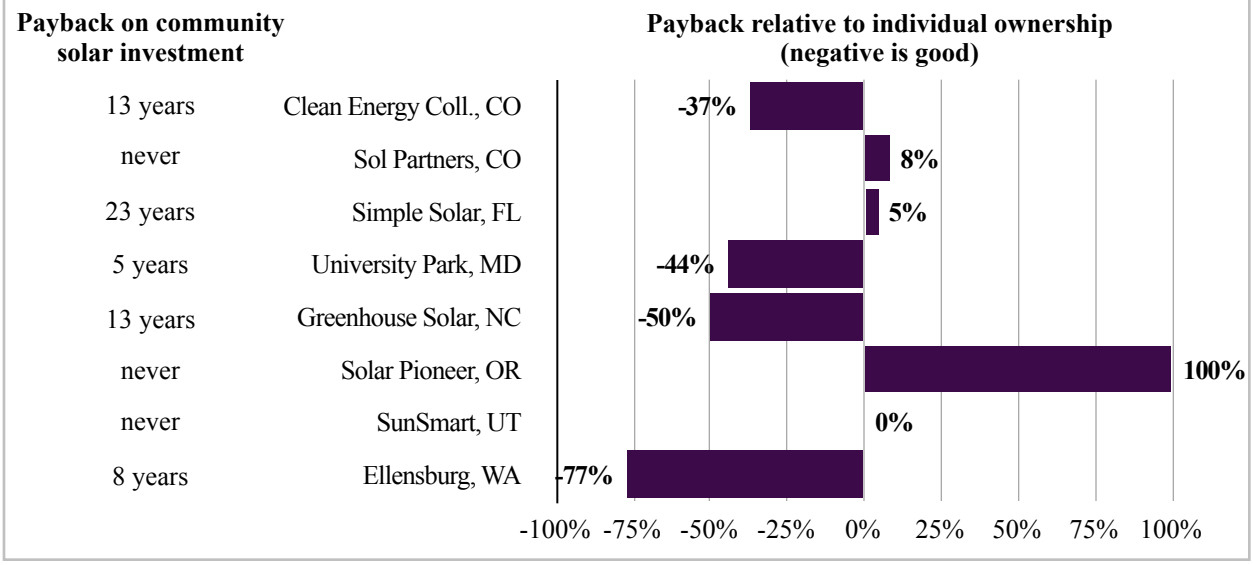
In terms of paying back, community solar projects with lower upfront costs paid back faster than individual solar ownership. In cases where payback was poorer with community solar, it was sometimes nonexistent. For Sol Partners, Solar Pioneer II, and SunSmart, the lease agreement expires before the subscriber recovers their initial costs. And Solar for Sakai was simply a charitable contribution, with no return whatsoever.

To be fair, there were some elements left out of the analysis. The individual ownership calculations did not factor in maintenance (such as inverter replacements) that typically happen within the first 20 years, whereas the lease or subscription customers are not responsible for maintenance costs. On the other hand,

a solar array can continue to produce long beyond the 20-year life of most lease arrangements, so the subscribers may miss out on revenue that owners would continue to receive.

Figure 14 summarizes the economics of the community solar projects relative to private ownership. Clean Energy Collective, University Park, and Greenhouse Solar are ownership-based community solar projects (and all provided a significant improvement over individual ownership), the remaining projects are structured as leases of power purchase agreements with 20-25 year terms. Investments in United Power's Sol Partners, Ashland's Solar Pioneer and St. George's SunSmart will not ever pay back because the lease terms expire before the investor's initial investment is recovered.

Figure 14 – Investment Payback for Community Solar Projects



In practice, community solar is making solar more accessible, but not necessarily more affordable.

Location

One of the significant benefits of solar PV is that it can be shoe-horned into existing structures, both reducing the use of virgin land and the cost of grid integration relative to other renewable energy generators. Therefore, it's important when evaluating community solar projects and policy to consider whether they maintain this competitive advantage of solar PV.

Four of the nine projects used existing structures for their solar arrays, three roofs and one parking lot canopy. The Clean Energy Collective used otherwise unusable land and Ellensburg, WA, placed their installation near an interstate highway for high visibility. The remaining three projects used open fields on utility property. While these utility-built projects probably did a reasonable job of tapping into existing grid infrastructure, they missed an opportunity to preserve open space.

Replicability

Perhaps the best measure of a successful community solar project is whether or not it can be used as a model for other communities. On that score, few of our examples measure up well. Sol Partners, Ellensburg, and Solar Pioneer all used one-time funds to construct the community solar project. Solar Pioneer and the Florida Keys project used limited available CREBs.

Summary Community Solar Scores

Community Solar Scorecard:	CEC	Sol Partners	Simple Solar	University Park	Green-house Solar	Solar Pioneer	Sun-Smart	Ellensburg	Sakai
Overcome Barriers	A	B	A	A	A	A	B	B	B
Expand Participation	A	C	A	A	C	A	A	A	B
Expand Ownership	A	F	D	A	A	F	F	F	F
Affordable	A	C	A	A	C	F	F	C	D
Location	C	F	F	A	A	A	F	C	A
Replicable	A	D	D	C	D	D	C	D	F
Overall Grade	**A-**	**D+**	**C+**	**A-**	**B**	**C+**	**C-**	**C**	**C-**

Overall, three community solar projects got a good overall grade, but only one had a good grade on replicability. This suggests a good opening for more supportive community solar policy (especially since the most replicable – Clean Energy Collective – is in a state with a new comprehensive community solar policy, Colorado).

The next section will examine two relatively new policies supporting community solar, in Colorado and Washington, and evaluate how they might help address the (often unavoidable) shortcomings of existing community solar projects.

Community Solar Policy

Community solar policy should remove barriers and/or create incentives for the development of community solar and there's much that could be done. Two states have created a fairly comprehensive definition for community solar as well as a system for its expansion. Other states have made more modest, piecemeal steps to encourage community solar.

The two flagship community solar policies are in Colorado and Washington. In Colorado, a 2010 law creates "community solar gardens" that must be owned by ten or more individuals and smaller than 2 MW. In Washington, a community solar project must be smaller than 75 kW, placed on local government property, and owners must meet several qualifications. So far, there are only two projects qualified for the policy and one predates the adoption of the legislation, the other relied on charitable contributions. In both states, community solar gardens or projects get special treatment under their policy.

Colorado Community Solar Garden Legislation

The Colorado community solar garden would be a cooperatively-owned (if not legally a cooperative) solar installation, with financial incentives, tax credits, and electricity credits or revenues shared among owners or "subscribers."

> "These so-called solar gardens will offer subscribers the same benefits as people who install the panels on their roofs, including access to rebates and tax incentives. Solar garden subscribers will also see the electricity produced by their share of the panels show up as a credit on their electricity bills."[55]

The solar garden law was signed in early June 2010.[56] The solar gardens will be solar PV installations of 2 MW or less and owned by 10 or more subscribers at a shared location. Subscribers can include residents, commercial entities, renters, low-income ratepayers, and even agricultural producers.

The subscribers of a community solar garden would have to live within the same county (or adjacent county) as the installation. This is not the same as the owners, who can be a utility, for-profit or nonprofit entity, including a "subscriber organization" – a profit or non-profit organization whose sole purpose is owning and operating the solar garden. The owner of the project can be a third party that contracts with the subscriber organization. The subscribers to the solar garden would be required to buy output of at least 1 kilowatt, but not exceeding 120% of their electricity consumption. Their subscription share can transfer with them if they move within the purchasing utility's service territory. Shares can be transferred or assigned to anyone else who qualifies as a subscriber if the original subscriber leaves the utility service territory.

The solar gardens would be treated as "retail distributed generation" under the revised Colorado renewable portfolio standard, treating them as if they were on-site, behind-the-meter projects.[57] In other words, for accounting purposes it's as if each investor has a solar panel on their roof feeding electricity into the house (behind the meter rather than into the grid).

Colorado Solar Gardens, Briefly

Solar Garden
- 2 MW or less
- 10 or more subscribers
- Rooftop or ground-mounted

Owners
- For- or non-profit whose sole purpose is to own or operate a solar garden

Subscribers
- Must live in same county
- Must own 1 kW share or more
- Share must not exceed 120% of electricity consumption

Utility
- Must buy 6 MW of solar garden electricity by 2013
- Half must come from solar gardens smaller than 500 kW
- Must encourage solar gardens with renters and low-income subscribers
- Can own up to 50% of a solar garden

The utility serving the geographic area of the solar garden would be required to purchase the output and renewable energy credits. The law also requires Colorado investor-owned utilities (IOUs) to purchase at least 6 MW from community solar gardens between 2011 and 2013 (the Public Utilities Commission will set purchase requirements for 2014 and beyond) and to pay a rate for the electricity comparable to that offered to other producers with on-site generation. At least half of the purchases must come from solar gardens smaller than 500 kW. No more than 20% of the state's distributed generation standard (3%) may come from solar garden purchases. The distributed generation standard is a set-aside within the state's renewable portfolio standard.

Interestingly, the community solar garden law requires utilities to make a good faith effort to get participation from low income ratepayers and renters. There's no detail in the bill of how that should be accomplished other than allowing utilities to prefer to buy electricity from community solar gardens with low-income subscribers.

Utilities are also allowed to own and to earn an extra profit on investments in community solar gardens. In general, the utility can own no more than 25% of a community solar garden, but if they can show the project would "provide significant economic development," the utility can own up to half the project and receive a bonus to their authorized rate of return. The utility can also get rate recovery for projects during construction.[58]

The only controversy over the bill is due to the gardens' classification as retail distributed generation, which means that a solar garden counts toward the set-aside for on-site distributed generation in the state's renewable portfolio standard (the on-site standard is half – 1.5% – of the total distributed generation standard – 3%).[59] Colorado SEIA "argued that some of the wording in the [early versions of the] legislation would create competition between rooftop solar and solar gardens."[60] In particular, the concern is that large-scale (close to 2 MW), utility-owned solar gardens will crowd out residential rooftop solar PV projects in two ways: by accelerating achievement of the 1.5% set-aside for DG and also by diverting funds from Xcel's Solar Rewards solar rebate program.[61]

Further details of the law's implementation will be developed by the Colorado PUC starting in October.[62]

Credit: ORNL

Scoring the community solar gardens law is an art as much as a science, because the rule-making is pending. It's clear that the policy will help overcome barriers to community solar, in particular by providing a legal structure for community solar projects and defining the type of generation they qualify as. Community solar gardens should expand participation in distributed solar generation and perhaps expand ownership as well. Solar gardens should help make solar more affordable by allowing for economies of scale in construction and installation, by enabling access to federal tax incentives, and by (unfortunately) using open fields instead of existing structures. Perhaps the greatest strength in the bill is creating an easily replicable model for community solar. While there will be variations as allowed by law, the creation of a defined "solar garden" in state law and a mandate for utilities to buy their electricity should encourage the development of many community solar gardens.

Community Solar Scorecard:	Solar Gardens
Overcome Barriers	**B**
Expand Participation	**A**
Expand Ownership	**C**
Affordable	**B**
Location	**F**
Replicable	**A**
Solar Gardens Overall	**B**

Clean Energy Collective's Community Solar Project near El Jebel, CO

Washington Community Solar Enabling Act

In Washington, the Community Solar Enabling Act defines community solar projects as 75 kW or less, owned by local individuals or entities (defined below) and provides significant incentives based on the state-based content of the project hardware.

The law was most recently updated in early 2010 – and defines a community solar project as one that is owned by individuals, nonprofits or businesses where the solar project is placed on local government property.[63] Utilities may also develop community solar projects with voluntary ratepayer contributions, e.g. green pricing.[64] The law clearly allows for a variety of ownership structures, most of which would permit the ultimate project owners to receive the federal tax incentives (the exception being utility green pricing programs).

The major impact of the amendment is that community solar projects get double the production incentive of other solar PV projects, $0.30 compared to $0.15.

Washington Community Solar, Briefly

Community Solar Project
- 75 kW or less
- Placed on local government property or on utility property (if utility-built)
- Rooftop or ground-mounted

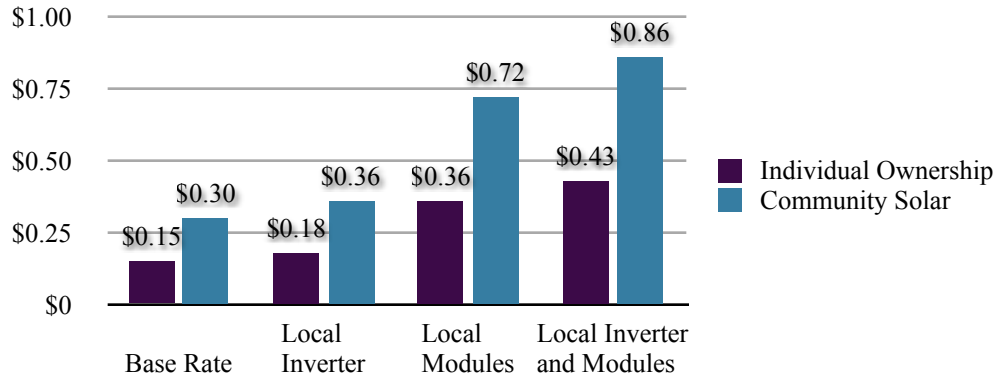
Owners/Subscribers
- Local individuals, households, nonprofits or non-utility businesses
- Must live same utility service territory

Utility
- Can operate a community solar project as a green pricing program

Incentive
- Community solar projects receive $0.30 per kWh until 2020.

This incentive gap between the two types of solar can become a chasm, because there are multipliers for local content.[65] The following figure (**Figure 15**) illustrates the dramatically higher incentives for community solar, especially when components of the project are manufactured in Washington.

Figure 15 – Production Incentive (per kWh) for Washington Solar Projects



When the owners of the project – who are the same as the subscribers, unlike the Colorado law – apply for the production incentive, their application must list the owners, show that the project provides "customer-generated electricity," and describe what, if any, parts of the generating system were built in Washington state. The investment cost recovery incentive is capped at $5,000 per owner and the program is only funded through 2020.[66]

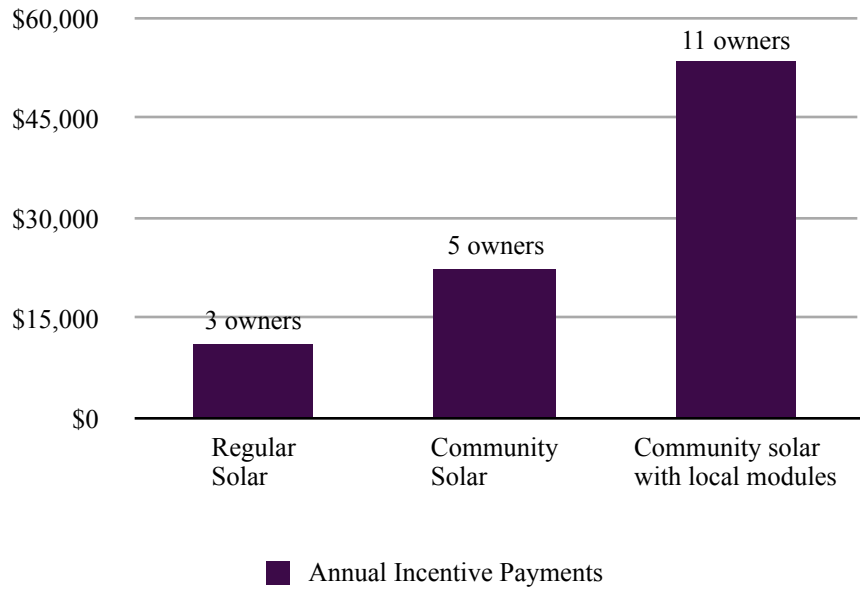
This means two things. First, projects that want the benefits would do well to build now to get the most production on the grid before the 2020 incentive expiration. Second, a project may be eligible for a much larger incentive than it can capture because each individual can claim no more than $5,000 apiece.

For example, a 50 kW solar project producing 74,000 kWh per year could receive up to $11,100 per year in incentive payments (at $0.15 per kWh). With only one or two owners, the project could not collect the

full incentive. If it were a community solar project, it could receive $22,200 in incentive payments (at $0.30 per kWh), and would require five owners to capture the full incentive.
The same community solar project built with local modules would receive $0.72 per kWh, for a total of $53,280. It would take 11 owners to maximize the incentive.

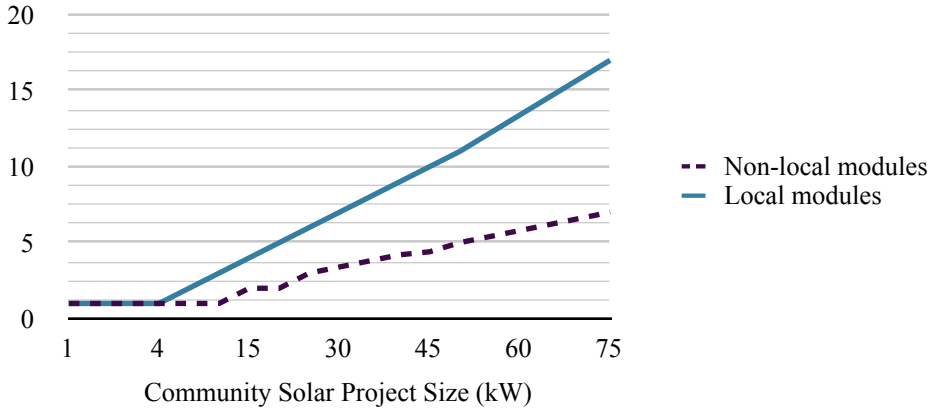
The Washington local content incentive serves a dual purpose, to incentivize production of solar components in-state and to increase the number of investors in solar power in the state. **Figure 16** illustrates this difference for a 50 kW solar project, comparing an individually-owned project to a community solar project, to a community solar project with locally-produced modules. Community ownership (and locally-produced modules) increase the total annual incentive payments and – because incentives are capped at $5,000 per owner – the number of owners needed to use the entire incentive.

Figure 16 – Washington's Solar Incentive Payment Encourages Community Solar and Local Content (based on 50 kW solar project)



In general, the bigger the project, the more owners needed to capture the state's production incentive. **Figure 17** illustrates the number of owners needed to capture the full state incentive for community solar projects from 1 to 75 kW.

Figure 17 – Minimum Owners of Community Solar to Maximize Washington State Incentives



The Washington law does a lot to lower financial barriers to community solar with the generous community solar incentive, although the requirement to use local government property sharply narrows the potential field of participants. The law gets high marks on ownership with the requirement that participants be owners and preference that large projects have more owners. The focus on financial incentives also makes Washington-based community solar more affordable. The statute is neutral toward the use of existing structures to mount the projects, which implicitly favors ground-mounted solar and its lower installation costs. However, the 75 kW limitation may mean that the roof-mount systems can more readily compete. Washington community solar projects should be replicable, but within limits. The requirement to use local government property makes a small universe of likely solar projects, as does the sunset of the incentive in 2020.

Community Solar Scorecard:	Washington Community Solar
Overcome Barriers	**B**
Expand Participation	**C**
Expand Ownership	**A**
Affordable	**B**
Location	**D**
Replicable	**C**
WA Community Solar Overall	**B-**

So far, only participants in two projects (both featured in this report) receive the state's production incentive, Ellensburg and Sakai.

Ellensburg, WA, community solar project

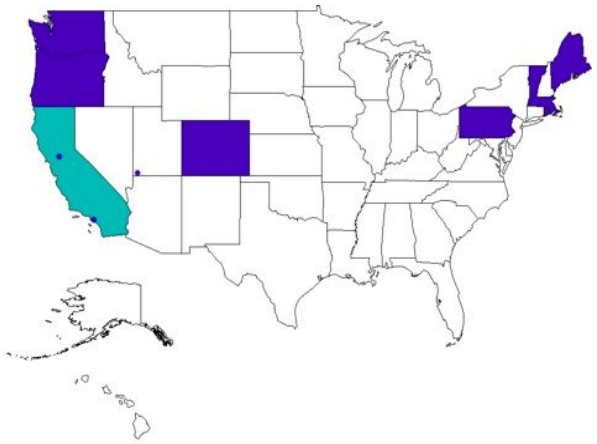
Community Net Metering

A common element of the community solar policies in Colorado and Washington is *community net metering*. Traditional net metering allows a customer to spin their meter backward (from an accounting standpoint), receiving a reduction in their bill for every kilowatt-hour generated by their on-site renewable energy system. Community net metering allows this backward meter-spinning for customers who are not on the physical site of the project. For example, 10 residents in the same utility service territory could share the output from a 10 kW solar array on a local small business.

A common restriction is that all owners of the project's output must be customers of the utility that takes the electricity, which means that customers must all live and remain in the utility service territory. There is usually a provision for transferring a net metering charge from one customer to another, but it's up to the individual to have that change made (and to obtain compensation for losing their access).

Community net metering (also called *virtual net metering*) is allowed in eight (8) states: Colorado (via solar gardens), Maine, Massachusetts, Vermont, Oregon, Pennsylvania, Washington, Rhode Island. It is also allowed in California's Multifamily Affordable Solar Housing program, the Sacramento and Los Angeles municipal utilities' solar "shares" programs, and the St. George, UT, municipal utility program (discussed later).[67] **Figure 18** displays the states or localities with community net metering. California's unique shading reflects the fact that two municipal utilities and one statewide authority (but not all utilities) offer community net metering.

Figure 18 – Community Net Metering Provisions



In Massachusetts, the Green Communities Act allows community net metering for a solar project that is owned by or serves the energy needs of at least 10 residential customers in the same neighborhood.[68] There are two solar gardens in development in Falmouth and Brewster, Massachusetts, based on this Act, although neither has proceeded to construction.[69]

Community net metering is an innovative way to encourage cooperation for community solar, but it ultimately does not make solar more affordable than individual ownership. It does reduce barriers to community ownership by allowing for collective net metering. This may modestly increase participation by allowing non-traditional individuals (e.g. renters) to participate in and own community solar projects. Community net metering has no provisions for projects to use existing structures. By setting a standard rule, community net metering should make it easier to replicate community solar projects.

Community Solar Scorecard:	Community Net Metering
Overcome Barriers	**B**
Expand Participation	**B**
Expand Ownership	**C**
Affordable	**C**
Location	**D**
Replicable	**B**
Community Net Metering Overall	**C+**

The Missing Links

There are at least four ways that community solar policy could be significantly improved, even beyond the two signature policies in Colorado and Washington.

Federal Tax Incentives

The most serious issue for community solar projects is whether or not they will be able to access federal tax incentives for solar. The 30% investment or personal tax credit for solar is frequently the largest incentive for building a solar power plant. The three community solar projects that did get the federal tax incentives – University Park, Clean Energy Collective, and Greenhouse Solar – were the best options for a solar investor (along with the Ellensburg project, helped by the state production incentive). In Colorado, the community solar garden law has been designed with access to federal incentives in mind, but it still requires that the individual subscriber to the solar garden be qualified for tax incentives. The Washington law is perhaps the most effective barrier remover, primarily because the incentive is generous enough that the community solar project may be able to create cash flow without the federal incentives. But this policy simply shifts responsibility from federal taxpayers to state taxpayers.

The most effective new rule for community solar would be a feed-in tariff, which provides a guaranteed grid connection, fixed payment based on the project cost, and long-term contract. More on feed-in tariffs can be found in *Feed-in Tariffs in America*.[70]

A second-best measure would be to change the federal tax incentives to cash grants, so that they can be claimed by any individual or entity. The cost to the government would be only modestly higher (due to an increase in the number of qualified projects), but there would no longer be an equity issue of using progressive income taxes to cover the costs of wealthier solar investors.

A less comprehensive measure is Senator Udall's proposal to allow the tax incentives to pass through in the event of third party ownership. This could help non-taxable entities like municipal utilities or rural electric cooperatives by letting them pass tax credits through to residents that buy into their projects. But it still means those ultimate investors must have sufficient tax liability.

Securities Regulations

A second serious issue for community solar is illustrated by the struggles of the University Park, MD, project. Because the project was a private enterprise, the investors had to comply with Securities and Exchange Commission's regulations. The most onerous is "registration" of an enterprise, a process that can cost hundreds of thousands of dollars. Although the University Park project avoided the costs of full registration by restricting themselves to in-state investors, it limited the project in other ways. They were allowed no more than 35 "unsophisticated" (non-wealthy) investors, were not allowed to advertise except by word of mouth. In addition, each member completed a 10-page financial disclosure form for the state of Maryland.[71]

Since the likely investors in community solar are not wealthy (the idea is to broaden participation beyond the wealthy or property owners), the Securities and Exchange Commission or state securities laws will be onerous. The limit on the number of investors means that projects will be limited in size or that individual contributions will have to be larger. A 22 kW system (like University Park) requires an average investment of $3,600 when split among 35 investors. This is less than buying solar independently, but is still a hefty sum for many households.

The limits on solicitation are much more onerous. Using the state registration route (instead of full registration) means that the project cannot advertise. In fact, they are limited to discussing the investment opportunity by word of mouth with people they already have a relationship with.

Disclosure requirements are also problematic, because it either means greater costs for the project or more in-kind time from each investor (or both) to correctly complete disclosure forms.

Securities laws also required a lot of legal footwork for the Clean Energy Collective, and in part that's due to downplaying the investment aspect of a community solar share and focusing instead on the opportunity to reduce electricity bills and receive cleaner energy.[72]

These laws are important protections against fraudulent investment opportunities, but they are needlessly complex for projects like community solar where most of the risks are well known. The creation of community solar gardens and other legal entities to support community solar will minimize the hurdles from securities regulations.

Location

Another issue is whether or not community solar will enhance the economics of rooftop solar or simply shift investment from individual rooftops to village greens. Four of the featured community solar projects were built on rooftops, with the remainder being open field designs. While this arguably helps to make solar more affordable for potential subscribers, it also reduces some of the value of solar PV – its ability to use "useless" space like rooftops or parking lot canopies and to seamlessly tie into the grid in these locations. Given the environmental backlash against concentrating solar power (and some of its proposed desert locations) as well as resistance to wind power in certain areas, community solar policy would do well to take advantage of solar's technical superiority in this regard.

One solution to this dilemma is a tiered incentive for community solar. Ontario has a producer payment for solar power that gives 80 cents per kWh for rooftop solar power generators and 58 cents per kWh for ground-mounted systems. A similar distinction in Washington's incentive or the Colorado solar garden law would have been wise.

Ownership

Many existing community solar projects have allowed investor participation via a lease or license to solar electricity rather than an ownership share. This choice is full of tradeoffs. On the one hand, subscribers or lease holders have fewer ongoing liabilities (e.g. inverter replacement, maintenance, system cleaning, etc) and very straightforward returns (e.g. 100 kWh per month for 20 years).

On the other hand, ownership confers many other benefits. So far, it's the only effective way to access federal tax incentives. Ownership of solar and its attendant responsibilities also changes electricity from a consumer good into an element that the individual can control. With ownership, a consumer can become a producer, and an energy producer can become energy independent. A solar subscriber merely substitutes a solar subscription for all or a portion of their traditional utility bill.

Most discouragingly, solar subscriptions can sometimes simply be a cover for green pricing premiums for solar power. In three of the discussed community solar projects – Sol Partners, SunSmart, and Solar Pioneer II – the solar subscription expires before the initial investment is paid back. In every case, the term of the agreement (20 or 25 years) is likely far shorter than the useful life of the solar panels. An owner has an incentive to squeeze every kWh out of their solar array, but a subscriber has a less intimate relationship.

Finally, widespread ownership of solar creates a constituency for greater policy support, and our sense is that this is a less likely outcome from commoditized solar subscriptions.

There's no ideal solution to the subscription versus ownership issue. To some extent, it's a question of an individual's tolerance of risk and reflects a personal choice. However, given community solar projects that offer little to no return on investment under a subscription model, it's important for prospective investors to read the fine print clearly to understand whether they are participating in a community solar investment or charitable contribution.

Conclusion

Community solar has a lot of promise. It can expand access to solar power generation and disperse the benefits of ownership more widely. It can make solar more affordable and harness economies of scale while still using existing structures. So far, that promise is largely unmet.

We found just a single model (used by three projects) that truly makes participants owners of the project rather than simply financial contributors.

The few existing community solar projects are a mixed bag. As the **Community Solar Project Scorecard** shows, three projects come close to meeting most of the goals of community solar, and only one seems easy to replicate. The other projects range from being modest improvements over individual ownership to electricity price premiums for the altruistic solar investor.

Community Solar Project Scorecard									
	CEC	**Sol Partners**	**Simple Solar**	**University Park**	**Green-house Solar**	**Solar Pioneer**	**Sun-Smart**	**Ellensburg**	**Sakai**
Overcome Barriers	**A**	**B**	**A**	**A**	**A**	**A**	**B**	**B**	**B**
Expand Participation	**A**	**C**	**A**	**A**	**C**	**A**	**A**	**A**	**B**
Expand Ownership	**A**	**F**	**D**	**A**	**A**	**F**	**F**	**F**	**F**
Affordable	**A**	**C**	**A**	**A**	**C**	**F**	**F**	**C**	**D**
Location	**C**	**F**	**F**	**A**	**A**	**A**	**F**	**C**	**A**
Replicable	**A**	**D**	**D**	**C**	**D**	**D**	**C**	**D**	**F**
Overall Grade	**A-**	**D+**	**C+**	**A-**	**B**	**C+**	**C-**	**C**	**C-**

There is much room for improvement in regulatory and policy arenas to help create more attractive conditions for community solar to reach its potential. Expanding participation in solar energy is important but creating more owners of solar projects is important as well, as is creating affordable and replicable project models.

The community solar policies are a modest improvement over the existing set of rules for solar power. Colorado's solar gardens law will help overcome barriers to federal tax incentives (although it can't solve the problem for non-taxable entities) and it will also help by creating a framework for raising capital and organizing investors. It should also help increase participation (and even some ownership), though without much encouragement for mounting solar on existing structures. And most of all, the solar gardens will be replicable.

Washington's community solar incentive will also help overcome financial and ownership barriers, but is less replicable given the requirements for use of local government property and the sunset of the incentive.

Community net metering is a common element of the two full-fledged policies and it lays the groundwork for more comprehensive community solar policy. But without any way to address issues of federal incentives, barriers to raising capital, or a focus on roof-mounted systems, it's not a very powerful stand-alone policy.

Community Solar Policy Scorecard			
	CO Solar Gardens	**WA Community Solar Incentive**	**Community Net Metering**
Overcome Barriers	**B**	**B**	**B**
Expand Participation	**A**	**C**	**B**
Expand Ownership	**C**	**A**	**C**
Affordable	**B**	**B**	**C**
Location	**F**	**D**	**D**
Replicable	**A**	**C**	**B**
Overall	**B**	**B-**	**C+**

Solar gardens and community solar gardens are a good first step, but there is a lot of ground yet to cover. Barriers need to be removed. Federal tax incentives need to be changed to allow *any* solar producer to claim them. Securities regulations need to reflect the reasonable risk of participation in community solar, and laws like the Colorado solar gardens should help codify structures for community solar.

Participation and particularly ownership can be increased as barriers fall and as more states create easily replicable structures for community solar investment. These simpler structures and greater access to incentives can make community solar more affordable.

There's no silver bullet for community solar's woes, but the existing community solar projects and policies should provide a good foundation for progress.

Credit: Stellar Sun Shop

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