Community Shared Solar

Review and Recommendations for Massachusetts Models



Commonwealth of Massachusetts
Deval L. Patrick, Governor
Timothy P. Murray, Lieutenant Governor
Richard K. Sullivan Jr., Secretary

Powered by SunShot
U.S. Department of Energy

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About the Massachusetts Department of Energy Resources (DOER)

DOER's mission is to create a cleaner energy future for the Commonwealth, economically and environmentally, including:

- Achieving all cost-effective energy efficiencies;
- Maximizing development of cleaner energy resources;
- Creating and leading implementation of energy strategies to ensure reliable supplies and improve relative cost; and
- Supporting clean-tech companies and spurring clean-energy employment.

DOER is an agency of the Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

About Cadmus

Covering the entire spectrum of energy, water, and sustainability consulting, Cadmus offers technical, policy, and managerial services to governments, utilities, and other organizations. Established in 1983, Cadmus is staffed with more than 400 full-time, professional consultants in offices across the United States. In the following areas, Cadmus supports a broad range of clients committed to improving the quality of life in the United States and worldwide:

- Energy
- Built Environment
- Natural Environment
- Climate
- Health.

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Glossary of Terms

- ***Aggregator.*** This is the entity that brings together the collective demand of the community shared solar project participants and administers the community shared solar project.
- ***Community Shared Solar (CSS).*** A solar photovoltaic (PV) system that provides benefits (for example, electricity, net metering credits, return on investment) to multiple participants. A CSS project is hosted by an entity with a suitable roof or parcel of land and is supported by participants, who invest in the project or purchase the electricity or net metering credits.
- ***Community Shared Solar Vendor (CSS vendor).*** A business or non-profit entity that develops and administers CSS projects.
- **Energy Management Services (EMS).** As defined in M.G.L. c. 25A §11I, an EMS is a program of services, including energy audits, energy conservation measures, energy conservation projects or a combination thereof, and building maintenance and financing services, primarily intended to reduce the cost of energy and water in operating buildings, which may be paid for, in whole or in part, by cost savings attributable to a reduction in energy and water consumption which result from such services. (EMS is a type of energy saving performance contracting.) Public entities in Massachusetts can use M.G.L. c. 25A §11I to procure a Solar EMS contract for the lease of public space (such as a public school roof), PV system construction, and a power purchase contract through a single, streamlined solicitation process.[1]
- ***Host Customer.*** This is the entity named on the electric utility account as the party responsible for paying the bills for the utility meter associated with a specific CSS project. Host customers applying for net metering services complete a Schedule Z with the utility company, which directs the utility how to allocate net metering credits.
- ***Investment Tax Credit (ITC).*** The federal business energy investment tax credit (ITC) is a corporate tax credit for renewable energy technologies, including solar, fuel cell, small wind, geothermal, microturbines, and combined heat and power. For solar PV systems, the credit is equal to 30% of expenditures, with no maximum credit. The 30% ITC is available for eligible systems placed in service on or before December 31, 2016.
- ***Net Metering.*** Net metering allows customers of Massachusetts' regulated utilities with eligible facilities to receive a credit from the utility company when the net metering facility produces more power than is needed at the project site. Excess power is exported to the electricity grid, the utility meter effectively spins backward, and the customer is credited for the electricity delivered to the grid. Net metering credits can be applied to the host customer's account, or the host customer can allocate net metering credits to other utility accounts.
- ***Net Metering Credit Allocation Agreement.*** In this guide, this term is used to describe a long-term contract for the purchase of net metering credits from a solar PV system.
- ***Participants.*** These are the community members who participate in a CSS project by purchasing the energy or net metering credits generated from the solar PV system or take an ownership stake in the project. Participants may be individuals or businesses.
- ***Participant Ownership Model.*** The Participant Ownership model for CSS projects is suitable for project organizers interested in developing a CSS project that is independent of a CSS vendor or facilitation by local government. Participants start a company, typically an LLC,

[1] Visit DOER's EMS web page for more information: http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/ems.html."

and benefit from a return on their investment in the company. The key features of the Participant Ownership model are that private individuals drive the process and participants take an ownership stake in the project.

- ***Passive Income.*** Passive income comes from investments in trade or businesses activities in which the investor does not materially participate or from rental activities even if the investor does participate. The investor may be either a natural person or a business. The 30% ITC for commercial PV systems can only be credited against passive income. The now-expired 1603 U.S. Treasury grant program offered an alternative to the ITC in which the system owner received a check from the federal government equal to 30% of the cost of the project. No passive income was required in order to receive the 1603 grant.
- ***Public Lease Model.*** In the Public Lease model, municipalities or other governmental entities lease public roof space or land for a CSS project. A CSS vendor installs the PV system, establishes the CSS business set-up, and administers the project. The key features of the Public Lease model are twofold. The municipality drives the process and brings the competitive forces of the market to bear through the lease of public space, and participants' benefit by having net metering credits applied against their electric bills.
- ***Securities.*** A security is an investment instrument issued by a corporation, government, or other organization that offers evidence of debt or equity. A transaction that involves an investment of funds in an enterprise, with an expectation of profits to be earned through the efforts of someone other than the investor, is a transaction involving a security.
- ***Schedule Z.*** When submitting an interconnection application to the local utility company, host customers applying for net metering services must complete a Schedule Z. The Schedule Z directs the utility company on how to allocate net metering credits.
- ***Site Owner.*** The owner of the property on which the CSS system is located.
- ***Solar Carve-Out Program.*** The Solar Carve-Out, a component of the Massachusetts Renewable Portfolio Standard, is a market-based incentive to support the development of solar PV across the Commonwealth. The Massachusetts Department of Energy Resources (DOER) has carved out a portion of the RPS Class I Renewable Energy requirement to support distributed solar PV facilities, as provided by the Green Communities Act of 2008, with a goal of 400 MW. All regulated and competitive retail electricity suppliers that serve the Massachusetts load need SRECs to meet the RPS Solar Carve-Out compliance obligation. (Municipal utilities are exempt.)
- ***Solar Renewable Energy Credits (SRECs).*** Electricity produced by solar PV systems qualified under the Solar Carve-Out is broken into two products: (1) the electricity production that is used on-site or delivered to the grid; and (2) the positive environmental attributes associated with this clean-energy production. SRECs represent the second product. One SREC is created each time a solar PV system generates one megawatt-hour (1000 kilowatt-hours, kWh) of electricity. The Solar Carve-Out compliance obligation creates a market demand for SRECs.
- ***System Owner.*** This is the entity that owns the solar PV system in a CSS project.
- ***Tax Equity Partner.*** These are investors having a taxable passive income that allows them to take advantage of the ITC and depreciation losses available to investors in solar PV systems. While tax equity partners are usually businesses, they may also be individuals, and they may own all or part of the CSS project.
- ***Virtual Net Metering.*** When net metering credits are applied to electric utility accounts other than the host customer's on-site utility account, this is called virtual net metering.

Virtual net metering allows PV generation in one location to offset electricity costs at another location. In this report, we also use the term virtual net metering to describe scenarios in which a PV system is interconnected behind a new meter and the majority of electricity produced by the PV system is delivered to the electric grid.

1. Introduction

The Massachusetts Department of Energy Resources (DOER) and the Mass Solar: Making it EZ Team[2] were awarded funds under the U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge, which incentivizes 22 regional awardees to make it easier for Americans to go solar. By streamlining permit processes, updating planning and zoning codes, improving standards for connecting solar power to the electric grid, and increasing access to financing, teams will clear a path for rapid expansion of solar energy and serve as models for other communities across the nation. The Rooftop Solar Challenge is part of the SunShot Initiative, which strives to make solar cost-competitive with other forms of energy by the end of the decade.

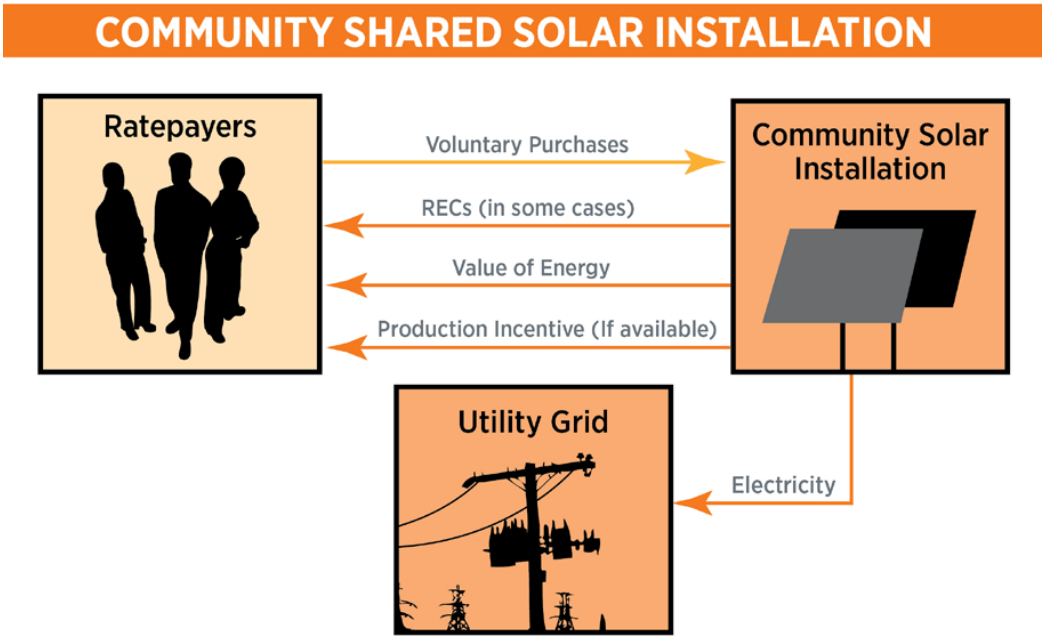
Background

In Massachusetts and beyond, site issues can prevent otherwise feasible solar photovoltaic (PV) installations. Shading and structural insufficiency, for example, are widespread. A core component of the DOER team's efforts under the Rooftop Solar Challenge grant is to explore opportunities for reducing barriers to rooftop solar PV installations through Community Shared Solar (CSS).

In this report, we define a CSS project as a solar PV project that provides benefits—such as electricity, net metering credits, or return on investment—to multiple participants (Figure 1). A CSS project is hosted by an entity with a suitable roof or parcel of land. Participants, such as individuals or businesses, are typically motivated by an inability to install a solar PV system at their own home or business, are renters, or cannot afford the initial capital investment needed for a solar PV system installation.

[2] In addition to DOER, the team consists of: (1) the municipalities of Boston, Cambridge, Harvard, Hatfield, and Winchester; (2) the Massachusetts Clean Energy Center (MassCEC); (3) the Solar Energy Business Association of New England (SEBANE); (4) the Massachusetts Board of Building Regulations and Standards (BBRS); and (5) MassDevelopment.

Figure 1: Basic Configuration of a CSS Project



Source: *A Guide to Community Shared Solar: Utility, Private, and Nonprofit Project Development.* (U.S. Department of Energy)

While CSS business models and relationships between parties vary, CSS projects face common challenges. Local and state policies and incentive programs, however, can help reduce these barriers.

In May 2012, DOER selected Cadmus to identify and assess the barriers and opportunities of implementing CSS in Massachusetts. In pursuit of a model framework for Massachusetts municipalities to adopt, we analyzed the mechanics of existing CSS projects, assessed potential barriers, and met with local communities to understand needs and potential issues regarding CSS (Section 3). Through this analysis, we developed two distinct CSS business models suitable for near-term use in Massachusetts – the Public Lease model and the Participant Ownership model. The defining features, potential risks, and anticipated costs and benefits of these models vary significantly (Section 4).

In a separate guide entitled "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013), we further detail the advantages and challenges unique to each business model. This comprehensive guide resource is designed to help Massachusetts' private citizens and public entities consider, plan, and implement CSS projects in their communities.

Summary of Research Activities

Research activities conducted for this report consisted of the following:

- A desktop review of existing CSS models to identify possible models for Massachusetts;
- A review of the existing challenges and barriers to CSS development in Massachusetts; and
- Working with DOER's municipal partners to ascertain local needs regarding CSS models.

Desktop Review of Existing CSS Models

Cadmus reviewed literature on existing and hypothetical CSS models, with a focus on identifying those most likely to be feasible in Massachusetts. We also interviewed industry experts in an effort to: (1) identify trends among existing models; (2) ascertain which program elements can best be translated to the Massachusetts context; and (3) clarify conflicting information from background literature.

Information gathered in our desktop analysis and interviews are discussed in Section 3. We also compiled this information into a summary of existing CSS models (Appendix C).

Review of Existing Challenges and Barriers

Cadmus staff gathered information on the existing challenges and barriers to CSS development, including those issues specific to Massachusetts, such as uncertainties in the Solar Renewable Energy Credit (SREC) market.

Working with Municipal Partners to Ascertain Local Needs and Issues

To understand local needs and issues as they relate to solar PV and CSS, Cadmus staff met with representatives from each municipal member of the DOER Rooftop Solar Challenge team to discuss: (1) approaches to CSS and the potential benefits and risks of the various approaches; (2) goals for local CSS development; (3) progress to date on local CSS projects; and (4) key considerations for local CSS development. The local needs, priorities, and issues identified in these discussions are summarized in Section 3.

2. Overview of Community Shared Solar

CSS improves access to solar PV installations by providing an alternative for community members with feasibility issues, such as site shading, at their home or business. A 2008 National Renewable Energy Laboratory (NREL) study estimated that only 22% to 27% of residential buildings are suitable for hosting a PV system.[3] CSS project organizers can help open the solar market to those who rent or have site issues (structural instability, poor orientation, shading), or face other barriers to on-site solar PV installations. By broadening demand for and access to solar PV, CSS can help reduce the payback period for investments in solar PV and help make solar energy cost-competitive with other types of energy.

What is the Basic Structure of a Community Shared Solar Project?

CSS business models vary significantly; however, the parties involved with a CSS project can be broadly categorized as follows:

- The site owner is the owner of the property on which the CSS system is located. The site owner may be a public entity, such as a municipality, or a private entity;
- CSS project participants are the community members who participate in a CSS project by purchasing the electricity generated from the PV system or net metering credits or take an ownership stake in the project. Participants may be individuals or businesses;
- The aggregator brings together the collective demand of the participants and administers the project. The aggregator also serves as the host customer of the PV system. Host customers apply for net metering services and complete a Schedule Z with the utility company, which directs the utility how to allocate net metering credits;
- The system owner owns the CSS project. The system owner typically partners with a tax equity investor to monetize the ITC and other available tax incentives; and
- The tax equity partner is an investor(s) with taxable passive income that is allowed to take advantage of the 30% ITC and other tax benefits available to investors in solar PV systems.[4]

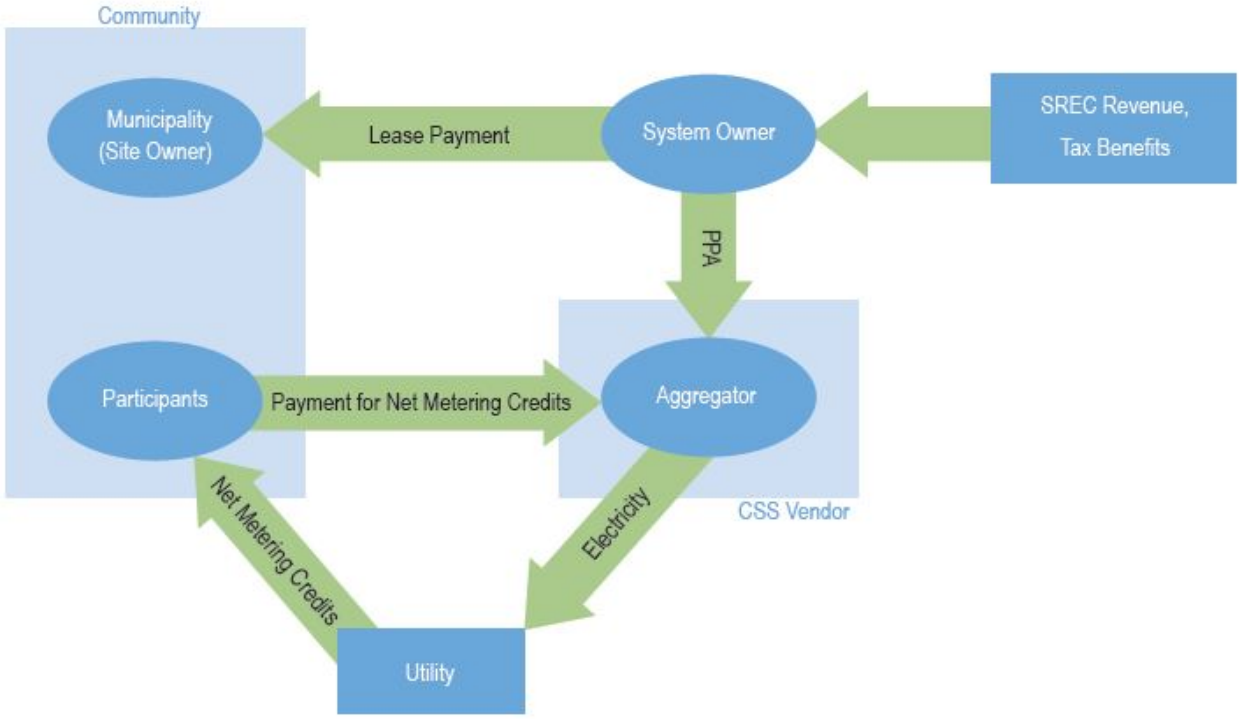
Relationships between the Parties

Across CSS business models, relationships between the parties vary. Figure 2 summarizes the relationships between the parties in a hypothetical CSS project in which the site owner is a municipality.

[3] Supply Curves for Rooftop Solar PV-Generated Electricity for the United States, National Renewable Energy Laboratory, Nov. 2008. www.nrel.gov/docs/fy09osti/44073.pdf.

[4] Under the federal Modified Accelerated Cost-Recovery System (Accelerated Depreciation) incentive, businesses can recover investments in eligible property through depreciation deductions. Solar PV systems are eligible for a six-year accelerated depreciation schedule.

Figure 2: Roles and Relationships between Parties, Hypothetical CSS Project using Virtual Net Metering with Municipal Site Owner



In this model, the municipal site owner leases out the project site for the purposes of CSS. Through this competitive procurement process, the site owner selects a qualified CSS vendor to develop and administer the project. The CSS vendor acts as the aggregator and host customer, prepares for a third-party (i.e., system owner) to own and install the system, and pays the system owner for the electricity generated. To install the PV system and occupy the site over the lifetime of the project, the system owner enters into a lease agreement with the site owner and makes lease payments.

Under different CSS business models, participants may purchase the benefits of the energy produced by the PV system in a variety of means.[5] In the scenario depicted in Figure 2, participants purchase the right to net metering credits created by the system by entering into net metering credit allocation agreements with the aggregator. As the administrator of the project, the aggregator acts as the host

[5] For example, participants may buy the right to a specified share of the energy generated, or net metering credits derived from the energy. In this context, the value of the energy is realized through credits that reduce utility electrical bills. Alternatively, participants may buy an ownership interest in the project and receive a corresponding share of the profits from sale of SRECs, energy, or net metering credits. As discussed in Appendix A, CSS models that involve participant ownership can trigger complex Securities and Exchange Commission (SEC) registration requirements.

customer and manages net metering credit allocation using the local utility company's Schedule Z.[6] Net metering credits generated by the PV system are applied against participants' electric utility bills.

What Makes for a Good Community Shared Solar Project?

Key provisions of a good CSS project will vary by business model and project; however, all projects can benefit from a strong project team, suitable installation site, an appropriate marketing plan, and the availability of net metering services and virtual net metering.[7] The Clean Energy Collective[8] speaks persuasively about the need for consumer protections, such as:

- Realistic assumptions regarding the available solar resource, inflation, and fair market values;
- Long-term contracts that establish predictable prices for net metering credits and SRECs;
- A contractually binding process for addressing the needs of participants who move or are otherwise no longer able to benefit from any virtual net metering credits;
- A credible legal opinion letter regarding a project's structure relative to securities regulations and tax law (under some CSS models); and
- Operation and maintenance escrow reserves for insurance, taxes, inverter replacement, and system decommissioning (under some CSS models).

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6 Net metering credits can be allocated only to utility customers in the same utility service territory and ISO-New England load zone. Where participants realize energy benefits through virtual net metering, a participant that relocates within the same utility service territory and ISO-New England load zone can continue to participate in a CSS project if the aggregator amends the Schedule Z to allocate credits to the participant's new utility account.

7 Project organizers should consult legal counsel when developing a marketing plan. As discussed in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013), marketing CSS projects following the Participant Ownership model is limited by securities regulations.

8 The Clean Energy Collective is a Colorado-based company that builds, operates, and maintains community-based clean energy facilities. http://cleanenergycollective.com/default.aspx

3. Findings

To develop a model CSS framework for Massachusetts municipalities, Cadmus interviewed industry leaders and reviewed documentation and other materials associated with CSS projects throughout the United States. We assessed potential barriers and met with DOER's Rooftop Solar Challenge partner municipalities to discuss local priorities and potential challenges. The findings of this research informed the recommendation of the business models described in Section 4, which are further detailed in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

Desktop Review of Existing CSS Models

Through a desktop review of existing CSS projects nationwide, we identified the key features of different business models and assessed their potential for scalability and replicability in Massachusetts. Here, we summarize the defining features[9] of three CSS projects explored in our desktop review, what sets them apart from each other, and their potential for near-term implementation in Massachusetts. Each project involves a different business and participant benefit structure.

El Jebel, Colorado (Clean Energy Collective)[10]

The Clean Energy Collective (CEC) is the aggregator of the 78 kW El Jebel CSS project. This project is located on a site leased from the Mid Valley Metropolitan District, a metropolitan water district. The approximately 20 participants own the individual PV panels, which are purchased from CEC. The CEC's confidential business structure enables a tax equity investor to claim the federal tax incentives, even though the PV panels are owned by the participants.

Panels are purchased under 50-year contracts (the anticipated useful life of the system) at a cost of $725 per panel (equivalent to $3.15 per Watt). The cost to participants was reduced by the ITC, a rebate from the local utility, and Holy Cross Energy's up-front purchase of Renewable Energy Credits (RECs) for $500 per kW installed. Participants can resell ownership of the panels to another utility customer or to CEC at fair market value. CEC arranged for low-cost financing to help participants overcome the obstacle of the up-front cost of purchasing the panels.

The value of the energy in the CEC model is realized by selling the power to the local utility under a solar power purchase agreement (PPA).[11] Participants are credited per kWh generated (for 50 years) on their utility bills at an amount that escalates as utility rates escalate. This process is facilitated by CEC-developed billing software.

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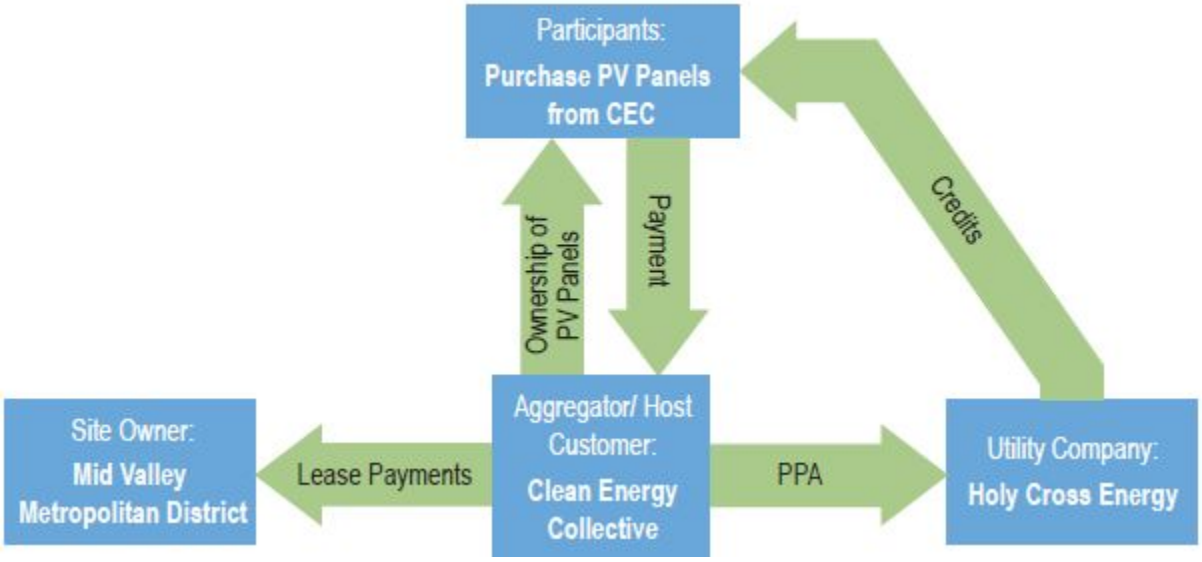
[9] The Clean Energy Collective and My Generation Energy consider their respective business models proprietary.

[10] The CEC model contains components of the Participant Ownership model, as participants have an ownership stake in the project. The Participant Ownership model is further discussed in Section 4 of this report and in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

[11] A solar PPA is a long-term contract for the purchase of power produced by a solar PV system.

Figure 3: Basic Structure of El Jebel, Colorado (Clean Energy Collective) Model



The project was funded internally and with bridge loan financing when the federal 1603 grant program was available. The El Jebel project was the first implementation of CEC's business model. CEC has since replicated the model in other Colorado communities and in other states.

In the absence of a legislative change, the CEC model is unlikely to be replicable in Massachusetts due to the PPA between the aggregator and the utility. Massachusetts' regulated utilities need Department of Public Utilities (DPU) approval to enter into PPAs that exceed one year in length. DPU approval of a long-term contract requires that the utility demonstrate that the contract is in the public interest.

Brewster, Massachusetts (My Generation Energy)[12]

My Generation Energy (MGE), a full-service solar installation firm, organized and built a CSS project in Brewster, Massachusetts. The Brewster Community Solar Garden® Cooperative, Inc., a member-owned cooperative, serves as the aggregator of this 346 kW system.

The Town of Brewster conducted a competitive solicitation for the lease of a municipally owned industrial park site, under Massachusetts General Law (M.G.L.) Chapter 30B §16, for the purpose of solar development. Through this process, Brewster entered into a 20-year lease agreement with Brewster Community Solar Garden LLC (the system owner entity). The solicitation documents are publicly available.[13] MGE serves as the project developer and provides operations and maintenance services for the PV system.

Participants of the Brewster Community Solar Garden Cooperative each purchase at least one SunShare. Each SunShare, purchased for $5,000, entitles participants to the value of energy created by 28 PV

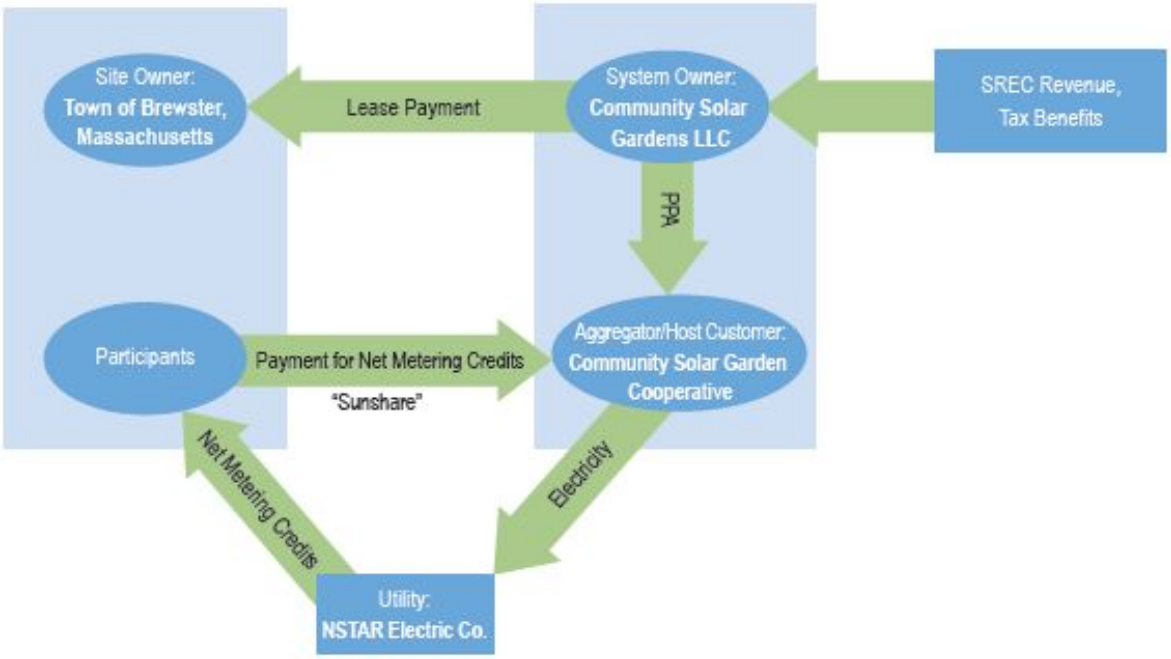
[12] The MGE model is one approach to the Public Lease model, in which a public entity leases available land for the purpose of CSS to a qualified CSS vendor. The Public Lease model is further discussed in Section 4 of this report and in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

[13] These documents also appear as appendices to "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (February 2013).

panels. The value of the energy is realized through virtual net metering. Net metering credits generated by the system are applied to participants' utility bills. MGE does not have its own billing software, and it encountered some challenges in coordinating the virtual net metering billing with the electric utility company. MGE staff interviewed noted that transferring the rights of a participant who moves out of the local utility's territory is a challenge.

The Brewster Community Solar Garden® Cooperative has an agreement with Brewster Community Solar Garden LLC, an entity presumably established to own the PV system and provide a vehicle for a tax equity investor to monetize the tax benefits.

Figure 4: Basic Structure of Brewster, Massachusetts (My Generation Energy) Model



The Brewster project demonstrates that the basic structure of the MGE model is viable in Massachusetts; however, increased penetration of CSS in in the Commonwealth requires greater public understanding and awareness of CSS. Further, public entities with available space and an interest in solar PV will likely receive greater economic benefit from entering into a solar Energy Management Services (EMS) agreement than from hosting a CSS project.

University Park, Maryland (University Park Community Solar)[14]

University Park Community Solar, LLC serves as the aggregator for this 22 kW CSS project installed on the roof of a Maryland church. In this model, participants invest in University Park Community Solar, LLC, which was created specifically for this project by the organizing participants. Each participant

[14] The University Park model is one approach to the Participant Ownership model, as participants have an ownership stake in the project. This particular approach (called the Alternative to Virtual Net Metering approach) does not require virtual net metering. This approach to the Participant Ownership model is further discussed in Section 4 of this report and in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

invests in the LLC,[15] but there is no set investment amount or per kWh basis. In return, participants earn a corresponding share of the benefits; specifically, revenue from electricity sales to the site owner (the church), federal tax incentives, and the auction of Maryland SRECs. The project qualified for the 1603 program, and this tax benefit was provided to the LLC (in the form of a check) and passed through to participants.

The University Park project does not rely on virtual net metering. Rather, the system was installed behind the church's existing utility meter, and the electricity produced by the PV system directly serves the building's load.[16] The site owner pays the LLC for all of the electricity generated by the PV system.

Because this model does not involve virtual net metering (that is, participants do not receive a credit on their utility bill for the energy produced by their share of the system), participants who move out of the local utility's territory can still receive payments from the project.

The volunteer founders of University Park Community Solar, LLC, spent more than two years developing the legal and financial arrangements for this CSS project. In addition to receiving free help from the Maryland Intellectual Property Legal Resource Center, University Park Community Solar paid $12,000 for other legal and accounting services. It also received a $10,000 grant from the State of Maryland. The legal and accounting documents are available for review.[17]

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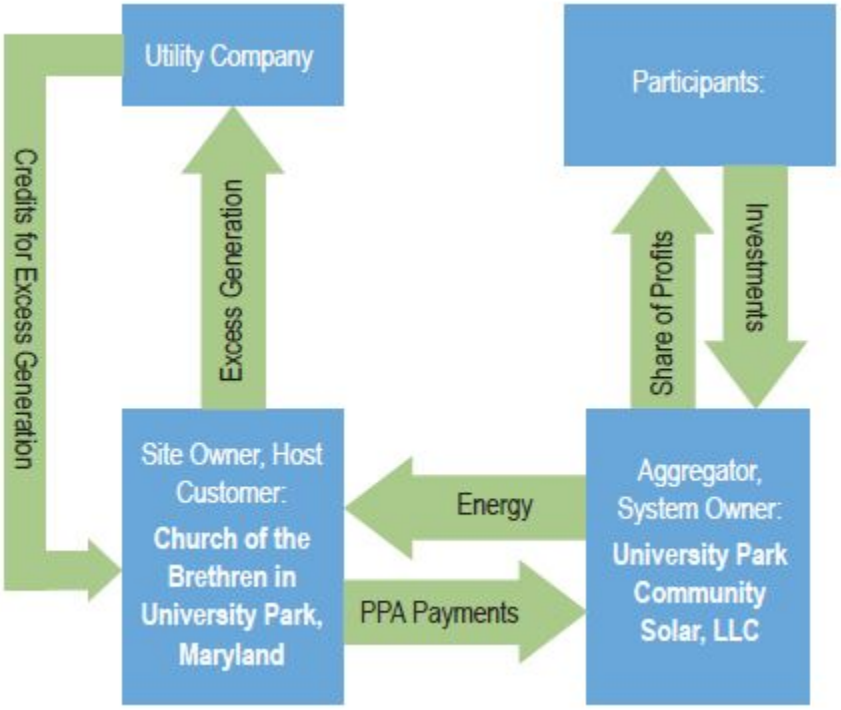
[15] The LLC took advantage of the private offering exemption that allowed it to sell investments in the LLC without the expense and delay of registering the offering with the Securities and Exchange Commission (SEC) and state regulators. This exemption allows for an unlimited number of accredited investors, but unaccredited investors are limited to 35. Investors are accredited if they meet specific conditions. The most relevant conditions are that the investor earns more than $200,000 per year ($300,000 if filing jointly) or has a net worth individually or with a spouse of at least $1 million (excluding their primary residence).While an unlimited number of accredited investors are allowed, the income and net worth requirements for accredited investors make them a very small percentage of the population. To take advantage of this exemption, the LLC was required to provide lengthy disclosure documents and limit investment to residents of Maryland, and could not publicly market the offering.

[16] In this report, we refer to this as interconnection behind an existing meter, rather than virtual net metering (where close to 100% of the PV generation is used to claim net metering credits).

[17] Some of these documents appear as appendices to "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

Figure 5: Basic Structure of the University Park Model



The University Park model is replicable in Massachusetts. Projects following this model will be inherently complex; participants' investment requires that organizers create a business entity and navigate complex securities requirements. Such projects are likely to generate little economic benefit for participants, as participants cannot take advantage of the premium value of net metering credits under a virtual net metering approach. Nevertheless, the University Park model does offer an important alternative to CSS models that require virtual net metering and net metering services.

Review of Challenges and Barriers to CSS Project Implementation in Massachusetts

Massachusetts policies and programs that support solar PV, such as the Solar Carve-Out program, virtual net metering, and rebate programs, each contribute to the opportunity for economically favorable CSS projects in the Commonwealth. For CSS to play a significant role in helping to address the unmet demand for solar PV in Massachusetts, however, projects must: (1) overcome the challenges and barriers facing CSS and solar PV more broadly; (2) meet local needs; and (3) overcome site-specific issues.

In this section, we describe challenges and barriers to implementing CSS projects in Massachusetts. While several of the challenges also impact solar PV project development in general, they have specific repercussions for CSS projects. Additionally, challenges to CSS implementation that impact projects nationwide are discussed in Appendix A.

Limitation on Community Members Participating in a CSS Project with a Public Host Customer

- **Challenge: Under current net metering regulations, Massachusetts public entities cannot serve as the Host Customer of a CSS project with more than approximately twenty participants.**

Under current net metering regulations, any net metered facility with a capacity in excess of 60 kW (AC) and a public entity Host Customer will fall under the public net metering cap. As net metering credits from net metering facilities that fall under the public cap cannot be allocated to the utility accounts of non-public entities, the capacity of a CSS project with a public entity as the host customer would be limited to 60 kW (AC). Projects of this size are likely to be less cost-effective than larger projects, which can achieve economies of scale. Further, the number of participants is limited. For example, a 60 kW project with a typical CSS participant share (e.g., between 3 kW and 5 kW) would support only twelve to twenty participants.

Aggregate Capacity Cap on Net Metering Services

- **Challenge: CSS models that depend on virtual net metering and net metering services may only be viable for a few years, or less, in some utility service territories.**

Net metering services are capped by Massachusetts legislation at 6% of each investor-owned utility company's peak load, with 3% of each utility company's total net metering cap allocated for private entities and 3% allocated for governmental and municipal entities.[18] Net metering services will be available only to those net metering facilities installed before the aggregate capacity cap in a given utility service territory is reached.[19] As of February 2013, over 50% of the space under the private cap in two utility territories has been claimed.[20]

In 2012, the Massachusetts DPU adopted the System of Assurance of Net Metering Eligibility[21] to help ensure that net metering caps are fully utilized. Prior to the adoption of the System of Assurance, the development of large distributed generation projects that rely on net metering services for their financial feasibility was projected to slow or stall as net metering caps were reached. The System of Assurance provides host customers, developers, and investors of eligible projects a limited-time guarantee that facilities will receive net metering services, as long as the rules of the System of Assurance are followed.

To secure an assurance of net metering eligibility, host customers of eligible facilities must submit an Application for Cap Allocation (ACA) with the System of Assurance.[22] An ACA requires, among other details, an executed Interconnection Service Agreement (ISA), adequate site control, and all necessary

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[18] To meet the definition of "a net metering facility of a municipality or other governmental entity," both the host customer and each net metering credit recipient must be a municipality or governmental entity.

[19] For more on net metering policy in Massachusetts see the Massachusetts Department of Energy Resources' DG and Interconnection Website. https://sites.google.com/site/massdgic/

[20] See *Public/Private Cap Info* at the System of Assurance of Net Metering Eligibility. www.massaca.org.

[21] DPU Order 11-11-A (October 25, 2012), Appendix A: System of Assurance of Net Metering Eligibility.

[22] The System of Assurance of Net Metering Eligibility is now located at www.MassACA.org. This web-based application was developed by Cadmus with support from the DPU and the Massachusetts regulated utilities.

governmental permits and approvals necessary to construct the facility (with the exception of ministerial permits, such as a building permit). The time and cost required to secure an executed ISA, site control, and permits helps ensure that net metering cap allocations are only granted to non-speculative projects.

Those considering CSS projects may not be prepared to invest the resources required to apply for a cap allocation. If the availability of net metering services is uncertain, prospective project organizers may not want to invest resources in education and project planning[23] and may choose not to move forward with the project.

Uncertainty in the Massachusetts SREC Market

- **Challenge: Prospective CSS participants may not have sufficient experience or expertise to evaluate the risks associated with uncertainty in the Massachusetts SREC market before investing in a project.**

Uncertainty in the Massachusetts SREC market can impact benefits for CSS project participants and reduce the interest among potential investors and aggregators. The Solar Carve-Out program sets a ceiling price that declines over time for SRECs. The auction sale price of SRECs bought and sold through the Solar Credit Clearinghouse auction, established by the DOER, is $285 ($300 minus a 5% auction fee). While most SRECs are sold in the market, this auction of last resort is intended to provide a price floor.

Some market participants have questioned the reliability of this price floor, and SREC prices fell significantly in 2011 and 2012. DOER has proposed changes to the Solar Carve-Out program that are intended to stabilize SREC prices;[24] however, the SREC program is market-based, and future SREC values are inherently unknown. Financial losses caused by SREC fluctuations could not only impact individual participants, investors, and aggregators, but may also damage the reputation of CSS more broadly if project investors are unable to recoup their investments due to lower than expected SREC prices.

Delays in Interconnection Authorization and Delivery of Net Metering Credits

- **Challenge: CSS participants may abandon projects due to significant delays in the solar PV grid interconnection process or the allocation of net metering credits to their electric bills.**

Delays in the interconnection authorization process may impact the timeline and economics of CSS projects. Distributed generation projects in Massachusetts currently may face significant interconnection delays. Exponential growth in the market for distributed generation in the Commonwealth and related factors have hindered the ability of local distribution companies to issue

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[23] In contrast, smaller projects will likely remain viable. A facility that is not a net metering facility of a municipality or other governmental entity are exempt from the net metering cap if the nameplate capacity rating is less than or equal to 25 kW on a three-phase circuit or 10 kW on a single-phase circuit. Projects of this small size, however, may not be economically viable as CSS projects.

[24] Ongoing Public Rulemaking Process. http://e2.ma/click/o2elg/k7nsym/ome2gb.

interconnection approvals in accordance with the timelines outlined in DPU's Model Interconnection Tariff.[25]

CSS project participants may also experience substantial delays in the receipt of net metering credits on their electric utility bills as a result of the manual processing of net-metering credits by Massachusetts utilities. Further, utility company billing software can also make it difficult for participants to identify net metering credits on their bills and interpret the impact of the credits. Such delays and perceived lack of transparency could have a negative impact on the credibility of a CSS project that depends on virtual net metering and possibly result in participants abandoning projects.

Technical Limitations of Solar Sites

- **Challenge: Some communities may not have suitable sites for CSS projects, and will therefore need to install their PV systems in other locations. This may reduce the value that community places on the project.**

The number of sites suitable for rooftop CSS projects solar PV is constrained by technical limitations such as Massachusetts' aging building stock, loading requirements of the state's building code, and, in some areas, the utility distribution system itself. Prospective CSS participants and site owners may view a project sited remotely as less desirable than a local project.

In response to heavy snowfalls in recent years, the Massachusetts building code was updated with increased loading requirements. Many rooftops that were well suited for solar PV under previous building codes now require structural upgrades to accommodate PV, thereby increasing installed cost.

Also, the structure of the electric grid itself in portions of Boston and Cambridge (two of the DOER Rooftop Solar Challenge partner municipalities) limits the number of sites suitable for solar PV. Portions of these cities are within the local utility's area network. Within these areas, interconnection of distributed generation may be limited due to concerns about grid reliability.

Property Tax Status Uncertainties

- **Challenge: CSS projects will not likely receive the property tax exemption available to some solar PV projects in Massachusetts. This may increase the cost of participating in a CSS project.**

Although M.G.L. c. 59, §5 (45) provides a property tax exemption for solar and wind energy systems, this exemption applies only to projects that are "being utilized as a primary or auxiliary power system for the

[25] Recent legislation requires the development of "an enforceable standard interconnection timeline for the interconnection of distributed generation facilities" by November 1, 2013. The Distributed Generation Working Group has gathered stakeholder input to inform the development of new standards, including interconnection timelines, and final resolution is forthcoming.

purpose of heating or otherwise supplying the energy needs of property taxable" under chapter 59.[26] The Department of Revenue's (DOR) Division of Local Services has interpreted this provision as requiring the energy to be used at the site of the taxable property. Therefore, a CSS project would not be tax exempt. A Payment in Lieu of Tax (PILOT) agreement may be negotiated as an alternative to property taxes.[27,28] Ultimately the local assessing authority makes the determination of the method and amount of taxation of these types of systems.

Although comprehensive guidance recommending a specific assessment methodology is currently unavailable, DOR has provided workshops throughout the Commonwealth to provide local assessors with the tools and methodology for valuing solar PV systems for the purpose of local taxation or for negotiation of PILOT agreements. Before proceeding with a CSS project, the tax implications for the system and the impact on the project economics must be determined.

The impact of property taxes —and the cost of pursuing property tax certainty –may decrease the appeal of CSS projects as compared to solar EMS projects or other energy initiatives.

Working With Municipal Partners to Ascertain Local Needs

To ascertain the needs and priorities of Massachusetts municipalities and identify potential issues related to CSS and solar PV, Cadmus staff met with representatives from DOER's Rooftop Solar Challenge municipal partners. Needs and issues discussed, like the municipalities themselves (Table 1), are diverse.

Table 1: Key Statistics, DOER Rooftop Solar Challenge Partner Municipalities[29]

Item	Cambridge	Boston	Harvard	Winchester	Hatfield
Median Household Income	$67,271	$50,710	$141,274	$122,238	$54,792
Population Living Below Poverty Line	9.5%	15.1%	1.9%	2.4%	2.6%
Population Different House 1 Year Ago	29.6%	23.6%	10.8%	8.5%	3.8%
Renters	66.2%	66.6%	7.0%	17.7%	30.3%
Structures with 2 or More Units	84.3%	81.7%	4.9%	19.8%	33.9%

[26] M.G.L. c. 59 § 5, cl.45 reads, "Any solar or wind powered system or device which is being utilized as a primary or auxiliary power system for the purpose of heating or otherwise supplying the energy needs of property taxable under this chapter; provided, however, that the exemption under this clause shall be allowed only for a period of 20 years from the date of the installation of such system or device."

[27] See M.G.L. c.164, §1, Definitions.

[28] For more information about property taxes and PILOT agreements, contact the Massachusetts Department of Revenue at 617-626-2400. Also see *The Guide to Developing Solar Photovoltaics at Massachusetts Landfills.* http://www.mass.gov/eea/docs/doer/green-communities/pubs-reports/pvlandfillguide.pdf.

[29] United States Census Bureau. American Fact Finder. 2008-2010 American Community Survey 3-Year Estimates (Boston, Cambridge, Winchester); 2006-2010 American Community Survey 5-Year Estimates (Harvard, Hatfield). http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

Cambridge

Approximately 66% of Cambridge residents are renters and more than 84% of housing structures have two or more units. While these housing statistics point to the potential for significant unmet demand for solar PV, Table 1 also suggests a potentially significant barrier to CSS projects; an estimated 30% of the City's population now lives in a different house than at the time of the survey.

In Table 2, we outline key local needs, priorities, and potential issues noted in our discussions.

Table 2: Key Needs and Priorities of Cambridge

Key Local Needs	Summary Description
Buy-Out Option	Given the prevalence of renters and relocation among Cambridge residents, city staff noted that CSS models that can accommodate a buyout of participants' shares were a priority.
Working Within Geographic Limitations	The interconnection of solar PV systems can be limited in sections of Cambridge's electricity grid designated by the local distribution company as part of the area network, due to concerns about reliability. Cambridge CSS projects may be constrained to areas outside of the area network.
Clarification of Zoning Questions	Under Cambridge zoning, electricity generation as a land use is not authorized (for example, construction of a power plant). Roof-mounted solar PV systems are considered mechanical systems; however, it is not known whether roof-mounted systems that serve residents in different buildings qualify as mechanical systems under the zoning ordinance. City staff also noted a need for clarification as to whether ground-mounted CSS projects would be allowable under this exemption.
Return on Investment for Participants	While city staff noted an existing interest in solar PV among residents, the Cambridge team said that CSS business models and projects that did not deliver any return to participants would likely be unappealing to residents.
Partnership With Local Business and Academic Institutions	City staff noted an interest in partnering with local businesses and universities. Cambridge anticipated that commercial properties and universities could help counter space constraints by acting as site owners in future CSS projects. The eco-district planned for the Kendall Square area was noted as an area of interest.

Boston

As with Cambridge, housing statistics for Boston, shown in Table 1, seem to indicate a municipality well-suited for CSS. Further, Boston has significant experience with solar PV. In 2007 and 2008, the city partnered with the U.S. DOE to accelerate the adoption of solar energy technologies through the Solar America Cities program. Through its Solar Boston initiative, the city helped develop solutions to local barriers to solar energy use.[30,31]

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[30] To increase market competition, drive down installation costs, and create deeper PV market penetration, for example, the City supported the development of the Boston-area solar workforce by organizing several installer education programs.

[31] "Solar Energy Technologies Program Peer Review." Solar America Cities Solar Boston Market Transformation Presentation. http://www1.eere.energy.gov/solar/review_meeting/pdfs/prm2010_boston.pdf.

Boston has a strong foundation in solar power, as demonstrated by its achievements under the Solar America Cities program. Nevertheless, approaches to CSS pursued in Boston must meet the city's unique needs and work within (or overcome) the barriers identified in the Solar Boston Initiative. Table 3 describes some of these issues.

Table 3: Key Needs and Priorities of Boston

Key Local Needs	Summary Description
Buy-Out Option	Given the prevalence of renters and relocation among Boston residents, city staff noted that CSS models that can accommodate a buyout of participants' shares were a priority.
Working Around Barriers to Using Municipally Owned Buildings	City staff noted that securing the use of municipal rooftops for solar PV was difficult. The potential for competing maintenance schedules between solar PV systems and other roof systems was seen as a potential barrier for site owners. Sites owned by non-profit entities were suggested as an alternative to municipal sites. The city's access to cheap capital was said to make solar EMS agreements less appealing than outright ownership, since the potential benefits to the city may be greater when Boston owns the project. This attitude may also apply to CSS projects.
Low-Income Component	City staff noted an interest in incorporating a low-income component into CSS projects pursued in Boston. CSS projects should allow low-income participants to realize energy benefits without requiring up-front capital.
Geographic Limitations	Due to concerns about reliability, the interconnection of solar PV systems can be limited in sections of Boston's electricity grid designated by NSTAR as part of the area network. The Renew Boston Solar map includes an NSTAR Area Network layer, which should facilitate CSS project planning efforts.[32] Solar PV development is also limited in the city's historic districts. Any installation of a solar energy system within the boundaries of a local historical district in Boston or to a property individually designated as a Boston landmark may require review and approval of the historic district commission or of the Boston Landmarks Commission. (These areas largely overlap with areas of Boston designated by NSTAR as part of the area network.)
Limited City Capacity	Aggregators and participants of CSS projects in Boston can benefit from the city's extensive solar experience and learn from its dedicated energy staff. For example, as a part of the city's participation in the SolarizeMass program, city staff members are currently holding community meetings in neighborhoods to discuss residential solar opportunities. They noted, however, that they lack the capacity to run a CSS program. The City may be able to lend branding and procurement support, as well as some oversight in relations with the installer. In interviews, city staff noted several potential partners for CSS projects in Massachusetts, especially community development corporations (CDCs). Potential CDC partners noted include Urban Edge, JPNDC, and Allston-Brighton CDC. City staff also recommended that a CSS model could partner with or involve Boston Buying Power, which already has a constituency of small business members.

[32] Renew Boston Solar Map. http://gis.cityofboston.gov/solarboston/#

Harvard

The Harvard team has developed a business structure for local CSS projects, working with an attorney to assist with the legal and business details. The team set up an LLC to serve as aggregators and the 1603 grant was secured for one project through the safe harbor of PV panels. Participants in the Harvard Solar Garden project were exempt from Securities and Exchange Commission (SEC) registration, in part, because almost all participants were accredited investors.[33] For more information on securities regulations and exemptions, see Appendix A.

Legal and financial documents from the Harvard Solar Garden project are publicly available. See www.hsgarden.org.

Table 4: Key Needs and Priorities of Harvard

Key Local Needs	Summary Description
Ownership Stake in CSS Project	Under the SolarizeMass program, all participating residents purchased PV systems, rather than entering into solar EMS contracts. CSS models that allow participants to take an ownership stake in the project may be of greater interest in Harvard than models in which participants buy, for example, net metering credits.
Adjust Local Expectations Regarding Project Payback	Given SREC projections at the time that Harvard participated in the SolarizeMass program, participating residents anticipated an estimated five-year payback on their investment under this program. Available incentives have decreased in value since that time, and new CSS projects will have a longer payback period. For CSS to build on the momentum of the SolarizeMass program, residents' expectations about CSS project economics may need to be adjusted.
Clarification of Zoning Questions	The Harvard Solar Garden project organizers found it difficult to secure zoning approval for this CSS project. Clarification of M.G.L. c. 40A §3 by the state on how it prevents municipalities from imposing restrictive zoning rules could facilitate future projects in Harvard.

Winchester

The Town of Winchester also has experience with solar PV projects, including participation in the SolarizeMass program. These ongoing projects may provide a foundation of support for and interest in CSS projects.

Winchester explored the option of siting a CSS project on a newly constructed school. In comparing the projected economic benefits of a CSS project to a solar EMS project, project organizers estimated that a solar EMS project is likely to generate greater economic benefit for the Town and subsequently decided that all public space suitable for solar PV should be used for solar EMS projects.

[33] Investors are accredited if they meet specific conditions. The most relevant conditions are that the investor earns more than $200,000 per year ($300,000 if filing jointly) or has a net worth of at least $1 million.

Table 5: Key Needs and Priorities of Winchester

Key Local Needs	Summary Description
Diversity of CSS Models	In Winchester's experience under the SolarizeMass program, an estimated 50% of participants entered into solar EMS contracts and 50% were interested in outright ownership. Prospective CSS participants may be interested in a variety of different CSS models.
Adjust Local Expectations Regarding Project Payback	Given SREC projections at the time that Winchester participated in the SolarizeMass program, participating residents anticipated an estimated five-year payback on their investment under this program. Available incentives have decreased in value since that time, and new CSS projects will have a longer payback period. For CSS to build on the momentum of the SolarizeMass program, residents' expectations about CSS project economics may need to be adjusted.
Identification of Suitable Sites	A significant number of Winchester residents were interested in participating in SolarizeMass; however, shading due to tree cover limited the number of sites suitable for PV installations. If suitable sites can be identified, CSS projects have the opportunity to meet this residual demand.
Maximizing Economic Benefit for Use of Town Property	Representatives from the Winchester team noted a desire to generate as much economic benefit for the Town as possible from the use of public space, leading to a preference for solar EMS projects on public property over CSS projects.

Hatfield

Our brief discussion with representatives from Hatfield, a DOER-designated Green Community, did not reveal specific local needs or barriers. As in any community, however, individuals interested in implementing CSS models in Hatfield will need to overcome the challenges to implementing CSS discussed in Section 2, as well as the challenges facing solar PV projects more broadly (see Appendix A). Hatfield also has some solar experience, including participation in the SolarizeMass program. Lessons learned from this experience should be incorporated into local CSS initiatives.

Section Summary

In this section, we have identified the opportunities and barriers of implementing CSS projects in Massachusetts. Although no single CSS model can address all of the challenges uncovered in our research, there are a few different models that offer unique advantages and benefits. Informed by the research described in this section, we identified two model frameworks suitable for near-time use in Massachusetts. In Section 4, we provide more information on these two recommended models.

4. Recommendations

In this section, we recommend two CSS model frameworks that best fit Massachusetts' unique combination of solar PV incentives and local community decision making processes. Each model requires the availability of net metering services. We also outline a variant of one of these models that can be used if net metering services are not available (e.g., if net metering caps are fully subscribed).

Model Evaluation and Selection

Our desktop analysis of CSS models used in Massachusetts and nationwide confirms that net metering services (or equivalents, such as PPAs with utility companies) are critical to the viability of most CSS projects. Models that involve a PPA with the local utility company have been successfully employed in Colorado and other states, as demonstrated by the Clean Energy Collective model (Section 3). In the absence of new legislation or regulation that requires Massachusetts' investor-owned utilities to purchase power from CSS projects, however, such an approach is not viable in the Commonwealth.[34] As such, our selection and development of model frameworks focused on those that can most cost-effectively utilize net metering services.

Another key consideration in the selection of model frameworks was complexity. Implementing solar PV projects (e.g., solar EMS projects) can be challenging and time-intensive, particularly for municipalities. These projects involve contract mechanisms, for example, that are unfamiliar to cities and towns. The perceived complexity of CSS will likely be even greater, as few Massachusetts municipalities have exposure to this emerging approach to solar PV.

The following questions will help those interested in pursuing CSS determine the best model for their project:

- *Is the prospective project site owned by a public entity or private party?* Public entities interested in making public space available for the purposes of CSS and hosting a project in exchange for lease payments can take advantage of private sector expertise for project development and administration. Where private citizens drive this process, however, securing lease agreements with private site owners will likely be much more practicable; projects sited on public land are subject to competitive procurement requirements.

- *Will the PV system be owned by a public or private entity?*[35] Whether the system owner is a public entity (e.g., municipality) or a private entity (e.g., third-party developer, company formed by organizing participants) strongly influences the value of net metering credits that will be available and places constraints on system capacity. If the system owner is a public entity and host customer, the project is limited to 60 kW (AC). Where the system owner is a private entity,

[34] This report does not consider options for Massachusetts' municipal utilities. A PPA approach may be an effective option in these territories.

[35] For purposes of this section, the system owner is assumed to also serve as the host customer and aggregator for purposes of allocating net metering credits.

the value of net metering credits declines significantly for projects greater than one MW (AC)[36] in capacity.

As shown in Table 6, the two most pragmatic models for implementing CSS in Massachusetts combine private entity ownership of the PV system with project siting on either public or private property. We call these models the Participant Ownership model and the Public Lease model. Each model has distinct advantages and challenges. As seen in Section 3, iterations of these models have been used to develop CSS projects across the country.

For reasons related to the regulations surrounding net metering in Massachusetts, as well as practical considerations concerning contractual complexity and level of risk a public entity may be willing to take, CSS projects in which the PV system is owned by a public entity, or in which the public entity serves as the host customer, are not recommended.[37]

[36] Net metering credits are calculated by utility companies using the following kWh-based electricity charges: default service, distribution, transmission, and transition. For net metering facilities larger than one MW (AC), only facilities that fall under the public cap are eligible for the distribution component.

[37] Note: CSS projects in which the public entity has a municipally owned utility would not face the same regulatory restrictions. This recommendation should therefore not be seen to apply to projects in municipal utility territories. Hybrid models, in which a public entity owns the PV system but leases it out to a private entity that operates the system, may be an alternative. The hybrid model offers a combination of low financing costs through public bonds and the ability to take the federal ITC. At the time of this report, however, no such models are known to have been implemented in Massachusetts, and the implications for a CSS project are unknown.

Table 6: CSS Business Models Categorized by Site and System Ownership

		Site Owner	
		Private Entity	**Public Entity**
System Owner	**Private Entity**	**PARTICIPANT OWNERSHIP MODEL** • Private entity (e.g., LLC) is formed by organizing participants for the purposes of developing a CSS project • Private entity owns or leases property on which the PV system will be installed • Participants realize a return on investment and benefit from net metering credits generated by the system	**PUBLIC LEASE MODEL** • Public entity leases property to a private entity for the installation of the CSS project • Private entity owns and operates the PV system • Participants benefit from net metering credits generated by the system
	Public Entity	**NOT RECOMMENDED** • Due to MA net metering regulations, projects are limited to a capacity of 60 kW (AC) or less • Public entity will need to serve as aggregator and execute net metering credit allocation agreements with participants • Public entity cannot take advantage of the 30% ITC	**NOT RECOMMENDED** • Due to MA net metering regulations, projects are limited to a capacity of 60 kW (AC) or less • Public entity will need to serve as the aggregator and execute net metering credit allocation agreements with participants • Public entity cannot take advantage of the 30% ITC

The Public Lease model allows municipalities and other public entities to facilitate CSS projects by making public roof space or land available for CSS. A CSS vendor develops and administers the project. The key features of the Public Lease model are twofold; the municipality drives the process and brings the competitive forces of the market to bear through the lease of public space, and participants benefit by having net metering credits applied against their electric bills. We recommend this model framework for Massachusetts municipalities and provide detailed guidance in "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013). The Brewster project discussed in Section 3 is an example of this model.

The Participant Ownership model is suitable for community members interested in developing a project that is independent of a CSS vendor or facilitation by a public entity. Project organizers form a company, typically an LLC. Participants, including project organizers, benefit from a return on their investment in the company. The key features of the Participant Ownership model are that private individuals drive the process and participants take ownership in the project. The University Park project discussed in Section 3 is one approach to this model. The Harvard Solar Garden project organized by private citizens in Harvard, Massachusetts, is another approach to this model.[38]

[38] Harvard Solar Garden. www.hsgarden.org.

Informed by a desktop review of existing CSS projects, interviews with industry leaders, and discussions with DOER's Rooftop Solar Challenge municipal partners, we anticipate that these models (the Public Lease model, in particular) are most practical for near-term implementation in the Commonwealth.[39]

Public Lease Model

The Public Lease model allows public entities with available space to meet community members' demand for CSS by engaging a vendor that specializes in CSS.[40] Under this model, a municipality, for example, conducts a competitive solicitation pursuant to M.G.L. c.30B §16 for the disposition of a public space (e.g., roof space, land). Through this process, the municipality selects a qualified vendor to develop and administer a CSS project and establish the project owner entity.[41] Under a lease agreement with the site owner, the system owner installs the PV system at the site and occupies the space for the life of the project. The municipal site owner receives a lease payment.

Participants' energy benefits are realized through virtual net metering. Participants enter into a net metering credit allocation agreement with the CSS vendor or an entity (for example, a cooperative) created by the vendor. This entity acts as the aggregator and host customer and allocates net metering credits to participating residences or businesses.

Table 7: Summary of the Public Lease Model

Key Element	Summary Description
Project Facilitator	Public Entity
Project Site (Site Owner)	Public Buildings or Land (Public Entity)
System Owner	CSS Vendor or private third party
What Benefits do Participants Receive?	Net Metering Credits
Virtual Net Metering	Required
Do Participants have an Ownership Stake in the Project?	No
Required Documents	• RFP and contract for lease of site (M.G.L. c. 30B §16) • Net metering credit allocation agreement between aggregator and participants

[39] See "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" for detailed implementation guidelines.

[40] In Massachusetts, the economic benefit to the public entity is likely to be less under a CSS project than if the public entity were to enter into a solar EMS contract; however, a CSS project gives public entities the ability to meet local demand for solar PV using public space.

[41] Currently, there are vendors in the United States and Massachusetts that install and operate PV systems and provide the needed business services associated with a CSS project. We expect the list of vendors offering these services to grow. See Appendix C for more information on existing CSS projects and vendors.

For project organizers that want to take advantage of private sector expertise for project development and administration, this model provides many advantages. Local officials and their staff are likely to be somewhat familiar with the required procurement pathway (M.G.L. c.30B §16).[42] Once a lease agreement is reached, project management and administration is largely overseen by the CSS vendor. As participants do not take an ownership stake in the CSS project, this model does not require project organizers to navigate complex securities requirements.

For-profit companies, such as The Clean Energy Collective and My Generation Energy, have offered CSS development and management services under this model (the details of their business models, however, are proprietary). Continued growth will be made more difficult by the expiration of the 1603 grant program. In the absence of the grant, CSS vendors will likely need to identify a tax equity partner to monetize the ITC. The cost of monetizing the ITC can increase project costs, thereby decreasing the net benefit to participants.[43]

In Table 8, we show the estimated first year benefits to participants of a hypothetical 100 kW CSS project developed under this model.[44]

Table 8: Estimated First Year Benefits of a Hypothetical 100 kW CSS Project, Public Lease Model*

	Projection	Assumption	Recipient
Net Metering Credit Revenue**	$20,000	@ $0.16 per kWh	All Participants
Net Metering Credit Purchase Cost	$16,250	@ $0.13 per kWh	All Participants
Net Benefit	$3,750	N/A	All Participants
Estimated First Year Benefit per Participant	$187.50	20 Participants	Each Participant

**Assumptions: 100 kW PV system, 125,000 kWh generated in first year, 20 participants*

***Net metering credit rates vary regularly and by utility service territory.*

In this scenario, the estimated annual net metering credit value is $20,000, and the estimated annual net metering credit cost is $16,250. The net benefit across all participants is $3,750. If we assume that each participant contributes equally to the project, the annual net benefit per participant is estimated to be $187.50.

The example in Table 8 does not consider lease revenue to the site owner. Each party's benefits are interrelated; the net economic benefit to the community as a whole is divided between the site owner and participants. This relationship should be carefully considered by project organizers when

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42 Contact the Department of Labor Standards (DLS) to determine prevailing wage implications for any installation on municipal property: http://www.mass.gov/lwd/labor-standards/prevailing-wage-program/.

43 Mendelsohn, Michael and John Harper, 1603 Treasury Grant Expiration: Industry Insight on Financing and Market Implications, NREL Technical Report, NREL/TP-6A20-53720, June 2012

44 "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013) contains step-by-step instructions on calculating the estimated benefits of CSS projects following the Public Lease and Participant Ownership models under different scenarios. Please reference the implementation guidelines for additional information.

establishing a goal for lease revenue. A higher lease payment to the site owner, for example, may result in decreased value to participating residents and businesses.

Participant Ownership Model

The Participant Ownership model for CSS projects is suitable for project organizers interested in developing a CSS project that is independent of a CSS vendor or facilitation by local government. The key features of the Participant Ownership model (summarized in Table 9) are that private individuals drive the process and participants take an ownership stake in the project. Project organizers start a company, typically an LLC, and participants enrolled are investors in the system owner entity. Under different approaches to this model, participants may purchase a share of the system owner entity or buy the PV panels directly.

The system owner (e.g., an LLC formed by project organizers for the purposes of the project) is incorporated following Massachusetts business incorporation requirements. Organizers register the LLC with the SEC or file for an exemption.[45] When a project site is identified, the LLC enters into a lease agreement with the site owner.[46]

Participants realize energy benefits through virtual net metering. Each participant enters into a net metering credit allocation agreement with the system owner. The system owner also acts as the aggregator and host customer and allocates net metering credits to participating residences or businesses. Depending on the specifics of the project, participants may also benefit from federal tax credits, SREC revenue, and Massachusetts Clean Energy Center (MassCEC) Commonwealth Solar rebate funds corresponding to their share of the project.

The Harvard Solar Garden project organized by private citizens in Harvard, Massachusetts, follows this model. Legal and financial documents from this project are publicly available.[47]

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[45] For a more detailed discussion of securities requirements, see Appendix A or refer to "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

[46] In this example, we assume that the system owner, aggregator, and host customer are all the same entity. This may vary depending on the structure of the CSS project.

[47] Harvard Solar Garden. www.hsgarden.org.

Table 9: Summary of the Participant Ownership Model

Key Element	Summary Description
Project Facilitator	Participants
Project Site (Site Owner)	Private Buildings or Land (Private Entity)*
System Owner	LLC (Participants are investors in the LLC)
What Benefits do Participants Receive?	Net Metering Credits, SREC Revenue, MassCEC Rebates, Federal Tax Credits (potentially)
Virtual Net Metering	Required
Do Participants have an Ownership Stake in the Project?	Yes
Required Documents	• Lease agreement • Business incorporation documents • SEC registration exemption • Net metering credit allocation agreement between LLC and participants • Project installation and operations and maintenance agreements

** While projects installed under this model can be installed on public land, leasing private land is likely to be more practical, as the competitive procurement process is required when public land is leased.*

Unlike the Public Lease model, this model provides an ownership opportunity for participants. It offers a vehicle for local solar proponents who wish to participate in CSS to take a more direct role than may be offered by the Public Lease model. Further, the Participant Ownership model does not require the availability of public space. One variation of the Participant Ownership model, discussed in the next section, can be used if net metering services are not available.

As the Participant Ownership model involves an ownership stake by participants, projects following this model can trigger complex securities requirements. Securities requirements limit the number and type of investors who can join the company, and how shares in the company can be marketed. These projects will likely require a significant investment of time and may require thousands of dollars in attorney fees to navigate state and federal securities regulations.

MassCEC Commonwealth Solar rebates are available for CSS projects in which participants have an ownership stake.[48] To take advantage of federal tax benefits, participants will likely need to recruit a tax equity investor. The tax equity investor will own more than 90% of the PV system during the first six years to comply with the ITC requirements. It is not clear, however, that the Commonwealth Solar rebate and the ITC can be taken at the same time.

[48] Personal communication with Elizabeth Kennedy of the Massachusetts Clean Energy Center (MassCEC). July 16, 2012.

Table 10 shows the estimated simple payback to participants of a hypothetical 100 kW CSS project developed under this model.[49] Two scenarios are considered: (1) having no tax equity partner and assuming no other means to monetize federal tax benefits, but receiving MassCEC Commonwealth Solar rebates, and (2) having a tax equity partner to monetize the federal tax benefits, but not receiving Commonwealth Solar rebates.[50]

Table 10: Estimated Simple Payback to Participants of a Hypothetical 100 kW CSS Project, Participant Ownership Model*

Solar PV System Cost (Including Lease)	Annual Net Metering Credit Revenue**	Annual SREC Revenue	Total Annual Revenue	Simple Payback with MassCEC Rebate and No Tax Equity Investor (Years)	Simple Payback with Tax Equity Investor and No MassCEC Rebate (Years)
$450,000	$20,000	$27,500	$47,500	9	7

**Assumptions: Net metering credit rate of $0.16 per kWh, first year generation of 125,000 kWh; system cost of $4.50 per Watt including cost of lease ($5,000 annual lease payment to site owner); SRECs valued at $220 per MWh; 15% Tax Equity Investor Return on Investment, Commonwealth Solar Rebate of $0.40 per Watt*

***Net metering credit rates vary regularly and by utility service territory.*

In this scenario, if a tax equity investor is not available to monetize federal tax benefits, but participants receive MassCEC rebates, a simple payback of nine years is projected. Where we assume that a tax equity partner is available to monetize tax equity federal tax incentives, but participants do not receive MassCEC rebates, a simple payback of seven years is projected.[51]

Alternative to Virtual Net Metering Approach

A CSS model that benefits participants by reducing their utility electric bills is not viable where net metering services are not available. In the Alternative to Virtual Net Metering approach (a variation of the Participant Ownership model), participants receive a return on their investment in the CSS project

[49] "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013) contains step-by-step instructions on calculating the estimated benefits of CSS projects following the Public Lease and Participant Ownership models under different scenarios. Please reference the implementation guidelines for additional information.

[50] While there is no formal guidance available, we understand that the Commonwealth Solar rebate would not be available to participants if they have only a small stake a in a project, as is the case when working with a tax equity provider to monetize federal tax benefits.

[51] The simple payback of these approaches is strongly linked to the assumed SREC value across the payback period. In this analysis, we assume SRECs valued at $220 per MWh. Simple payback decreases by approximately one year if SRECs are valued at the Solar Credit Clearinghouse Auction minimum of $285 per MWh. If SRECs are valued at $500 per MWh or higher, simple payback drops to five years or fewer.

rather than a reduction in their utility bills through net metering. Participant revenue is generated from two sources: (1) the sale of SRECs generated by the PV system; and (2) the sale of electricity to the site owner. The key features of this model are summarized in Table 11.

The system owner (e.g., the LLC formed by project organizers for the purposes of the project) is incorporated following Massachusetts business incorporation requirements. Organizers register the LLC with the SEC or file an exemption.[52] When a project site is identified, the LLC enters into a combined lease agreement and PPA with the site owner.[53] The site owner purchases power delivered from the PV system. The electricity generated directly serves the building's load, and the site owner uses less electricity from the distribution grid.

Participants realize energy benefits from the sale of electricity to the site owner and from the sale of SRECs. Depending on the specifics of the project, participants may also benefit from federal tax credits and MassCEC rebates corresponding to their share of the project.

The University Park Community Solar (Figure 5) project follows this model. Participants own shares in a company that sells power through a PPA to the site owner.

[52] For a more detailed discussion of securities requirements, see Appendix A or refer to "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

[53] In this example, we assume that the system owner and aggregator are the same entity. This may vary depending on the structure of the CSS project.

Table 11: Summary of Alternative to Net Metering Model

Key Element	Summary Description
Project Facilitator	Participants
Project Site (Site Owner)	Private Buildings or Land (Private Entity)*
System Owner	LLC (Participants are investors in the LLC)
What Benefits do Participants Receive?	Net Metering Credits, SREC Revenue, MassCEC Rebates, Federal Tax Credits (potentially)
Virtual Net Metering	No. The PV system is interconnected on the load side of the building's electrical meter. Energy generated by the PV system directly serves the building's load.
Do Participants have an Ownership Stake in the Project?	Yes
Required Documents	• Lease agreement • PPA with site owner • Business incorporation documents • SEC registration exemption • Project installation and operations and maintenance agreements

** While projects installed under this model can be installed on public land, leasing private land is likely to be more practical, as the competitive procurement process is required when public land is leased.*

This approach provides an approach to CSS when net metering services are not available. As this approach involves an ownership stake by participants, these projects may trigger complex securities requirements. These projects will likely require a significant investment of time and may require thousands of dollars in attorney fees to navigate state and federal securities regulations.

Table 12 shows the estimated simple payback to participants of a hypothetical 100 kW CSS project developed under the Alternative to Virtual Net Metering Approach.[54] Two scenarios are considered: (1) having no tax equity partner and assuming no other means to monetize the federal tax benefits, but receiving MassCEC Commonwealth Solar rebates, and (2) having a tax equity partner to monetize the federal tax benefits, but not receiving MassCEC rebates.[55] This analysis assumes that the building hosting the PV system will take the medium commercial electric rate, which is applied for many medium-sized commercial buildings.

[54] "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013) contains step-by-step instructions on calculating the estimated benefits of CSS projects following the Public Lease and Participant Ownership models under different scenarios. Please reference the implementation guidelines for additional information.

[55] While there is no formal guidance available, we understand that the Commonwealth Solar rebate would not be available to participants if they have only a small stake a in a project, as is the case when working with a tax equity provider to monetize federal tax benefits.

Table 12: Estimated Simple Payback to Participants of a Hypothetical 100 kW CSS Project, Alternative to Virtual Net Metering Approach*

Solar PV System Cost	Annual Electric Savings	Annual Site Owner Share of Electric Savings	Annual Participants Share of Electric Savings	Annual SREC Revenue	Total Annual Investor Revenue	Simple Payback with No Commonwealth Solar Rebate and No Tax Equity Investor (years)	Simple Payback with Tax Equity Investor and No Common-wealth Solar Rebate (years)
$400,000	$14,370	$7,185	$7,185	$27,500	$34,685	12	8

**Assumptions: First year generation of 125,000 kWh; System Cost of $4.00 per Watt (does not include lease payment to site owner, as site owner is likely to receive only a nominal lease fee); SRECs valued at $220 per MWh; 15% Tax Equity Investor Return on Investment, Commonwealth Solar Rebate of $0.40 per Watt, PPA between site owner and LLC calls for the site owner to pay for electricity at an annual rate that is equivalent to one-half of the annual expected energy savings.*

The participant revenue and simple paybacks under this model are generally lower than in models that require the availability of net metering services. This is because the value of electricity produced by a PV system at the medium commercial rate ranges from approximately 20% to 30% less than the value of electricity produced under a small commercial rate in most utility territories.[56] Buildings with other utility rate classes will show different revenue and simple paybacks. For example, CSS projects at facilities on a time-of-use (TOU) rate should, in general, show better results than those represented here.

[56] Virtually net metered systems are typically assigned a small commercial rate.

5. Next Steps

To support the implementation of CSS projects in Massachusetts, Cadmus has explored opportunities and barriers to CSS, as well as local needs and priorities. Based on our research and analysis, we have recommended and developed two model frameworks for public and private entities in the Commonwealth. Each model addresses barriers in a unique way and offers a different set of benefits.

In "Community Shared Solar: Implementation Guidelines for Massachusetts Communities," we provide prospective project organizers with a detailed roadmap to implementing projects under the Public Lease and Participant Ownership models. For each business model, the Implementation Guidelines provide guidance on the following:

- Circumstances under which the model is appropriate;
- Roles and relationships between the various parties;
- Key criteria and considerations;
- Forming a CSS project team;
- Identifying potential project sites;
- Estimating costs and benefits; and
- Relevant procurement processes.

Prospective project organizers considering, planning, or implementing CSS projects in their community should refer to the Implementation Guidelines for more comprehensive guidance.

Appendix A. Challenges and Barriers to CSS Implementation

Barriers to CSS and solar PV development in general that are not unique to Massachusetts are described below. For each challenge identified, we note whether the Public Lease Model, the Participant Ownership Model, or both are impacted by the challenge.

Challenges Unique to CSS

Securities Requirements

- **Challenge: CSS models that involve an ownership stake by participants can trigger complex SEC requirements. Complying with securities requirements likely require that project organizers engage professional legal and accounting assistance.**
- **CSS model impacted: Participant Ownership model**

The time and cost required to register an investment offering with the SEC and state regulators would be prohibitive to all but those companies that are planning to build a large number of very large CSS projects. However, several exemptions from registration are available for offerings that meet certain requirements. The most common and representative exemption is Regulation D of the private offering exemption. While different rules within Regulation D provide for different requirements, the exemption typically allows for raising up to $1 million (or $5 million in some cases) in any 12-month period. Regulation D imposes a number of limitations, including restrictions on the number of investors and how the offering can be marketed.

While the number of accredited investors is typically unlimited, the number of non-accredited investors is limited to 35. Investors are accredited if they meet specific conditions. The most relevant conditions are that the investor earns more than $200,000 per year ($300,000 if filing jointly) or has a net worth of at least $1 million. While wealthy members of a community may be able to meet these conditions, this investment model limits broader community participation in CSS. A CSS project following this model will necessarily be limited in terms of scale and replicability.

The other significant limitation in Regulation D is marketing. Private offerings cannot be advertised; they are essentially limited to word of mouth marketing. A private offering memorandum and various legal agreements are still required, with associated costs of approximately $10,000 to $20,000.

Custom Contract Documents Required

- **Challenge: Important contract terms will vary significantly by project depending on the needs of the parties, their tolerance for risk, and the CSS model.**
- **CSS models impacted: Participant Ownership model, Public Lease model**

It may be difficult for participants and/or site owners to identify a beneficial project, because CSS projects are so new. This can slow or stop contract negotiations and increase administrative costs for all parties. Some sample contract documents for solar EMS agreements are publicly available[57]; however, model contract documents for CSS projects do not currently exist.[58]

To ensure that CSS contracts match the risk tolerance of the participants and site owner, contract documents must be adapted to the specifics of each CSS project. While there are key provisions that should appear in some form in all CSS contracts, the utility of template contract documents is limited.

Alternative Financing Approaches Not Yet Available

- **Challenge: Crowd funding and other potentially attractive options for financing CSS projects (e.g., Real Estate Investment Trusts, Master Limited Partnerships) are currently unavailable for this application. The actual impact of these tools on CSS implementation is unknown.**
- **CSS models impacted: Participant Ownership model, Public Lease model**

The 2012 JOBS Act was intended to make it easier for ventures such as CSS projects to obtain funding. Included in the law are provisions that ease securities regulations regarding crowd funding. Crowd funding typically involves raising many small investments from a large number of average investors, often taking advantage of social media and the internet. The JOBS Act tasked the SEC with developing rules for implementing the crowd funding exemption by January 2013. As of February 2013, the rules have not been finalized.

While the SEC has yet to establish regulations enabling crowd funding, it is likely that there will be a substantial regulatory burden placed on crowd funding managers. For example, under the JOBS Act, there is a yearly aggregate amount that non-accredited investors can invest in crowd funding opportunities (i.e., across all the crowd-funding opportunities in which a participant is investing). The limit ranges from 2% for investors earning up to $40,000 a year to $10,000 for those earning $100,000 a year or more. How a crowd funding portal will comply with these requirements, and ensure that investors have not exceeded these limits, has not yet been determined.

Other potentially attractive business forms that were identified in our research were subsequently ruled out. Using Real Estate Investment Trusts (REITs) to fund CSS projects would potentially allow a large number of participants to help finance a project without the burdensome SEC exemption requirements. Unfortunately, REITs are unable to invest in personal property, and the IRS categorizes solar PV as personal property (as opposed to real property, which is what REITs are allowed to invest in). Although there are arguments being made that solar PV should be reclassified as real property, we found no evidence of any IRS or Congressional movement in that direction.

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[57] In Massachusetts, for example, DOER has drafted template solar EMS contract documents for public entities to reference. The documents are intended as guidance to ensure compliance with the statute and regulation.

[58] Various sample contract documents from existing CSS projects are provided as appendices to "Community Shared Solar: Implementation Guidelines for Massachusetts Communities" (2013).

Another potentially advantageous business model researched was Master Limited Partnerships (MLP). MLPs are limited as to what they can invest in, and solar PV systems are not included. Again, we found no evidence of any significant movement to change this.

Challenges Common to Solar PV Projects

Securing a Tax Equity Partner

- **Challenge: CSS models must secure a tax equity partner to take advantage of the significant tax benefits available for solar projects.**
- **CSS models impacted: Participant Ownership model, Public Lease model**

The ITC for commercial PV systems can only be credited against passive income. Accelerated depreciation write-offs allowed for commercial PV systems can only be deducted either from income (CSS projects do not normally realize that much income so quickly) or from passive income from other sources. Unfortunately, CSS aggregators may not have the idle capital available to make passive investments and earn passive income. Although some forms of business (LLCs, S-corporations, partnerships, and cooperatives) are able to pass the tax credit and depreciation losses through to their individual owners, those owners must have passive income of their own in order to take advantage. Where participants have an ownership stake (Participant Ownership model), only the wealthiest members of a community are likely to have the necessary passive income. For the Public Lease model, a CSS vendor will most likely need a tax equity partner to offer net metering credits to participants at an attractive price.

These tax benefits are significant and can make the difference in whether a CSS project is financially attractive to participants. The ITC can reduce the project cost by 30%. Depreciation of the remaining 85% of the cost (the owner's basis in the project is only reduced by half of the amount of the ITC) can save another 30% if the owner is in the typical 35% incremental tax bracket (35% of 85% equals 29.75%). Combined, these two tax benefits can cut the effective cost of the project by 60% for an owner that can take full advantage.

As aggregators are typically unable to use these tax benefits themselves, they turn to tax equity investors that have both the passive income necessary to take full advantage and the expertise and appetite required to deal with complex agreements. The demand for these investors far exceeds the supply, so they command a substantial return on their investment. In 2010, there were only 16 large national tax investors, most of which were financial institutions. The top 10 investors accounted for more than 95% of the identified investments, and the top two (JP Morgan and GE EFS) accounted for approximately 50%. The legal and financial transaction costs of obtaining tax equity capital can, by one estimate, consume 15% to 40% of the ITC benefit.[59]

Despite these drawbacks, the net tax benefits to a project are still so significant that navigating the difficulty and costs of obtaining tax equity capital are well worth it for those aggregators that have the

[59] *§1603 Treasury Grant Expiration: Industry Insight on Financing and Market Implications*, June, 2012, National Renewable Energy Laboratory (NREL), Mendelsohn, Michael, and Harper, John.

necessary acumen and resources. For many other aggregators, this opportunity to significantly reduce the cost of a project will be unavailable. This will be especially true of aggregators that: (1) rely on volunteers; (2) do not develop many projects; or (3) do smaller projects.

As previously noted, the 1603 program offered an alternative to the ITC that did not require a tax equity investor to projects that started construction prior to 2012. Instead of a 30% tax credit, the system owner received a check from the federal government equal to 30% of the cost of the project. No passive income was necessary in order to cash the check. Many of the CSS models that were financially attractive to participants under the 1603 program may no longer be viable now that the program has expired.

Appendix B. Literature Review

Community Shared Solar: Implementation Guidelines for Massachusetts Communities. This comprehensive guide is intended to support Massachusetts' public and private entities plan and implement CSS projects.

A Guide to Community Shared Solar: Utility, Private, and Nonprofit Development was updated in May, 2012 by NREL. This resource includes a comprehensive treatment of solar models, case histories, state policies, tax policies, securities issues, and resources. http://www1.eere.energy.gov/solar/pdfs/54570.pdf.

Community Solar Power: Obstacles and Opportunities (2nd edition) was published in October, 2011 by the Institute for Local Self-Reliance (ILSR). Its 38 pages include case histories, models, barriers, policies, and a unique scorecard rating of existing projects. www.ilsr.org/community-solar-new-model-local-ownership.

Community Renewables: Model Program Rules was published in November, 2010 by the Interstate Renewable Energy Council (IREC). It includes guiding principles, definitions, and model rules for CSS projects that involve virtual net metering. http://irecusa.org/wp-content/uploads/2010/11/IREC-Community-Renewables-Report-11-16-10_FINAL.pdf

The Northwest Community Solar Guide was published in 2009 by the Bonneville Environmental Foundation (BEF) and Northwest Sustainable Energy for Economic Development (SEED). It includes case studies, project economics, incentives, and an overview of the steps for smaller, do-it-yourself CSS projects. www.nwseed.org/documents/NW%20Community%20Solar%20Guide.pdf

The Community Solar Tool developed by the University of Oregon offers Web-based project planning support. http://communitysolar.dyndns.org

The Community Power Network serves as a clearinghouse for information on CSS. http://communitypowernetwork.com

The Solar Gardens Institute (SGI) also provides a broad array of information. The map on their home page shows both: (1) existing CSS projects; and (2) SGI solar gardens, which are local people or groups who are interested in building a CSS project. www.solargardens.org

§1603 Treasury Grant Expiration: Industry Insight on Financing and Market Implications was published in June, 2012 by NREL. It describes the challenges faced by solar project developers due to the expiration of the 1603 program and the need to once again find tax equity partners in order to take advantage of the ITC and accelerated depreciation. www.nrel.gov/docs/fy12osti/53720.pdf

Securities Law Issues Relating to Community Solar Projects is a memorandum developed in 2009 by the Stoel Rives law firm for NREL. http://nwcommunityenergy.org/solar/financing/NREL%20%20Securities%20Memo.pdf

Appendix C. Summary of Existing CSS Projects

LEADING MODELS	
University Park, MD **David Brosch** **301 779-3168** **davidcbrosch@comcast.net** **www.universityparksolar.com**	
Aggregator	Local LLC created by volunteer participants. The number of unaccredited participants is capped by securities law for private offerings at 35.
System Owner	The LLC – the 1603 grant was passed through to participants
Participant Contract	Invest in a share of the LLC; if moving out of territory, can still receive income
Host	The system is behind the meter of the church on which it is located. Maryland's net metering law allows credit for up to 200% of a host's energy use.
Virtual Net Metering	No – LLC sells electricity to the host and distributes net revenue to participants
Comments	• 22 kW: ~$130,000 • Financed by participants • $10,000 state grant • Organizing the LLC and private offering cost ~$12,000, in addition to pro bono help • ~$7,000/year REC sales • ~5-6 year payback claimed
Pros	+ Replicability - sample legal docs are available for free; model was replicated using 1603 grant by Greenbelt, MD; however, committed volunteers are a must + A vehicle for grass roots enthusiasm
Cons	- Scalability – limit on number of unaccredited investors - Financial viability is uncertain now that the 1603 program has ended; getting a tax equity partner is impractical for smaller projects, and the tax credit is only useful to wealthy participants - May seem like an investment, as opposed to getting one's power from solar

LEADING MODELS, CONTINUED	
El Jebel, CO **Paul Spencer, President** **970 948-6309** **paul@easycleanenergy.com** **www.easycleanenergy.com**	
Aggregator	Clean Energy Collective (CEC), a company founded to promote and develop community shared solar
System Owner	CEC – a proprietary model allows CEC's tax equity partner to benefit from the tax incentives even though participants own the panels; CEC started as a co-op and moved to a more traditional business form.
Participant Contract	Buy panels; if moving out of territory, CEC will buy back at fair market value
Host	Wastewater treatment plant – CEC leases land
Virtual Net Metering	Yes – proprietary software makes it easy to interface with utility billing software
Comments	• 78 kW: ~$466,000 • 2.3 MW more is now operating at 3 projects in other cities and states, and more projects have broken ground • Financed by CEC until participants buy panels • $78,000 utility rebate • $39,000 REC sale • ~13 year payback claimed
Pros	+ Replicability – CEC makes it easy + Scalability – CEC has lined up funding; no limit on number of participants + Consumer protections – escrows for insurance, etc.
Cons	- Proprietary model; however, a competitive RFP process might help address this concern - May seem more corporate, as opposed to grass roots

LEADING MODELS, CONTINUED	
Brewster, MA **Luke Hinkle, President** **508 237-4650** **luke@mygenerationenergy.com** **www.mygenerationenergy.com**	
Aggregator	Local Co-op organized by My Generation Energy (MGE) , a local full-service solar installation firm
System Owner	A separate LLC organized by MGE. This LLC may offer a vehicle for investment by a tax equity partner
Participant Contract	Buy a share of the co-op, with rights to the power from 28 panels; if moving out of territory, MGE can resolve the issue
Host	Land owned by town in industrial park
Virtual Net Metering	Yes
Comments	• 346 kW: ~$1,500,000 • Financed by co-op from sale of shares to members • 4-5 year payback claimed
Pros	+ Replicability – MGE makes it easy + Scalability – co-ops can have many members + Co-op offers a vehicle for grass roots enthusiasm
Cons	- Proprietary model; however, a competitive RFP process might help address this concern

UTILITY-SPONSORED MODELS	
Brighton, CO **Jerry Marizza** **303 637-1250** **newenergy@unitedpower.com** **www.unitedpower.com/mainNav/greenPower/solPartners.aspx**	
Aggregator	United Power, a utility cooperative; SOL Partners Cooperative Solar Farm is the name of the project
System Owner	United Power
Participant Contract	Lease panels for 25 years; if moving out of territory, assign lease to another customer
Host	United Power
Virtual Net Metering	Yes
Comments	• 10 kW: ~$120,000 • A utility co-op is unable to use federal tax grant • $50,000 state grant • Installation labor donated by utility
Cons	- A 20-year payback claimed
Marathon, FL **Contact not published** **305 852-2431** **Email NA** **www.fkec.com/Green/simplesolar.cfm**	
Aggregator	Florida Keys Electric Cooperative (FKEC); Simple Solar is the project name
System Owner	FKEC
Participant Contract	Lease panels for 25 years; if moving out of territory, assign lease to another customer
Host	FKEC
Virtual Net Metering	Yes
Comments	• 97 kW: cost NA • A utility co-op is unable to use federal tax grant • Low-Cost Clean Renewable Energy Bonds (CREBs) helped fund the project
Cons	- A long 21-year payback claimed - CREBs are no longer available

UTILITY SPONSORED MODELS, CONTINUED	
Ashland, OR **Mary McClary** **541 488-5357** **Email NA** **www.ashland.or.us/Page.asp?NavID=13370**	
Aggregator	Ashland Municipal Electric Utility (AMEU); Solar Pioneer II is the project name
System Owner	AMEU
Participant Contract	Buy panel output for 20 years; if moving out of territory, assign output to another customer
Host	City-owned service center
Virtual Net Metering	Yes
Comments	• 64 kW: ~$442,000 • A municipal utility is unable to use federal tax grant • AMEU sold a state tax credit to a bank for 22% of the project cost • Low-Cost Clean Renewable Energy Bonds (CREBs) helped fund the project
Cons	- The deal is currently upside down for participants; $825 buys $480 worth of energy - CREBs are no longer available
St. George, UT **Rene Fleming** **435 627-4841** **Rene.fleming@sgcity.org** **www.sgsunsmart.com**	
Aggregator	The City of St. George Energy Services Department utility and Dixie Escalante Electric (DEE) utility; SunSmart is the project name
System Owner	DEE and City utility
Participant Contract	Buy panel output for 19 years; if moving out of territory, sell the output with their home
Host	DEE and City utility
Virtual Net Metering	Yes
Comments	• 100kW: cost NA • The utilities were unable to use federal tax grant • 25% state tax credit available to participants
Cons	- The payback for this 19-year deal is probably 19 years with the City utility rates and >19 years with DEE

UTILITY SPONSORED MODELS, CONTINUED	
Sacramento, CA **Stephen Frantz** **916 732-5107** **sfrantz@smud.org** **www.smud.org/en/residential/environment/solar-for-your-home/solarshares**	
Aggregator	Sacramento Municipal Utility District (SMUD); SolarShares is the project name
System Owner	enXco, a developer of solar projects; SMUD buys the power in a 20-year
Participant Contract	Buy panel output at fixed monthly fee for up to 20 years; opt out at any time
Host	A leased site in a nearby town
Virtual Net Metering	Yes
Comments	• 1 MW: Cost NA • enXco was able to use federal tax incentives • Subsidized by State solar surcharge funds
Cons	- The deal is currently upside down for participants; e.g., for a $53 monthly fee, they save $30 on their monthly utility bill
Tucson, AZ **Mark Romito** **Phone NA** **mromito@tep.com** **www.tep.com/Renewable/Home/Bright**	
Aggregator	Tucson Electric Power (TEP); Bright Tucson Community Solar Program is the program name
System Owner	TEP
Participant Contract	Buy panel output at semi-fixed monthly fee for up to 20 years; opt out at any time
Host	University of Arizona Science and Technology Park
Virtual Net Metering	Yes
Comments	• 1.6 MW; ~$6,400,000 • TEP is for-profit and was able to use the federal tax incentives
Pros	+ TEP is expanding the program as demand has reached 2.1 MW
Cons	- The deal is currently upside down for participants; getting six 150 kWh blocks adds ~$18 to their monthly utility bill

UTILITY SPONSORED MODELS, CONTINUED	
Ellensburg, WA **Gary Nystedt, Resource Mgr** **509 962-7245** **Email NA** **www.ci.ellensburg.wa.us/index.aspx?NID=310**	
Aggregator	City of Ellensburg Energy Services (CEES) utility; Ellensburg Community Renewable Park is the project name
System Owner	CEES and perhaps participants; the City sells equity in the project to participants, but the contract does not mention an LLC or other ownership entity
Participant Contract	Invest in the project, receive a share of the output for 20+ years; if moving out of territory, assign the output to another customer
Host	A City park
Virtual Net Metering	Yes
Comments	• 36 kW: ~$285,000 • Grants received from the local university, ARRA, and foundations • State incentive of $0.30/kWh • Without a separate ownership entity, the federal tax benefits likely are unused
Pros	+ CEES is expanding the program to meet demand + Without the grants and state incentive, the project is not replicable

UTILITY SPONSORED MODELS, CONTINUED	
Seattle, WA **Community Solar Program Mgr** **206 684-3800** **sclenergyadvisor@seattle.gov** **www.seattle.gov/light/solar/community.asp**	
Aggregator	Seattle City Light (SCL), a municipal utility; Community Solar is the project name
System Owner	SCL
Participant Contract	Buy panel output for 9 years; if moving out of territory, assign the output to another customer
Host	A City park
Virtual Net Metering	Yes
Comments	• 24 kW: cost NA • Grants received from U.S. DOE
Cons	+ The deal is currently upside down for participants; for a $600 enrollment fee, they get total energy credits of ~$32 plus state incentives of ~$500
Florence, AZ **Contact NA** **Phone 602 236-4448** **Email NA** **www.srpnet.com/environment/communitysolar**	
Aggregator	Salt River Project (SRP), an investor owned utility; Copper Crossing Solar Ranch is the project name
System Owner	SRP, or perhaps a third-party solar developer under a PPA, the Website does not say
Participant Contract	Buy panel output at monthly fee that is fixed for five years; opt out at any time
Host	NA – the Website does not say
Virtual Net Metering	Yes
Comments	• 20MW project, some of which will be used for community solar: Cost NA
Cons	- The deal is currently upside down for participants; getting four 2500 kWh blocks adds ~$12-$16 to their monthly utility bill

SPECIAL PURPOSE ENTITY MODELS	
Colorado Springs, CO David Amster-Olszewski 800 793-0786 contactus@mysunshare.com http://mysunshare.com	
Aggregator	Sunshare, a company founded to promote and develop community shared solar
System Owner	Sunshare
Participant Contract	Lease panels for 20 years; if moving out of territory, sell lease with home or assign it to another customer
Host	Pikes Peak Community Foundation owns the site (a farm) but does not buy the power
Virtual Net Metering	Yes – the City Council, which oversees the municipal utility, had to pass a resolution to authorize
Comments	• 575 kW: cost NA • Sunshare claims the credits over 20 years will save 25% over the cost of electricity today • Sunshare is able to use the federal tax benefits
Pros	+ Replicability – Sunshare makes it easy, and is already working on their next farm + Scalability – No limit on number of participants + Consumer protections – escrows for insurance, etc.
Cons	- Lease only lasts 20 years, but panels will last far longer

SPECIAL PURPOSE ENTITY MODELS, CONTINUED	
Whidbey Island, WA Linda Irvine Phone NA linda@nwseed.org Website NA	
Aggregator	Island Community Solar, LLC (ICS), created by volunteer participants; P-Patch is the project name
System Owner	ICS
Participant Contract	Invest in ICSC and earn share of profits; 36 participants
Host	10-year lease from Port of Coupeville's Greenbank Farm
Virtual Net Metering	No – power is sold to utility
Comments	• 50 kW: ~$410,000 • $25,000 utility grant • Used 1603 program, which has expired • State incentive of $1.08/kWh through 2020
Pros	+ Securities law limits # of members + Project is dependent on big state incentive + Project also relied on the 1603 grant, which has expired, and is not structured to use the federal tax credit

SPECIAL PURPOSE ENTITY MODELS, CONTINUED	
Boone, NC Steve Owen, Executive Director 828 268-5022 info@aire-nc.org http://aire-nc.org/community-megawatt	
Aggregator	LLC created by Mr. Owens, with 7-10 investors
System Owner	LLC
Participant Contract	Invest in a share of the LLC; if moving out of territory, can still receive income
Host	The system is behind the meter of the AIRE office building on which it is located
Virtual Net Metering	No – LLC sells electricity to the host and distributes net revenue to participants
Comments	• 2.4 kW: ~$20,000 • Financed by participants • 35% state tax credit • Most installation costs were pro bono
Pros	+ A vehicle for grass roots enthusiasm
Cons	- Scalability – limit on number of unaccredited investors - Financial viability is uncertain now that the 1603 program has ended; getting a tax equity partner is impractical for smaller projects, and the tax credit is only useful to wealthy participants - May seem like an investment, as opposed to getting one's power from solar

SPECIAL PURPOSE ENTITY MODELS, CONTINUED	
Statewide, CA Multifamily Affordable Solar Housing (MASH) program, administered by California Center for Sustainable Energy (CCSE) Agnes Stupak, Program Mgr 858 244-1177 Email NA http://energycenter.org/index.php/incentive-programs/multifamily-affordable-solar-housing	
Aggregator	The owner of an affordable housing complex chooses to build a shared solar PV system
System Owner	Either the owner of the complex, or a third party solar developer working under a PPA
Participant Contract	The complex owner builds a system (or signs a PPA) and gets the credits for the common areas; tenants don't have to do anything, but they benefit from the credits on their utility bills
Host	The housing complex
Virtual Net Metering	Yes - the California PUC requires the utilities to credit the energy to the individual tenants and to the common areas according to their energy use and rates
Comments	• The complex owner only benefits financially from the energy credits for the common areas • Most new projects are using the PPA model in order to monetize the federal tax benefits • The program relies on generous incentives established by CPUC • The program also relies on the mission of affordable housing agencies to help tenants reduce their living costs
Pros	+ The program is fully subscribed and has a waiting list
Cons	- Without CPUC incentives, the owner's credits for the common areas are not enough to pay for the project; even with the incentives, the credits are often not enough

SPECIAL PURPOSE ENTITY MODELS, CONTINUED	
Edmonds, WA Chris Herman, Co-op President Phone NA sustainableedmonds@gmail.com http://tangerinepower.com/edmonds	
Aggregator	Edmonds Community Solar Co-op (ECSC)
System Owner	ECSC presumably owns the system, although it is not clear if Tangerine Power might own it
Participant Contract	Invest in project by joining co-op for $25 fee and then investing in $1,000 SunSlice from Tangerine Power; get $1,000 back over time
Host	Frances Anderson Community Center
Virtual Net Metering	No – ECSC sells electricity to community center
Comments	• 6 kW: cost NA • State incentive of $1.08/kWh through 2020
Pros	+ ECSC is expanding to Phase II
Cons	- Project is dependent on big state incentive - Project also relied on the 1603 grant, which has expired, and is not structured to use the federal tax credit - The deal is currently upside down for participants; spend $1,025 and get back $1,000.

NON-PROFIT MODELS, CONTINUED	
Winthrop, WA Ellen Lamiman 425 320-6063 elamiman@silicon-energy.com www.sustainablemethow.net/solar.htmhttp://okanoganelectriccoop.com/content/community-solar-0	
Aggregator	Partnership for a Sustainable Methow (PSM), a local non-profit eligible for state securities exemption
System Owner	Participants, and perhaps PSM – the ownership details are not clear from the readily available resources; 49 participants
Participant Contract	Invest in project, receive pro rata share of profits
Host	Town of Winthrop, which will end up owning the system after state incentives end in 202
Virtual Net Metering	No
Comments	• 23 kW: ~$200,000 • State incentive of $1.08/kWh through 2020 • Cannot use the 1603 grant or ITC
Cons	- Project is dependent on big state incentive
Bainbridge Island, WA	
Aggregator	Community Energy Solutions, a local non-profit
System Owner	Sakai Intermediate School
Participant Contract	Donate to CSE to help buy solar for a local school
Host	Sakai Intermediate School
Virtual Net Metering	No – no need; donors do not expect any credits or other financial return
Comments	• 5.1 kW: ~$50,000 • $25,000 grant from utility • $30,000 in donation to CSE • This is not really a community shared solar project in the usual sense of the term
Cons	- Relies on the generosity of donors who get no financial return except a charitable tax deduction