Beyond Single-Subscriber Solar:

Recommendations for encouraging distributed solar generation in Boulder, Colorado, under two future utility-ownership scenarios

FINAL REPORT

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Acknowledgments
We'd like to thank David Wiedinmyer, Business Director with Clean Energy Collective, who provided valuable support and a sounding board for our ideas. We'd also like to thank Namaste Solar and Ben Griffin for providing guidance in developing financial models provided in this report. Lastly, we'd like to thank our advisors and teachers, Paul Komor and Adam Reed, for their dedication to education and research in the realm of renewable energy.

Executive Summary

The following report examines ways for the City of Boulder to increase distributed solar generation beyond the single-subscriber model under two different potential future scenarios: (1) municipalization, and (2) a renewed contract with Xcel Energy as the service provider. The report focuses on community-scale solar generation that allows multiple energy subscribers to share a single solar array, but also provides recommendations for sourcing from distributed-scale independent power providers.

Community solar programs are relatively new for the state of Colorado, which were established only in 2010 with the "Colorado Community Solar Gardens Act." Community solar programs are significant in increasing solar DG as they permit subscribers to participate in solar DG development that would otherwise be excluded. These missed customers include:

(1) Renters, condo owners, and other residents who do not own their roofs
(2) Home- and business-owners without adequate sunlight or facing other physical obstacles to installing solar arrays
(3) Individuals without the financial means to otherwise install solar arrays

Thus, a focus on community solar allows for addressing these major missed market opportunities.

We present four different options for the City to consider in pursuing community-scale solar generation. First, we discuss the current "solar garden" model under Xcel, which the City can mimic under municipalization. Next, we discuss two additional options available to the City under municipalization: (1) an investor-funded independent power producer model, and (2) a hybrid community subscriber-wholesale DG model.

With careful attention to the underlying policy framework, we provide a detailed analysis and financial report for each of the distributed solar models open to the City. Each has its attendant merits and limitations, which we describe at length. Our data demonstrates that each model is financially viable for the City to pursue. However, the financial models included here demonstrate that the investor-funded IPP and hybrid community subscriber-wholesale DG models are friendlier to capital investment and developers, and allow for greater solar DG capacity.

In sum, we find that municipalization offers more robust opportunities for the City to develop solar DG, but that it still has several options for pursuing solar DG goals under Xcel. Under the former scenario, we recommend that the City invite applications from Independent Power Producers (IPPs) and other parties interested in distributed solar via an RFP process. Under the latter scenario, we recommend that the City negotiate with Xcel to secure additional solar garden projects in the near future. Section Six offers more detailed recommendations under both scenarios.

Whether or not the City municipalizes its electricity system, there are abundant opportunities for the City to maintain and bolster its reputation at the cutting-edge of solar DG development.

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1. Introduction

1.1 Purpose and context for report

This report seeks to provide recommendations and strategies to City of Boulder staff for encouraging distributed solar development within City limits. Three primary models constitute the focus of this report: a community solar garden model, an investor-funded model, and a hybrid model. Single-subscriber and solar-leasing residential models are described for comparison but not evaluated.

The stimulus for this report lies in the City's current evaluation of the potential for municipalization of the electricity system. Part of this effort includes the City's goal to increase the percentage of electricity generated by local, distributed electricity systems, such as solar photovoltaics. This report aims to provide information to support that goal, whether or not municipalization is carried through. The City has several powerful options for increasing the capacity of distributed solar electric generation beyond the standard single-subscriber residential model, and these options exist independent of rebates and incentives currently provided in limited quantities by Xcel Energy. This report aims to highlight the tools and possibilities at hand for encouraging distributed solar, to provide sample financial models for developing such projects, and to provide recommendations for both potential future scenarios.

1.2 Boulder's energy future and goals

In November of 2011, Boulder residents approved two ballot measures (2B and 2C) that authorized the creation of a city-owned utility. This effort was instigated in large part by residents' concerns about global climate change and by the desire to decrease greenhouse gas emissions produced by electricity generation, beyond what Xcel Energy, the energy service provider, currently offers. The City is now undergoing a vetting process whereby a variety of factors are under evaluation for determining whether or not the City will municipalize the electricity purchasing and distribution system. The three main considerations for the City are future rate projections, energy sourcing and purchasing options, and reliability standards. Assuming that reliability, financing, and balancing were secured, municipalization would ultimately allow the City more freedom to choose a less fossil-intensive electricity generation portfolio.

As the City of Boulder has outlined in its Climate Action Plan (CAP), the City upholds the goal of decreasing its overall greenhouse gas emissions. Currently, about 50% of the City's total emissions come from electricity consumption (City of Boulder, 2006), so sourcing an increasing percentage of electricity from renewable sources is a pillar of attaining this goal.

Boulder's six energy future goals are:

1. Ensure an energy supply that is safe, stable and reliable;
2. Ensure competitive rates while balancing short-term and long-term interests;
3. Significantly reduce carbon emissions and other pollutants to improve environmental quality;
4. Provide Boulder energy customers with a greater say about their energy supply;
5. Promote local economic vitality;
6. Promote energy equality, protecting vulnerable populations and encouraging energy literacy.*

** Taken from City of Boulder, December 2012 report: "Exploring Opportunities for Reaching Boulder's Energy Future Goals"*

1.3 The contribution of distributed solar

Whether or not the City municipalizes its electricity system, it is intent on meeting the above six energy goals. Distributed solar systems, including but not limited to traditional single-subscriber rooftop systems, are poised to make a significant contribution to a cleaner electricity portfolio (goal #3), provide Boulder residents with greater say and choice in their energy sources (goal #4), and promote economic vitality through local PV sourcing and development (goal #5). This is partly due to Boulder's strong solar resource. Boulder has one of the highest rates of PV per capita in the nation (bouldercolorado.gov). With an average of 300 sunny days per year, solar generation is a viable option by which the City of Boulder can significantly increase its locally generated electricity.

Aside from boasting a valuable and consistent solar resource, Boulder also hosts a community that is interested in increasing renewable energy integration. As was evidenced by the passage of measures 2B and 2C in November 2011, Boulder residents have voiced their desire for cleaner energy. Distributed generation - especially solar - is a viable means by which to develop a cleaner energy portfolio.

1.4 Standard models for distributed solar development

Distributed solar, for the purposes of this report, assumes the definition put forth by Colorado's HB 10-1001 (which created the state's Renewable Portfolio Standard, or RPS). The bill defined "distributed generation" (DG) as either *retail distributed generation* or *wholesale distributed generation*. By these definitions, retail distributed generation means "a renewable energy resource that is located on the site of a customer's facilities and is interconnected on the customer's side of the utility meter" (HB 10-1001). *Retail* distributed generation systems can provide no more than one hundred and twenty percent of the customer's average annual electricity consumption (known as the "120 net-metering rule"). *Wholesale* distributed generation simply means "a renewable energy resource in Colorado with a nameplate rating of thirty megawatts or less and that does not qualify as retail distributed generation" (HB 10-1001). Thus, a variety of systems qualify under these two categories, including residential rooftop solar, community solar gardens, and investor-funded independent power providers (IPPs - so long as they are less than 30 MW capacity). Individuals, businesses, and communities can own distributed generation. By Colorado state law, all investor-owned utilities (IOUs) are required to source 3% of electricity from distributed generation systems by 2020.

A variety of models exist in Colorado and elsewhere for developing distributed solar systems. Below the standard models used in Colorado are described. For the remainder of this report, only three select models will be evaluated at length as they relate to the focus of this study.

Perhaps the best-known distributed solar model is the *single-subscriber model*, whereby an energy customer purchases a solar PV system that is installed on an optimal rooftop on their property. The homeowner then begins generating electricity and receives a monthly credit from the electric utility that counters their usage charges. This is made possible by what is known as *net-metering.* Under net-metering, the homeowner's meter accurately records in both directions,

and only the "net" usage (minus the electricity generated) is charged. The dollar or credit value of the electricity generated ranges widely by utility service area, depending on the program the local utility has created. A variety of tax breaks and rebates (at the municipal, county, state, and federal level) also provide incentives for the customer to install a rooftop PV system.

A spin-off of the single-subscriber rooftop system is known as *residential solar leasing*. A solar lease is a legal contract in which a homeowner leases solar photovoltaic panels from a provider. In this agreement, the homeowner does not have to provide any upfront costs but instead pays a monthly lease fee for the panels. Typical leases run 15-25 years, and at the end of the contract, the homeowner typically has the choice of renewing the contract, purchasing the panels, or having the system removed. The energy customer still receives the benefits of net-metering and gets the electricity generation credit on their monthly usage bill.

The three remaining models will serve as the focus of this report: *community solar gardens,* an *independent power producer model*, and a *hybrid community subscriber-wholesale DG model*.

A *community solar garden* is a new approach in distributed solar systems. A solar garden is a shared solar array with multiple grid-connected subscribers. In Colorado, there must be at least ten subscribers. Each subscriber "buys in" to the solar PV system and then receives credits for the amount of electricity that their portion of the array generates through what is known as *virtual net-metering.* Virtual net-metering allows net metering on energy bills for generation systems that are not situated on the energy customer's property. Community members who would not have otherwise been able to install a solar PV system (such as renters, lower income residents, and homeowners with unfavorable rooftop solar conditions) can do so through solar gardens and virtual net-metering. Solar gardens are described further in Section Three of this report.

Another model used for distributed solar development is known as the Independent Power Producer model (IPP). IPP's qualify as wholesale distributed generation under Colorado HB 10-1001 and are set up as a business that is investor-funded and that sells the electricity it generates to a customer like an investor-owned utility, a municipality, or a rural electric cooperative. IPP models operate by securing a multi-year Power Purchase Agreement, or PPA, prior to developing the generating array. The IPP model is described further in Section Four of this report.

Another innovative approach to distributed solar development is a hybrid version of the previous two models. For the purposes of this report, we refer to this as the *hybrid community subscriber-wholesale DG model*. This model combines the benefits of community solar gardens with the opportunity to secure a PPA with the area's electricity service provider. This is a subscriber model that uses virtual net-metering to attribute generation credits to its subscriber's energy bills, but also secures a PPA between the developer and the utility to guarantee a long-term rate for excess energy produced. Another benefit of this model is that the for-profit developer, who has a tax liability under the PPA model, is able to utilize the Federal Investor Tax Credit (ITC). Several developers in Colorado are engaging in this type of approach, but perhaps the pioneer is the Clean Energy Collective (easycleanenergy.com), which got its start by developing a community solar subscriber array near Aspen, working in partnership with Holy Cross Energy.

This hybrid model is described further in Section Five.

Additional models for distributed generation development have been innovated and legislated across the country, including meter aggregation, group/joint billing, and several other systems.

2. Background: Solar PV capacity and potential in Boulder

2.1 Current solar DG capacity

Boulder's current distributed solar capacity is roughly 12 megawatts (MW). The majority of this capacity is derived from single-subscriber, residential rooftop solar photovoltaic panels, though there are a number of non-residential systems, including the City's own one-megawatt Wastewater Treatment Facility Solar Electric System. Total distributed solar generation in Boulder provides an estimated 17,387 megawatt-hours (MWh) generated per year (assuming a 17% capacity factor). Distributed solar, then, amounts to **1.3%** of Boulder's total annual consumption. This percentage does not include the standard credit multipliers allowable for utilities under RPS compliance. (In Colorado, renewable energy generated in-state is given a 1.25x multiplier, and solar distributed generation is given a 3x multiplier, which would put Boulder's solar DG generation officially at 3.9% of total consumption for RPS compliance purposes). For the purposes of this report, the authors consider *actual* percentages of distributed generation.

2.2 Non-solar distributed generation

The City of Boulder also operates three hydroelectric dams with a combined capacity of 21.3 MW. This amounts to an estimated 42,320 MWh generated annually.

2.3 Boulder's load & distributed generation as percentage of load

Boulder's total electricity load is 236 MW on average (City of Boulder staff), with estimated annual peak demand at 260 MW, plus or minus 20%, without adjusting for line losses (Roy et al. 2011:16). In 2010, Xcel sold 1.3 million MWh to Boulder electric customers, with about 82% going to commercial customers and the rest going to residential customers (Roy et al. 2011:16).

Together, electricity generated from current distributed generation (solar PV at 17,387 MWh per year and hydroelectric at 42,320 MWh per year) amounts to **59,707 MWh/year.** Thus, distributed generation currently represents **4.6%** of current electricity consumption in Boulder. For the purposes of this report, we propose two goals (conservative and aggressive) with regard to the percentage of *distributed solar* generation. These goals may help the City to set future targets for integration of distributed solar generation. The goals do not take into account the current REC multipliers that exist in Colorado and which allow utilities to more easily meet compliance (renewable energy generated in Colorado counts for 125% of the RPS, and distributed generation counts as 300%).

2.4 Recommended DG Goals

While the state Renewable Energy Standard (RES) provides an important baseline for renewables integration in Colorado, Boulder residents may desire to exceed this standard and thus cut emissions even further. Under the current system of electricity provision by Xcel Energy, however, the City does not have the option to significantly cut emissions from electricity consumption beyond the 30% by 2020 RPS. If the City were to municipalize its electricity

system, it would not be held legally to the 30% RPS, since rural electric cooperatives and municipal utilities are only required to source 10% of their electricity from renewable energy sources. However, it is likely that Boulder residents under a municipalization scenario will likely want to uphold, as a baseline, the 30% renewable energy standard, with *at least* 3% of its total energy consumption generated by distributed systems, as is required of investor-owned utilities. As shown above, the City currently sources 4.6% of its electricity from distributed generation, including *both* solar and hydro. For the purposes of this report, however, we propose plausible targets for distributed solar only.

2.4.1 Conservative goal: 3% actual solar distributed generation

As shown in Section 2.1, distributed generation in the City of Boulder amounts to 17,387 megawatt-hours, or 1.3% of total consumption. As a conservative goal, this report recommends the City of Boulder strive for a target of 3% of total consumption sourced from distributed solar generation by 2020. The City could easily meet this goal by encouraging additional solar installations. To meet this 3% distributed generation goal, an additional 21,613 MWh/year would need to be generated from local sources. Assuming a 17% capacity factor (standard for this geographic latitude and annual snowfall, including inverter inefficiencies), the City would need to install an additional **14.5 MW of additional solar capacity**.

2.4.2 Aggressive goal: 5% actual solar distributed generation

The City of Boulder, with its goal to significantly cut emissions and to emphasize locally sourced energy resources, could meet a much higher standard for the total percentage of distributed solar electricity generation. We recommend a 5% target by 2020, and propose that the City could meet this through the aggressive encouragement of distributed solar development. The City already offers rebates for residential PV installations, and thus the purpose of this report is to focus on options for encouraging larger-scale solar PV, through the development of solar gardens and independent power provider developments.

To achieve the 5% distributed solar generation target with local solar, the City would need to generate an additional 47,613 MWh/year from local solar PV. This would amount to new installations totaling **32 MW of capacity** (assuming a 17% capacity factor).

2.5 Potential distributed solar capacity

There is an estimated 80 million square feet of rooftop space in the City of Boulder (energyshouldbe.org). A fair guess as to how much of this rooftop space would be available and suitable for solar PV is between 25% and 50%, or 20 million or 40 million square feet. Translating this available rooftop space into solar capacity means that, in rooftops alone, there exists the potential for **350MW to 700MW** of PV capacity. Thus, if the City's potential solar capacity is conceptualized solely as available and acceptable rooftop space, there is more than enough potential to meet the above aggressive 5% goal for distributed solar. This calculation does not include potential municipal land, including City Open Space.

With the City's clear desire for the increased contribution of distributed generation in mind, we now describe and evaluate three models for distributed solar development that extend beyond the traditional single-subscriber system. Financial models are provided to demonstrate the economic viability and workings of each system. Lastly, we offer suggestions for recommendations on how

and when to deploy these systems, given two potential future scenarios of electricity provision: under the current provider, Xcel Energy, and under the possibility of a city-owned utility. Recommendations are based on policy research, financial modeling, and conversations with local solar developers.

3. Model 1: Community Solar Gardens

3.1 Introduction to community solar gardens

Community solar programs across the U.S. turn the costly endeavor to generate renewable energy into an affordable opportunity by allowing multiple subscribers to voluntarily share the costs and benefits of a single solar array.

The first community solar program was conceived in the city of Ellensburg, Washington in 2003. Today, at least ten states boast community solar projects, each under varying policy regimes.

Generally, community solar programs involve (Brunette et. al., 2012):

- Generation of clean energy with two or more subscribers
- Benefits derived from economies of scale
- Optimization of array placement by freeing it from individual onsite generation
- Community participation and economic impact therein
- Facilitation towards energy independence for a community or community members

Most programs are driven by the following potential benefits (BEF & NW SEED, 2009):

- Financial returns to local communities
- Increased local awareness, involvement in, and support for clean energy
- Strengthened communities through collaborative efforts
- Optimal project siting
- Reduced cost due to economies of scale
- Lower entry cost and lower financial risk
- Greater community participation
- Removal of ownership issues as barrier to participation in solar
- Generation of local jobs
- Opportunity to test new models of marketing, project financing, and service delivery

Broadly speaking, community solar projects serve the community-at-large by reducing fossil fuel emissions and opening new opportunities in green business.

3.2 Increasing community participation in solar DG

Specifically, community solar projects serve:

(1) Renters, condo owners, and other residents who do not own their roofs
(2) Home- and business-owners without adequate sunlight or facing other physical obstacles to installing solar arrays
(3) Individuals without the financial means to otherwise install solar arrays

Without community solar programs, these three groups have few, if any, opportunities for generating solar energy. While there are many other reasons that solar DG has not yet been installed within city limits to its fullest potential (as discussed in this report), *the obstacles posed*

to these three groups represent significant losses in community participation and solar DG growth.

Ownership issues alone present a large challenge for solar DG in Boulder: 50.6% of residents are renters and 26.3% reside in condos ("Boulder Homes & Real Estate Data"). Secondly, in regards to siting issues, we estimate that 50% to 75% of rooftop space in the City of Boulder is not suitable for solar PV (see section 2.5 of this report). Thirdly, costs remain a significant deterrent. In the state of Colorado, rooftop arrays range from $12,000 to upwards of $180,000 (Jaffe, 2012). In contrast, subscribers of community solar can sign on for as little as $700 un-tethered from ownership and other siting constraints. Also, many projects are committed to facilitating opportunities for the participation of low-income communities through the creation of set-asides or specific projects geared only to those communities.

At the same time, Colorado's innovative legislation around community-scale renewable energy generation offers many avenues for providing incentives for increasing participation. In fact, many states have turned to Colorado as an example for furthering their own solar DG goals.

In 2010, Colorado passed the "Colorado Community Solar Gardens Act," (HB 10-1342) allowing the qualifying utility or other non-profit and for-profit organizations to own and operate community solar gardens. The legislation defines a solar garden as a "solar electric generation facility with a nameplate rating of 2 MW or less" that has at least 10 subscribers (HB 10-1342). Importantly, the legislation also directs the PUC to "include gardens in the state's renewable energy plan" (HB 10-1342). To ensure lower transmission and distribution costs, the legislation requires that the solar garden be "located on the site of customer facilities" (HB 10-1342).

In the following sections, we explore a range of distributed solar models that may flourish under the "Solar Garden Act" and other legislation currently applicable to the City of Boulder. We examine the viability, costs, and benefits of each potential model and pay attention to increasing participation of the three aforementioned groups in order to further the City's growth of solar DG.

3.3 Many distributed solar models

Currently, many solar gardens are underway or already operating in the greater Boulder-Denver area. These have been built by several different developers, under a variety of utility ownerships, including Xcel Energy, Rural Electric Cooperatives, and municipal utilities such as Colorado Springs.

For the purposes of this report, we explore Xcel's solar garden model as the base case for Boulder (which the City can mimic under municipalization), as well as two additional distributed solar options available under municipalization: investor-funded independent power producer model, and a hybrid community subscriber-wholesale DG model.

*3.4 Base case: community solar garden model under Xcel's Solar*Rewards Community™ program*

In August 2012, Xcel began accepting applications for the first time from developers desiring to build solar gardens in Colorado. In less than 30 minutes from opening the Solar*Rewards

Community program, Xcel received more than three times the number of applicants than it could support (Jaffe, 2012).

Xcel's program is based on a simple and popular idea. The company offers to buy the energy and RECs generated from solar gardens in operation under the Solar*Rewards Community system ("Solar*Rewards Community"). So far, Xcel has offered a total of 9MW/year allocated to two programs: (1) standard offers of 500 kW or less and (2) large requests for proposal program for systems greater than 500 kW.

Under the program, each subscriber is allocated a "share" in the solar garden that can be as high as 40% of the total garden. Based on the subscriber's share percentage of the total garden, the subscriber receives a bill credit (virtual net-metering) for excess generated energy ("Solar*Rewards: FAQ"). If there is a subscriber organization that installs the solar garden, it receives production incentives from Xcel and is allowed to sell or lease "shares" to subscribing customers ("Solar*Rewards Community").

3.5 Benefits

3.5.1 Building community solar gardens

At least two solar garden projects are under construction in the Boulder area as a result of this program. These projects demonstrate excellent potential in yielding the benefits of community solar discussed in section 3.1 and increasing the participation of the three groups of consumers discussed in section 3.2.

3.5.2 Increasing participation of low-income communities in solar DG

Since the start of its solar gardens program, Xcel has required that each participating project have a minimum of 5% of the garden's kW capacity allocated to low-income subscribers ("Solar*Rewards: FAQ").

For the purposes of its program, Xcel understands members of one of the following groups as a qualified low-income subscriber ("Solar*Rewards: FAQ"):

Energy Outreach Colorado
The Atmosphere Conservancy
Colorado LEAP Program
Municipal Housing Authority (ex. Denver Housing Authority)

*Institutions that represent low-income individuals do not count as low-income subscribers. Only the individual low-income subscriber (with an Xcel Energy account) is eligible ("Solar*Rewards: FAQ").

3.6 Constraints

3.6.1 Limited capacity

That the program in 2012 attracted plenty more applicants than it could support underscores both its merits and constraints. Developers were drawn into solar garden development in recognition of the many potential benefits of community solar as discussed above. But, Xcel could accept only a handful of projects due to a number of financial constraints.

Firstly, Xcel's responsibility to maintain low rates impedes expansion of the solar garden incentive program that relies on funding from all ratepayers. Secondly, Xcel must manage the costs of maintenance for grid connection on all these residential systems without transferring these costs to usage charges. Thirdly, it is more efficient for Xcel to deal with purchasing power or RECs from a handful of power providers, rather than thousands of small-scale residential systems. Fourthly, solar DG potentially harms Xcel's energy sales. As *Power* magazine reported earlier this month (Wagman, 2012), "Roof-mounted, customer-owned solar also poses something of an existential threat to incumbent utilities by slicing away part of their load and a portion of their revenue." Furthermore, although Xcel is able, in theory, to sell the excess RECs on the open (read: fluid) market, it is possible that prices will drop below the price for the RECs originally paid by Xcel. Companies like Xcel also face the potential future scenario in which the REC market will plateau. This is possible because once states meet their RPS goals the REC market could become non-existent for any production beyond the minimum needed for states to meet their goals.

Over demand will likely continue to be the case in the next few years, as Xcel has not made any moves to expand the program. For 2013, Xcel will offer another 9 MW to state solar gardens, which is much less than the demand from developers to participate. Xcel has not yet announced its plans for the program following 2013.

3.6.2 The 120% net-metering rule

Qualified projects in Colorado face a different limitation known colloquially as the 120% rule. It goes like this: If a subscriber's generation exceeds consumption, Xcel is required to buy the excess generation. However, the subscriber is allowed to generate only 120% of the total customer usage from the previous 12 months (determined at the time the subscriber is added) (HB 10-1342). The 120% rule limits economic viability of projects, especially in the potential scenario of no other offered rebates ("Solar*Rewards: FAQ").

3.6.3 Gap in Addressing City's Energy Goals

In a recent City memo (City of Boulder Staff), representatives for Boulder's energy future recognized the merits of Xcel's solar garden program, but declared the following adhering concerns regarding their partnership: (1) the agreements between Xcel and Boulder do "not embody the spirit of partnership sought by the city," (2) the agreements are conditioned on the approval of a 20-year contract, (3) it remains unclear how far the agreements would go "towards the achievement of the city's energy goals" and how new opportunities might be pursued within the contract, and (4) Xcel appears to be pushing the city to agree to a 20-year contract without first defining "what would or could be achieved." Should the city choose to renew its contract with Xcel, the company has agreed to continue its Community Solar Gardens program, but only within in its 9 MW/year capacity.

3.7 Financial Model

To get an idea of what the economics of Community Solar Subscriber Model looks like for a solar PV development firm, we constructed a 20-year pro forma financial model (Appendix A) using realistic, current-market condition inputs for EPC (engineering, procurement, and construction) costs, developer fees, tax rates, yearly O&M (operations and maintenance),

insurance, and land lease rates that we verified through our discussions with local solar developers. Our model simulates a community solar garden developed by a third-party private firm, with up-front, capacity-based subscriber shares sold to local consumers who receive virtual net-metering credit on their monthly energy bill for at least the next 20 years (or until they sell their shares). In our financial model, we assume that the third-party developer needs to make a profit equal to or above their current cost of capital to make this a viable model and provide the free-market incentive to continue to develop community solar.

Our model simulated a 200 kW capacity project, assuming that all subscriber shares were sold so that there would be no excess energy production (equal to 100% net-metering). All RECs generated are sold by the third-party developer at a rate of 9¢ per kWh over a 20-year period. The third-party developer, having a tax liability, is able to take advantage of the current 30% federal ITC and use the federal Modified Accelerated Cost Recovery System (MACRS) depreciation schedule to reduce the tax liability of the project. Making use of these incentives, the developer can lower the effective cost of the electricity generated by the solar PV facility and provide for the developer's margin of profit.

Historically when it comes to renewable energy, some consumers are willing to purchase solar energy at an inflated present value as compared to the rate they pay on their electric bill for energy coming from the grid. The consumer who purchases subscriber shares in the Community Solar Garden model is usually willing to pay for the positive, environmental benefits of renewable energy and the "feel-good" benefit of being "solar-powered." Purchasing solar, with its known costs (i.e. no fuel costs) is also a hedge against rising future electricity rates. In our simulated model based on real-world examples, subscription shares are sold at a rate of $3,500 per kW capacity ($3.50 per Watt). At this subscription rate, the simple (not factoring future inflation or alternative opportunity costs of the upfront amount) levelized cost of energy (LCOE) for each subscriber is equal to paying 12.3¢ per kWh of energy consumed, which is above the current residential electricity rate under Xcel Energy. With the limited amount of Solar Rewards capacity that Xcel Energy currently allocates each year, finding enough consumers to participate in this program will not be a problem. However, if in the future a much greater capacity was allowed under Xcel's Solar*Rewards program, or if a similar, City-owned municipal utility program wished to aggressively increase solar DG within Boulder, it might be more difficult to find consumers willing to pay an increased rate for solar.

Our model simulation shows that it is possible, with the current federal investor tax credit (ITC) (which expires at the end of 2016) in place, for a third-party developer to make a healthy profit with the community solar garden model. With the subscription rate and REC sales as discussed above, our model shows an internal rate of return (IRR) of 23.6% for the developer without the use of leverage (debt). This still leaves room for a decent return if development costs such as land lease rates or EPC costs increase. Or, it allows the developer to lower subscription rates. The use of leverage, with favorable interest rates, to partially finance the project could further increase the developer's return. Removing the ITC shows an IRR of 11.1%, which is most likely still above the developer's cost of capital (assumed to be 10% in this case) and allows for a positive net present value (NPV) for the project.

4. Model 2: Investor-funded Independent Power Producer

4.1 What is an IPP?

An Independent Power Producer (IPP) is an entity, which is not a public utility, but which owns facilities to generate electric power for sale to utilities, usually through a long-term Power Purchase Agreement (PPA). Electricity produced by an IPP can be considered "distributed generation" under Colorado law if its nameplate capacity is less than 30MW (HB 10-1001).

4.2 The power purchase agreement

A power purchase agreement is a contract between two parties, one who generates electricity for the purpose of sale (IPP in this case) and one who agrees to purchase the electricity (the utility in this case). The PPA defines all of the commercial terms for the sale of electricity between the two parties, including when the project will begin commercial operation, schedule for delivery of electricity, penalties for under delivery, payment terms, and termination. A PPA is the principal agreement that defines the revenue stream and credit quality of a generating project and is thus a key instrument of project finance. There are many forms of PPAs in use today and they vary according to the needs of buyer, seller, and financing counterparties.

4.3 Approaches to investor-funded distributed solar

An investor-funded model uses equity capital, usually along with borrowed funds (debt), to finance the project initially. This model relies on a PPA or feed-in tariff (FIT) contract to guarantee a future revenue stream from the energy produced and sold to the utility, over the life of the project. Investors expect to receive a required rate of return (above the cost of capital, or also thought of as the opportunity cost if that money was invested in another project with equal risk) from their investment, and there is no virtual net-metering involved in this model.

The investor in this model may just be the project development company that provides the upfront equity. However, this model also allows for a large group of investors who each put up small amounts of equity (also known as "crowdfunding"), and who purchase a piece of the future revenue stream in proportion to the size of their initial investment. One potential complication with the investor-funded model has been securities regulations and the need to file with and be regulated by the U.S. Securities and Exchange Commission (SEC) in regards to those securities. A security is an investment instrument issued by a corporation, government, or other organization that offers evidence of debt or equity. Any transaction that involves an investment of money 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. However, thanks to passage of the Federal JOBS Act within the past year, companies will be able to offer returns on investments for "crowdfunded" projects for every kWh of solar energy produced without burdensome SEC regulation. This scenario should greatly increase the amount of capital available to finance renewable energy projects throughout the country, and allow those who might not be able to benefit from a net-metering situation (ex: live in another state) to still invest in the promotion of renewables.

4.4 Financial model

We used the financial model we developed to also simulate the IPP scenario with a 20-year PPA in place for a 1 MW solar capacity, to look at the financial viability of this arrangement (Appendix B). In the IPP scenario, there is no funding provided by subscribers who might be

willing to pay more for their electricity coming from a clean source such as solar; than from fossil fuel sources coming from the grid. In this model, the equity investors expect a required rate of return (we assumed at least 10% for our purposes) to be provided ample incentive to invest in renewables.

We assumed a 20-year PPA rate of 10.5¢ per kWh for production, with a 4% per year escalator, and the same 9¢ per kWh for the sale of RECs. In this model we also assumed 45% leverage at 8% interest, 55% investor equity, a 30% federal ITC, and the federal 5-year MACRS accelerated depreciation schedule. Under this scenario, the investors in the project were able to recognize a 17.2% levered IRR with a positive NPV. However, if we eliminated the ITC, the project has a negative NPV and a levered return of only 6.5%. This is not a large enough return to attract investor equity to the project when the required rate of return is 10%. When the ITC expires at the end of 2016, EPC costs will have to be lower, PPA rates higher, or some form of municipal-funded capacity rebate or production rebate will need to be in place to offset the loss of the ITC and allow the project to still be financially viable. Our modeling shows an upfront rebate of 75¢ per Watt (installed capacity) required to offset the 30% ITC in this simulation.

4.5 Sensitivity analysis of IPP-PPA financial model

We also used our investor-funded IPP model with a long-term PPA to perform a sensitivity analysis to get an idea of the cost and revenue drivers that most impacted the levered IRR and NPV of the project. We looked at parameters such as PPA price, ITC, REC price, required rate of return, upfront capacity rebate, project size, EPC costs, interest rate (on debt), amount of leverage (debt) that finances the project, and lastly, land-lease rates. We took all of these parameters, and varied each one by ± 30% (while keeping the other parameters constant) and looked at the degree of change to IRR and NPV as compared to the base case (where nothing was changed).

When we weighted both the change in levered IRR and NPV values for the different parameters, we found the PPA price, ITC value, REC price, EPC costs, and interest rate on the debt to be the biggest drivers behind profitability for the investor-funded IPP model (Appendix B). If Boulder municipalizes, the city-owned utility will be able to directly negotiate PPA pricing, taking into account the favorable time of day production for solar that should warrant a premium pricing. The City will also be able to purchase RECs above its RPS mandate, helping to ensure a large driver of financial viability for this model.

Obviously the City cannot influence the expiration of the federal ITC, but the City could use their excellent credit rating to guarantee loans under favorable interest rates for solar DG projects, along with working with reputable solar developers to use economies of scale to contain EPC costs for projects on City-owned properties.

4.6 Benefits

This investor-funded IPP financial model would be possible under City municipalization and would help to greatly increase the capacity of solar DG within Boulder city limits. Economies of scale allow the investor-funded IPP model to be rather large (> 1MW usually), but it can also be scaled to size depending on the physical space available for the solar PV and the interconnection agreement with the utility. Economically, this model is very friendly to investors and developers

and likely to attract the investment capital needed to fund an aggressive growth of solar.

4.7 Constraints
Under the current Solar Rewards structure with Xcel Energy, this model is not possible as Xcel only allows for virtual net-metering of qualified community solar programs. As previously stated, when the current ITC expires, the financial feasibility of this model is in question without other changes to the cost, revenue, or rebate structure.

5. Model 3: Hybrid Community Subscriber-Wholesale DG

5.1 Introduction to the hybrid model
Previously we looked at the community solar garden model, where a subscription fee was paid upfront and virtual net-metering was employed, but the energy production of the solar PV installation could not be greater than 120% of the subscriber's past energy consumption. We also discussed the investor-funded IPP model, where energy is sold directly to the grid via a long-term PPA that guarantees an agreed upon rate per kWh of production. The last financial model we looked at that could be implemented under a municipal utility is what we refer to as the Hybrid Community Subscriber-Wholesale DG model. This hybrid model combines the upfront subscriber fee of customers who want to receive a credit on their monthly energy bill, but allows for revenue on energy production above consumption. The excess energy production in this model would be covered under a PPA or City-mandated feed-in-tariff, and any upfront equity needed to finance the project could be provided by investors (separate from the subscription customers), and leverage could be used to provide a tax shield and increase investor's IRR.

This model may combine the best attributes of the previous models, with local customers willing to pay subscription rates that exceed the LCOE from the grid, in order to support the positive attributes of solar within the community, along with equity investors chasing lucrative guaranteed returns. The long-term PPA for energy production that exceeds the net-metering amount, along with the sale of RECs, allows for the required investor return. The PPA, by guaranteeing stability and lowering project risk, also allows for easier debt financing at reasonable interest rates.

5.2 Financial model
For this solar model, we modified our financial model to simulate the Hybrid Community Subscriber-Wholesale DG model, with a 20-year PPA in place for any excess production (Appendix C). We assumed 1 MW project capacity, with a similar subscription rate and the PPA price of the previous two models, along with a similar $ per kWh REC payment. We assumed 167% net-metering (which would currently not be allowed under Colorado state law), and 70% investor equity and 30% debt financing for the project. We kept the 30% ITC in place, and assumed a 10% required rate of return for investor equity.

Under these assumptions, investors realized a 29% levered IRR with a positive NPV for the 20-year project life. Eliminating the ITC would reduce the levered IRR of this simulation to 10.4%, putting the investment potential of the project under the current assumptions on the bubble. To help provide the financial incentives necessary to make this model financially viable in the absence of the ITC, the City could introduce a capacity-based or production-based rebate for

solar DG, or agree to a higher PPA price per kWh to offset the expiration of the ITC at the end of 2016.

5.3 Benefits
The hybrid community subscriber-wholesale DG model represents yet another financially viable model that would help to greatly increase distributed solar within Boulder. Like the IPP model discussed above, this model offers many incentives to developers and investors alike, while also allowing local consumers with limited resources to "own" solar energy through subscription.

5.4 Constraints
This hybrid community subscriber-wholesale DG model would be financially feasible under City municipalization. However, the model would have more flexibility for financial structuring with a change to the existing 120% net-metering law, which would allow the project to produce and sell more than 120% annual consumption. As previously stated for the IPP model, when the current ITC expires, the financial feasibility of this model may also be in question without other changes to the cost, revenue, or rebate structure.

6. Distributed Solar Under Two Future Scenarios: Recommendations

6.1 Introduction: two future utility-ownership scenarios
As has been mentioned, the City of Boulder is currently undergoing a process to examine the plausibility for transitioning to a city-owned utility, rather than its current position as a customer of Xcel Energy. These two different future scenarios (continued service under Xcel and municipalization) each hold vastly different possibilities for the future of distributed solar in City limits. In the remaining sections, this report aims to differentiate the possibilities under each scenario and to provide scenario-specific recommendations for increasing total distributed solar.

6.2 Recommendations for increasing distributed solar under Xcel Energy
Under continued electricity service by Xcel Energy, the City of Boulder would be significantly constrained in its ability to significantly expand its current level of distributed solar generation. Continuation of Xcel's Solar*Rewards Community program would provide a certain level of opportunity for solar garden development, though Xcel's current program is limited to permitting 9 MW/year for the entire state of Colorado. Additionally, there is very little possibility that Xcel would agree to another type of distributed solar contribution (aside from the current single-subscriber Solar*Rewards program). However, there are, perhaps, possibilities for negotiating with Xcel for a certain amount of solar gardens *outside* of the current 9 MW/year parameters. With these considerations in mind, we offer three recommendations for encouraging additional solar DG under Xcel:

6.2.1. **Collaborate with partners** such as Namaste and Clean Energy Coalition to apply for future Xcel Solar*Rewards Community projects within City limits. However, as stated, Xcel's current solar gardens program is limited to 9 MW/year for the entire state, and so there is no guarantee that the City and its partners would win a permit in future years.

6.2.2. **Leverage political capital** in negotiations with Xcel to secure additional solar garden projects within the City of Boulder. We suggest that if the City decides to continue with Xcel as its service provider that there may be opportunity for negotiations in which Xcel agrees to allow

the development of 1-2 solar gardens/year within the City of Boulder. This could fit within Xcel's existing Solar*Rewards Community structure or could be creatively reconceived into a new arrangement.

6.2.3. **Continue to provide municipal rebates** and incentives for single-subscriber systems.

6.3 Recommendations for increasing distributed solar under municipalization
Under a locally owned utility, the City would have much greater flexibility in encouraging a range of distributed generation options, including solar PV. The City would not be constrained by Xcel's currently limited solar garden program and additionally could open an RFP process to invite applications by both community-subscriber developers and independent power producers. With this greater flexibility in mind, we suggest the following recommendations:

6.3.1. **Open an RFP process** (as was done by the Colorado Springs municipal utility) to invite applications for community solar multiple-subscriber projects. A reasonable starting target might be 4MW/year of solar garden development. This could amount to as many as eight smaller scale projects (up to 500 kW) or as few as two small-scale projects (up to 2MW). **Consider offering a PPA, or a robust FIT rate,** for these solar garden systems, to make the projects more financially viable and to allow subscribers to sell the excess energy back to the City at a reasonable price.

6.3.2. **Invite IPPs** to propose community-sized projects that could provide distributed solar electricity at a wholesale price to the City. **Offer a PPA** that would attract investors and allow solar companies to gain competitive financing.

6.3.3. **Make financial models publicly available** for solar garden systems as well as IPP systems. These might consist of the type of modeling documents this report provides, and they would demonstrate that distributed solar represents a financially viable opportunity for residents and businesses alike.

6.3.4. **Publish a database** of available and suitable space (rooftop, vacant lots, and open space) that could host both small-scale (10kw-500 kW) and large-scale (500 kW to 2MW) projects. This would serve to both attract independent power producers as well as encourage groups of community members interested in developing their own solar garden array.

6.3.5. **Educate the Boulder community** about community solar & encourage resident-initiated projects. Community solar projects need not be initiated by developers but, as has been done in other states, could also be built by a group of interested residents or by a condominium homeowners association. Colorado state law requires there be at least ten subscribers. However, the City should provide ample information and educational packets to the community that make this opportunity substantially easier and more accessible.

6.3.6. **Build opportunities for greater social inclusion** in solar DG. While there is a high demand for solar DG, many interested individuals do not have the financial means to participate. Under Xcel's solar garden model, there is a 5% low-income set-aside required for every project. Should the city follow a different model under municipalization, we recommend a continued

commitment to providing incentives aimed at deepening the participation of low-income and other vulnerable populations. Indeed, one of six pillars of the City of Boulder's energy future plan is a commitment to "vulnerable populations." Under municipalization, the City should at least maintain the 5% set-aside, but should also carefully examine California's Multifamily Affordable Solar Housing (MASH) and New Solar Homes Partnership (NSHP) programs that provide at minimum a 10% set-aside to low-income populations (visit http://www.gosolarcalifornia.org/about/csi.php for more information). Furthermore, the City should also collaborate with local organizations representing minority populations (i.e. women, African Americans, immigrants, etc.) to build diversity in solar DG projects. The CAP tax might be one way to pursue this goal.

6.3.7. **Continue and Expand programs supporting energy efficiency and consumption reduction**. There are several *low-tech* avenues for curbing fossil-fuel emissions, which the City can encourage in addition to solar DG development. Rebates for insulation and lighting and heating efficiency, for example, help to reduce energy consumption. These kinds of incentives keep the City's larger energy goals in mind, such as the reduction of carbon emissions (see section 1.2). Should the City expand these incentives, a demand for high-tech solutions may be lessened.

6.4 Additional Future Considerations

6.4.1 Rebates when ITC expires, Feed-in Tariffs

Currently Section 48 of the Internal Revenue Code defines the federal ITC. The ITC allows commercial, industrial, and utility owners of PV systems to take a one-time tax credit equivalent to 30% of qualified installed costs. There is also a federal residential renewable energy tax credit (Internal Revenue Code Section 25D), but the residential tax credit requires that the PV system be installed on a home the taxpayer owns and uses as a residence, thus it would rarely, if ever, be applicable to community shared solar projects. However, this ITC is set to expire at the end of 2016, and our financial modeling has shown the ITC to be a major driver for the profitability of community solar projects. We propose that the City step in under municipalization to allow for an upfront, capacity based rebate for solar projects to partially offset the expiration of the ITC.

Another consideration where the City, under municipalization, could encourage the promotion of solar DG would be with a robust feed-in tariff policy for the subscriber financial model, which could also potentially allow for the 120% rule to be bypassed. A strong feed-in tariff policy, one in which the value of solar PV electricity generation is based on the cost of generation (or the avoided cost of producing fossil-fuel electricity), and in which the risk of utility electricity pricing uncertainty has been eliminated, makes it economically advantageous to provide net electricity to the grid. It provides long-term guaranteed competitive pricing for renewable energy generation, but can always be ramped down as solar capacity to the grid increases. Feed-in tariff programs have given rise to spectacular growth rates of local solar PV generation in Germany and many other countries.

6.4.2 The 120-net metering rule

According to Colorado state law, no individual or multiple-subscriber solar DG system may sell more than 120% of average annual consumption back to the utility, whether in the form of Renewable Energy Credits (RECs) or payments. This constitutes a fairly significant limitation

for the future of solar DG, as distributed systems (whether IPP or community subscriber) become more financially viable if they are allowed to generate and sell additional excess energy. Ideally, the 120 net-metering law could be altered to allow distributed systems under municipalities to produce and sell an excess of 120% of annual consumption.

6.4.3 New legislation under review

Colorado's "Solar Gardens Act" might be bolstered in the near future by Senator Mark Udall's bill to extend solar tax credits to subscribers of off-site community solar arrays. If Udall's "Solar Uniting Neighborhoods (SUN) Act" is passed, Colorado residents will have an even greater incentive to develop solar gardens.

6.4.4 Encouraging greater participation of local businesses in community solar

Local businesses in the City of Boulder are ideally situated to capitalize on community solar programs. Some of Boulder's fastest growing businesses represent the "green" market, demonstrating that Boulder shoppers value environmentally friendly business practices. Shopping malls, such as at Pearl Street and 28th Street are ideal centers for rooftop community gardens. It is important to note, however, that businesses that wish to demonstrate their care for the environment to their customers are limited by gardens in that their solar panels would likely not be visible at the storefront. Sociologists have demonstrated that individuals often choose to install solar arrays in shady and less than optimal locations in order to increase their visibility from the street and thereby garner recognition and status (Sexton & Sexton, 2011). This issue, called "conspicuous conservation," has been well noted in Colorado (ibid.). One way around this potential dilemma is for the City to give participating businesses recognition and provide them community solar certificates to display in their windows.

6.4.5 Sourcing solar PV locally and maintaining responsible land use

As the City develops the RFP process for community solar projects, two points for further consideration include sourcing solar locally and maintaining responsible land use. These considerations should be easy for Boulder as there are already many regulations in place aimed at responsible land use and strengthened local business. The Solar Gardens Institute offers useful ethical guidelines for developing community solar projects that could serve the City in the creation of the RFP process (see: http://www.solargardens.org/about/).

6.4.6 Encouraging the use of rooftops for solar DG

Generally, it is less expensive and more convenient to install solar arrays on open land, rather than atop roofs. This is because roofs require greater maintenance. The City might find it prudent to offer special incentives to community projects that make use of rooftop space.

6.4.7 Broadening incentives allowed to accrue on one property

Currently, Xcel limits the amount of incentives that can accrue on one property ("Solar Panels Installed at CU," 2010). For large institutions, such as CU-Boulder, it may prove beneficial to broaden incentives for a single property.

7. Conclusion

Based on our research presented in this report, we surmise that municipalization offers greater opportunities for the City to develop solar DG, but that some options for pursuing DG goals are still available under Xcel. A detailed financial analysis included in this report shows that Xcel's current solar garden model is financially viable, but that so, too, are three options under municipalization: (1) community solar garden subscriber model (similar to Xcel's model), (2) investor-funded independent power producer model, and (3) a hybrid model of (1) and (2).

We have therefore provided analyses of all four avenues for the City to consider in determining whether or not it will pursue municipalization. Each option has benefits and limitations, which we have described at length.

On the one hand, Xcel is able to mobilize its economy of scale to efficiently and effectively develop solar DG in Boulder. On the other hand, Xcel's internal constraints deter the company from developing solar DG to its fullest potential. While municipalization means decreased scale, our financial models show that the City is capable of furthering solar DG beyond what Xcel has offered. We conclude, then, that municipalization offers increased opportunity for solar DG growth within city limits based on our figures.

Should the City decide to renew its contract with Xcel as the service provider, it has several options available for pursuing a significant increase in distributed solar beyond Xcel's current 9MW/year solar gardens program. Mainly, we recommend the City try to negotiate with Xcel for a greater allotment of community solar gardens.

Under the two utility-ownership scenarios discussed in this report – municipalization or continued service under Xcel – the City of Boulder is able to maintain and deepen its role as a beacon of inspiration to other localities around the world also desiring to increase their renewable energy generation. No doubt, the City is ideally situated to reach and expand its current distributed solar goals.

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Appendix A.1 (Solar Garden Model Parameter Inputs)

Project Details: Virtual Net-Metering Model		
Project	Solar DG	
Developer		
Location	Boulder, CO	
Solar:		
Nameplate Capacity (kWdc)	200	
Nameplate Capacity (kWac)	166.7	
Solar Yield (kWh/kWdc)	1,497	
Efficiency Rating	20.50%	
Derate Factor	83.3%	
Annual PV Degradation	0.50%	
Total Annual Production (kWh/y)	299,300	
Sources of Capital:		
Debt	$ -	0%
Investor Equity	$ 720,000	100%
Total	$ 720,000	100%
Subscription Sales: Virtual Net-Metering, RECs owned by Investors		
Subscription Rate ($ per kW)	$ 3,500.00	
Subscription Sales (Capacity - kWdc)*	200	
Virtual Net-Metering % (120% max by CO law)	100%	
Total Annual Net Metering Production (kWh/y)	299,300	
Subscriber Simple LCOE ($ per kWh)	$ 0.123	
**Use value of 0 if no net-metering*		
Financial Metrics:		
Required Rate of Return (Equity)	10.00%	
Project NPV	**$ 181,969**	
Unlevered IRR	**23.6%**	
Levered IRR	**23.6%**	

Power Revenue:		
Initial PPA/Feed-in Tariff Price ($/kWh)	$ -	
PPA/FIT Term (years)	20	
PPA/FIT Escalator	4.00%	
LCOE	$0.000	
REC's:		
Initial REC Price ($/kWh)	$ 0.090	
REC Term (years)	20	
REC Escalator	2.0%	
Rebates:		
Upfront Rebate ($ per kWdc)*	$ -	
Rebate Payout Period (years)	1	
**Use value of 0 if no Rebate applicable*		
Tax Inputs:		
ITC (Solar) %	30%	
Federal Tax	35%	
State Sales Tax	4.6%	
Effective Tax Rate	40%	
Debt Terms:		
Interest Rate	10.0%	
Tenor (years)	15	
	0	
Depreciation Schedule: 5 year MACRS	**Yearly Depreciation**	
Depreciable Basis*	$ 612,000	
*(*Depreciable Basis reduced by*	Year	%
half of the value of the ITC)	1	20.00%

CAPEX:			
	$ per Wdc	$	% EPC
EPC Cost	$ 2.75	$ 550,000	100%
Land Acquisition	$ -	$ -	0%
Developer Costs	$ 0.15	30,000.00	5%
Developer Fees	$ 0.70	140,000	25%
Capitalized Interest	$ -	-	0%
Total CAPEX	$ 3.60	$ 720,000	131%
Contruction Debt:			
Amount (% of EPC cost)	0%		
Amount	$ -		
Interest Rate	8.0%		
Construction Period (months)	6		
Construction Interest	$ -		
Operating Expenses:			
O&M Service	($/kWdc/yr)	$ 8.00	
O&M Escalator		1.0%	
Asset Management ($/Wdc/yr)	($/kWdc/yr)	$ 2.00	
Asset Mgmt Escalator		2%	
Insurance ($/Wdc/yr)	($/kWdc/yr)	$ 3.00	
Insurance Escalator		1%	
Land Lease Payment	($/acre/yr)	$ 400	
Property Tax	Exempt?	yes	
Property Tax Rate	($/kWdc/yr)	$ -	

Land Lease Assumptions:	
Lease Rate ($/acre/yr)	$ 400
Lease Escalator	2%
Acres	2
Lease Term (years)	20
Year 1 Amount	
$ 1,600	
$ 400	
$ 600	
$ 800	
$ -	

Appendix A.2 (Solar Garden Pro Forma)

Project Financial Summary (Pro Forma) - Community Solar Garden Subscriber Model

Project Life (years)	20															
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	20
Fiscal Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
REC Price ($/MWh)		$0.090	$0.092	$0.094	$0.096	$0.097	$0.099	$0.101	$0.103	$0.105	$0.108	$0.110	$0.112	$0.114	$0.116	$0
Solar Power Production (kWh)		299,300	297,604	296,314	294,833	293,359	291,892	290,432	288,980	287,535	286,098	284,667	283,244	281,828	280,419	279,0
Virtual Net-Metering Production (kWh)		(299,300)	(297,604)	(296,314)	(294,833)	(293,359)	(291,892)	(290,432)	(288,980)	(287,535)	(286,098)	(284,667)	(283,244)	(281,828)	(280,419)	(279,0
Net Production to Grid (kWh)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenue																
Power Revenue		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subscriber Revenue	[redacted]	700,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REC Revenue		26,337	27,338	27,746	28,159	28,579	29,005	29,437	29,875	30,320	30,772	31,231	31,696	32,168	32,648	33,1
Rebate Revenue		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Revenue	$ -	$ 726,337	$ 27,338	$ 27,746	$ 28,159	$ 28,579	$ 29,005	$ 29,437	$ 29,875	$ 30,320	$ 30,772	$ 31,231	$ 31,696	$ 32,168	$ 32,648	$ 33,1
Operation Expenses																
O&M Costs		$ (1,600)	$ (1,616)	$ (1,632)	$ (1,648)	$ (1,665)	$ (1,682)	$ (1,698)	$ (1,715)	$ (1,733)	$ (1,750)	$ (1,767)	$ (1,785)	$ (1,803)	$ (1,821)	$ (1,8
Asset Management		(400)	(408)	(416)	(424)	(433)	(442)	(450)	(459)	(468)	(478)	(488)	(497)	(507)	(517)	(5
Insurance		(600)	(606)	(612)	(618)	(624)	(631)	(637)	(643)	(650)	(656)	(663)	(669)	(676)	(683)	(6
Land Lease Payment		(800)	(816)	(832)	(849)	(866)	(883)	(901)	(919)	(937)	(956)	(975)	(995)	(1,015)	(1,035)	(1,0
Property Taxes		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Operation	$ -	$ (3,400)	$ (3,446)	$ (3,493)	$ (3,540)	$ (3,588)	$ (3,637)	$ (3,687)	$ (3,737)	$ (3,788)	$ (3,840)	$ (3,893)	$ (3,947)	$ (4,001)	$ (4,056)	(4,
EBITDA	$ -	$ 723,337	$ 23,892	$ 24,253	$ 24,619	$ 24,990	$ 25,367	$ 25,750	$ 26,138	$ 26,532	$ 26,932	$ 27,338	$ 27,750	$ 28,167	$ 28,591	29,0
Tax Benefits																
Interest on Debt		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation (5yr MACRS)		(122,400)	(195,840)	(117,504)	(70,502)	(70,502)	(35,251)	-	-	-	-	-	-	-	-	-
EBT	$ -	$ 601,137	$ (171,948)	$ (93,251)	$ (45,883)	$ (45,512)	$ (9,884)	$ 25,750	$ 26,138	$ 26,532	$ 26,932	$ 27,338	$ 27,750	$ 28,167	$ 28,591	29,0
Tax Benefit (Expense)		(238,050)	68,091	36,927	18,170	18,023	3,914	(10,197)	(10,351)	(10,507)	(10,665)	(10,826)	(10,989)	(11,154)	(11,322)	(11,4
Investment Tax Credit		216,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tax Equity Benefit (Expense)		(22,050)	68,091	36,927	18,170	18,023	3,914	(10,197)	(10,351)	(10,507)	(10,665)	(10,826)	(10,989)	(11,154)	(11,322)	(11,4
Debt Service																
Beginning Balance		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest Paid		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Principal Paid		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ending Balance		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Unlevered Cash Flow																
EBITDA	$ -	$ 723,337	$ 23,892	$ 24,253	$ 24,619	$ 24,990	$ 25,367	$ 25,750	$ 26,138	$ 26,532	$ 26,932	$ 27,338	$ 27,750	$ 28,167	$ 28,591	29,0
Tax Equity Benefit (Expense)	-	(22,050)	68,091	36,927	18,170	18,023	3,914	(10,197)	(10,351)	(10,507)	(10,665)	(10,826)	(10,989)	(11,154)	(11,322)	(11,4
CapEx	(720,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Unlevered Cash Flow	$ (720,000)	$ 701,487	$ 91,984	$ 61,180	$ 42,789	$ 43,013	$ 29,281	$ 15,553	$ 15,787	$ 16,025	$ 16,267	$ 16,512	$ 16,761	$ 17,013	$ 17,269	17,5

Appendix B.1 (Investor-funded IPP Parameter Inputs)

Project Details: IPP Model		
Project	Solar DG	
Developer		
Location	Boulder, CO	

Solar:		
Nameplate Capacity (kWdc)	1000	
Nameplate Capacity (kWac)	833.3	
Solar Yield (kWh/kWdc)	1,497	
Efficiency Rating	20.50%	
Derate Factor	83.3%	
Annual PV Degradation	0.50%	
Total Annual Production (kWh/y)	1,496,500	

Sources of Capital:		
Debt	$ 1,650,000	45%
Investor Equity	$ 2,016,000	55%
Total	$ 3,666,000	100%

Subscription Sales: Virtual Net-Metering, RECs owned by Investors	
Subscription Rate ($ per kW)	$ -
Subscription Sales (Capacity - kWdc)*	0
Virtual Net-Metering % (120% max by CO law)	#DIV/0!
Total Annual Net Metering Production (kWh/y)	-
Subscriber Simple LCOE ($ per kWh)	#DIV/0!
Use value of 0 if no net-metering	

Financial Metrics:	
Required Rate of Return (Equity)	10.00%
Project NPV	**$ 463,583**
Unlevered IRR	**9.9%**
Levered IRR	**17.2%**

Power Revenue:	
Initial PPA/Feed-in Tariff Price ($/kWh)	$ 0.105
PPA/FIT Term (years)	20
PPA/FIT Escalator	4.00%
LCOE	$0.139

REC's:	
Initial REC Price ($/kWh)	$ 0.090
REC Term (years)	20
REC Escalator	2.0%

Rebates:	
Upfront Rebate ($ per kWdc)*	$ -
Rebate Payout Period (years)	1
Use value of 0 if no Rebate applicable	

Tax Inputs:	
ITC (Solar) %	30%
Federal Tax	35%
State Sales Tax	4.6%
Effective Tax Rate	40%

Debt Terms:	
Interest Rate	8.0%
Tenor (years)	15

	0

Depreciation Schedule: 5 year MACRS		Yearly Depreciation
Depreciable Basis*		$ 3,116,100
(*Depreciable Basis reduced by	Year	%
half of the value of the ITC)	1	20.00%

CAPEX:	$ per Wdc	$	% EPC
EPC Cost	$ 2.75	$ 2,750,000	100%
Land Acquisition	$ -	$ -	0%
Developer Costs	$ 0.15	150,000.00	5%
Developer Fees	$ 0.70	700,000	25%
Capitalized Interest	$ 0.07	66,000	2%
Total CAPEX	$ 3.67	$ 3,666,000	133%

Contruction Debt:	
Amount (% of EPC cost)	60%
Amount	$ 1,650,000
Interest Rate	8.0%
Construction Period (months)	6
Construction Interest	$ 66,000

Land Lease Assumptions:	
Lease Rate ($/acre/yr)	$ 400
Lease Escalator	2%
Acres	8
Lease Term (years)	20

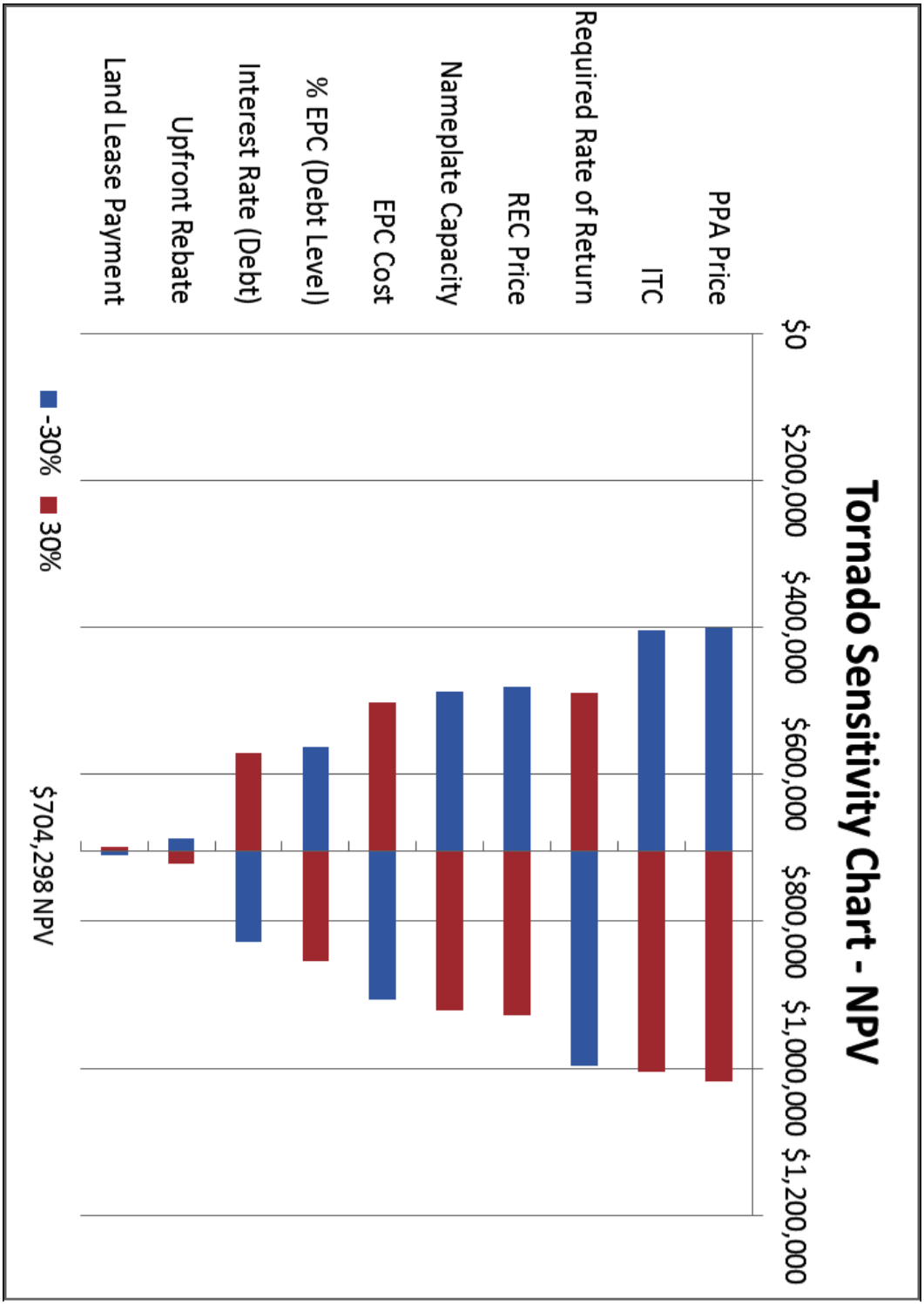
Operating Expenses:			Year 1 Amount
O&M Service	($/kWdc/yr)	$ 8.00	$ 8,000
O&M Escalator		1.0%	
Asset Management ($/Wdc/yr)	($/kWdc/yr)	$ 2.00	$ 2,000
Asset Mgmt Escalator		2%	
Insurance ($/Wdc/yr)	($/kWdc/yr)	$ 3.00	$ 3,000
Insurance Escalator		1%	
Land Lease Payment	($/acre/yr)	$ 400	$ 3,200
Property Tax	Exempt?	yes	
Property Tax Rate	($/kWdc/yr)	$ -	$ -

Appendix B.2 (Investor-funded IPP Pro Forma)

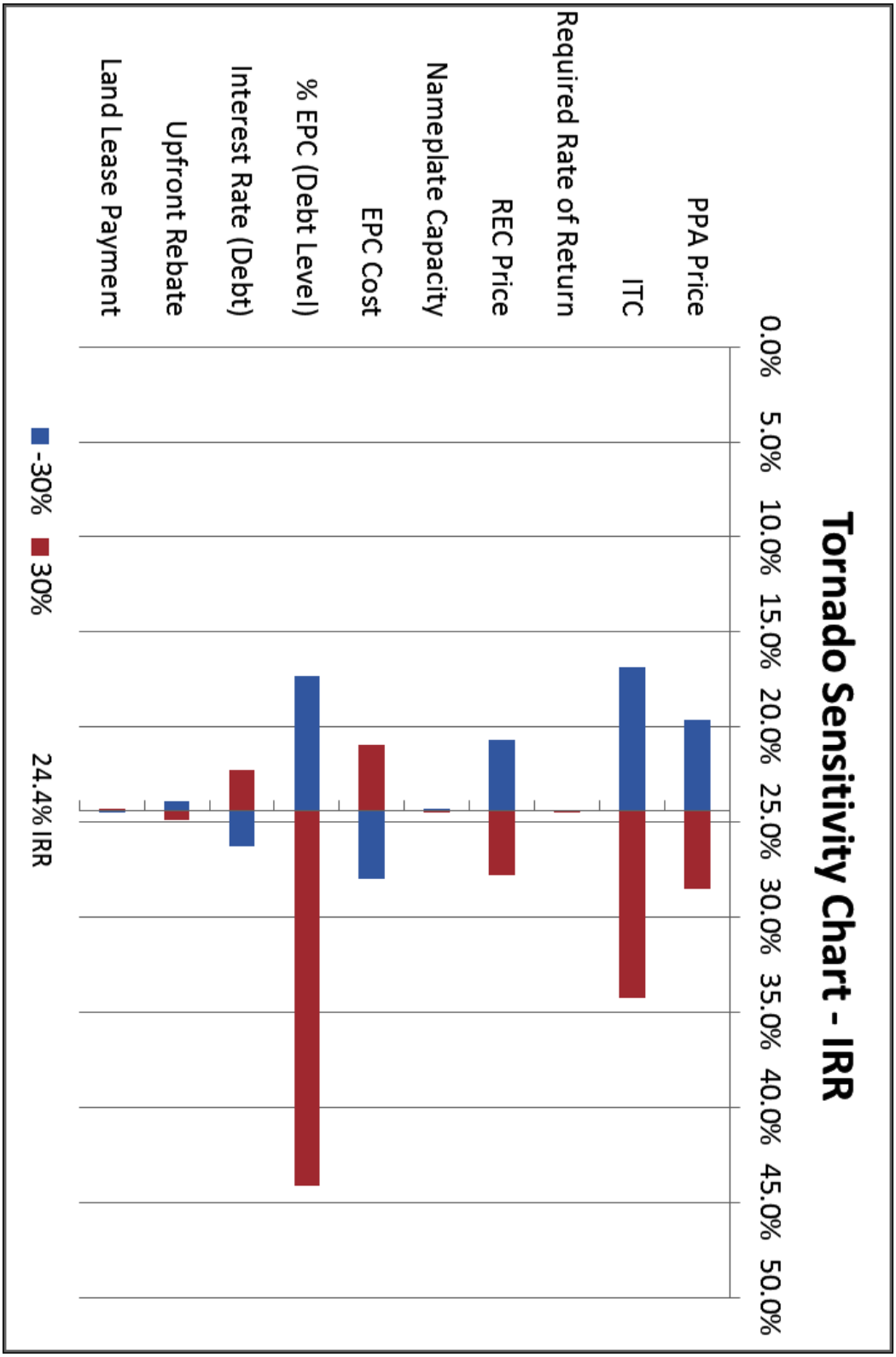
Project Financial Summary (Pro Forma) - IPP model with a PPA

Project Life (years)	20															
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	20
Fiscal Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
PPA Price ($/kWh)		$0.105	$0.109	$0.114	$0.118	$0.123	$0.128	$0.133	$0.138	$0.144	$0.149	$0.155	$0.162	$0.168	$0.175	$0
REC Price ($/MWh)		$0.090	$0.092	$0.094	$0.096	$0.097	$0.099	$0.101	$0.103	$0.105	$0.108	$0.110	$0.112	$0.114	$0.116	$0
Solar Power Production (kWh)		1,436,500	1,489,018	1,481,572	1,474,165	1,466,794	1,459,460	1,452,162	1,444,902	1,437,677	1,430,489	1,423,336	1,416,220	1,409,139	1,402,093	1,395,0
Virtual Net-Metering Production (kWh)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Production to Grid (kWh)		1,436,500	1,489,018	1,481,572	1,474,165	1,466,794	1,459,460	1,452,162	1,444,902	1,437,677	1,430,489	1,423,336	1,416,220	1,409,139	1,402,093	1,395,0
Revenue																
Power Revenue		$ 157,133	$ 162,601	$ 168,253	$ 174,115	$ 180,174	$ 186,444	$ 192,932	$ 199,646	$ 206,594	$ 213,783	$ 221,223	$ 228,922	$ 236,888	$ 245,132	$ 253,6
Subscriber Revenue		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REC Revenue		134,685	136,632	138,729	140,796	142,893	145,023	147,183	149,376	151,602	153,861	156,154	158,480	160,842	163,238	165,6
Rebate Revenue		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Revenue	$ -	$ 291,818	$ 299,293	$ 306,988	$ 314,910	$ 323,067	$ 331,466	$ 340,115	$ 349,023	$ 358,196	$ 367,644	$ 377,376	$ 387,402	$ 397,730	$ 408,370	$ 419,3
Operation Expenses																
O&M Costs		$ (8,000)	$ (8,080)	$ (8,161)	$ (8,242)	$ (8,325)	$ (8,408)	$ (8,492)	$ (8,577)	$ (8,663)	$ (8,749)	$ (8,837)	$ (8,925)	$ (9,015)	$ (9,105)	$ (9,
Asset Management		(2,000)	(2,040)	(2,081)	(2,122)	(2,165)	(2,208)	(2,252)	(2,297)	(2,343)	(2,390)	(2,438)	(2,487)	(2,536)	(2,587)	(2,6
Insurance		(3,000)	(3,030)	(3,060)	(3,091)	(3,122)	(3,153)	(3,185)	(3,216)	(3,249)	(3,281)	(3,314)	(3,347)	(3,380)	(3,414)	(3,4
Land Lease Payment		(3,200)	(3,264)	(3,329)	(3,396)	(3,464)	(3,533)	(3,604)	(3,676)	(3,749)	(3,824)	(3,901)	(3,979)	(4,058)	(4,140)	(4,2
Property Taxes		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Operation	$ -	$ (16,200)	$ (16,414)	$ (16,631)	$ (16,852)	$ (17,075)	$ (17,302)	$ (17,533)	$ (17,767)	$ (18,004)	$ (18,245)	$ (18,490)	$ (18,738)	$ (18,990)	$ (19,246)	$ (19,5
EBITDA	$ -	$ 275,618	$ 282,879	$ 290,357	$ 298,059	$ 305,992	$ 314,164	$ 322,583	$ 331,256	$ 340,192	$ 349,399	$ 358,887	$ 368,664	$ 378,740	$ 389,124	$ 399,8
Tax Benefits																
Interest on Debt		(132,000)	(127,139)	(121,888)	(116,218)	(110,094)	(103,480)	(96,336)	(88,622)	(80,290)	(71,292)	(61,574)	(51,078)	(39,743)	(27,501)	(14,2
Depreciation (5yr MACRS)		(623,220)	(997,152)	(598,291)	(358,975)	(358,975)	(179,487)	-	-	-	-	-	-	-	-	-
EBT	$ -	$ (479,603)	$ (841,412)	$ (429,823)	$ (177,134)	$ (163,076)	$ 31,197	$ 226,246	$ 242,634	$ 259,902	$ 278,108	$ 297,313	$ 317,586	$ 338,997	$ 361,623	$ 385,5
Tax Benefit (Expense)		189,923	333,199	170,210	70,145	64,578	(12,354)	(89,594)	(96,083)	(102,921)	(110,131)	(117,736)	(125,764)	(134,243)	(143,203)	(152,
Investment Tax Credit		1,099,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tax Equity Benefit (Expense)		1,289,723	333,199	170,210	70,145	64,578	(12,354)	(89,594)	(96,083)	(102,921)	(110,131)	(117,736)	(125,764)	(134,243)	(143,203)	(152,
Debt Service																
Beginning Balance		$ 1,650,000	$ 1,589,231	$ 1,523,601	$ 1,452,720	$ 1,376,169	$ 1,293,494	$ 1,204,205	$ 1,107,772	$ 1,003,625	$ 891,147	$ 769,670	$ 638,475	$ 496,784	$ 343,758	$ 178,4
Interest Paid		132,000	127,139	121,888	116,218	110,094	103,480	96,336	88,622	80,290	71,292	61,574	51,078	39,743	27,501	14,2
Principal Paid		60,769	65,630	70,881	76,551	82,675	89,289	96,432	104,147	112,479	121,477	131,195	141,691	153,026	165,268	178,4
Ending Balance		$ 1,589,231	$ 1,523,601	$ 1,452,720	$ 1,376,169	$ 1,293,494	$ 1,204,205	$ 1,107,772	$ 1,003,625	$ 891,147	$ 769,670	$ 638,475	$ 496,784	$ 343,758	$ 178,490	$
Unlevered Cash Flow																
EBITDA	$ -	$ 275,618	$ 282,879	$ 290,357	$ 298,059	$ 305,992	$ 314,164	$ 322,583	$ 331,256	$ 340,192	$ 349,399	$ 358,887	$ 368,664	$ 378,740	$ 389,124	$ 399,8
Tax Equity Benefit (Expense)	-	1,237,451	282,852	121,942	24,123	20,361	(53,332)	(127,743)	(131,177)	(134,716)	(138,362)	(142,119)	(145,991)	(149,981)	(154,093)	(158,3
CapEx	(3,666,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Unlevered Cash Flow	$ (3,666,000)	$ 1,513,068	$ 565,731	$ 412,299	$ 322,181	$ 326,373	$ 260,832	$ 194,840	$ 200,079	$ 205,476	$ 211,037	$ 216,768	$ 222,673	$ 228,759	$ 235,031	$ 241,4

Appendix B.3 (Investor-funded IPP Tornado Sensitivity Chart - NPV)



Appendix B.4 (Investor-funded IPP Tornado Sensitivity Chart – IRR)



Appendix C.1 (Hybrid Community Subscriber-Wholesale DG Parameter Inputs)

Project Details: Hybrid Community Subscriber-Wholesale DG Model		
Project	Solar DG	
Developer		
Location	Boulder, CO	
Solar:		
Nameplate Capacity (kWdc)	1000	
Nameplate Capacity (kWac)	833.3	
Solar Yield (kWh/kWdc)	1,497	
Efficiency Rating	20.50%	
Derate Factor	83.3%	
Annual PV Degradation	0.50%	
Total Annual Production (kWh/y)	1,496,500	
Sources of Capital:		
Debt	$ 1,100,000	30%
Investor Equity	$ 2,544,000	70%
Total	$ 3,644,000	100%
Subscription Sales: Virtual Net-Metering, RECs owned by Investors		
Subscription Rate ($ per kW)	$ 3,500.00	
Subscription Sales (Capacity - kWdc)*	600	
Virtual Net-Metering % (120% max by CO law)	167%	
Total Annual Net Metering Production (kWh/y)	897,900	
Subscriber Simple LCOE ($ per kWh)	$ 0.123	
**Use value of 0 if no net-metering*		
Financial Metrics:		
Required Rate of Return (Equity)	10.00%	
Project NPV	**$ 852,585**	
Unlevered IRR	**15.4%**	
Levered IRR	**29.0%**	

Power Revenue:	
Initial PPA/Feed-in Tariff Price ($/kWh)	$ 0.105
PPA/FIT Term (years)	20
PPA/FIT Escalator	4.00%
LCOE	$0.139
REC's:	
Initial REC Price ($/kWh)	$ 0.090
REC Term (years)	20
REC Escalator	2.0%
Rebates:	
Upfront Rebate ($ per kWdc)*	$ -
Rebate Payout Period (years)	1
**Use value of 0 if no Rebate applicable*	
Tax Inputs:	
ITC (Solar) %	30%
Federal Tax	35%
State Sales Tax	4.6%
Effective Tax Rate	40%
Debt Terms:	
Interest Rate	8.0%
Tenor (years)	15
0	
Depreciation Schedule: 5 year MACRS	**Yearly Depreciation**
Depreciable Basis*	$ 3,097,400
*(*Depreciable Basis reduced by* Year	%
half of the value of the ITC) 1	20.00%

CAPEX:			
	$ per Wdc	$	% EPC
EPC Cost	$ 2.75	$ 2,750,000	100%
Land Acquisition	$ -	$ -	0%
Developer Costs	$ 0.15	150,000.00	5%
Developer Fees	$ 0.70	700,000	25%
Capitalized Interest	$ 0.04	44,000	2%
Total CAPEX	$ 3.64	$ 3,644,000	133%
Contruction Debt:			
Amount (% of EPC cost)	40%		
Amount	$ 1,100,000		
Interest Rate	8.0%		
Construction Period (months)	6		
Construction Interest	$ 44,000		
Operating Expenses:			Year 1 Amount
O&M Service	($/kWdc/yr)	$ 8.00	$ 8,000
O&M Escalator		1.0%	
Asset Management ($/Wdc/yr)	($/kWdc/yr)	$ 2.00	$ 2,000
Asset Mgmt Escalator		2%	
Insurance ($/Wdc/yr)	($/kWdc/yr)	$ 3.00	$ 3,000
Insurance Escalator		1%	
Land Lease Payment	($/acre/yr)	$ 400	$ 3,200
Property Tax	Exempt?	yes	
Property Tax Rate	($/kWdc/yr)	$ -	$ -

Land Lease Assumptions:	
Lease Rate ($/acre/yr)	$ 400
Lease Escalator	2%
Acres	8
Lease Term (years)	20

Appendix C.2 (Hybrid Community Subscriber-Wholesale DG Pro Forma)

Project Financial Summary (Pro Forma) - Hybrid model with a PPA

Project Life (years)		20														
Year		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	20
Fiscal Year		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
PPA Price ($/kWh)			$0.105	$0.109	$0.114	$0.118	$0.123	$0.128	$0.133	$0.138	$0.144	$0.149	$0.155	$0.162	$0.168	$0.175	$0
REC Price ($/MWh)			$0.090	$0.092	$0.094	$0.096	$0.097	$0.099	$0.101	$0.103	$0.105	$0.108	$0.110	$0.112	$0.114	$0.116	$0
Solar Power Production (kWh)			1,496,500	1,489,018	1,481,572	1,474,165	1,466,794	1,459,460	1,452,162	1,444,902	1,437,677	1,430,489	1,423,336	1,416,220	1,409,139	1,402,093	1,395,0
Virtual Net-Metering Production (kWh)			(897,900)	(893,411)	(888,943)	(884,499)	(880,076)	(875,676)	(871,297)	(866,941)	(862,606)	(858,293)	(854,002)	(849,732)	(845,483)	(841,256)	(837,0
Net Production to Grid (kWh)			598,600	595,607	592,629	589,666	586,717	583,784	580,865	577,961	575,071	572,196	569,335	566,488	563,655	560,837	558,0
Revenue																	
Power Revenue			$ 62,853	$ 65,040	$ 67,304	$ 69,646	$ 72,070	$ 74,578	$ 77,173	$ 79,858	$ 82,638	$ 85,513	$ 88,489	$ 91,569	$ 94,755	$ 98,053	$ 101,4
Subscriber Revenue			2,100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REC Revenue			134,685	136,692	138,729	140,796	142,893	145,023	147,183	149,376	151,602	153,861	156,154	158,480	160,842	163,238	165,6
Rebate Revenue			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Revenue	$	-	$ 2,297,538	$ 201,732	$ 206,032	$ 210,441	$ 214,963	$ 219,600	$ 224,356	$ 229,235	$ 234,240	$ 239,374	$ 244,643	$ 250,049	$ 255,597	$ 261,291	$ 267,
Operation Expenses																	
O&M Costs			$ (8,000)	$ (8,080)	$ (8,161)	$ (8,242)	$ (8,325)	$ (8,408)	$ (8,492)	$ (8,577)	$ (8,663)	$ (8,749)	$ (8,837)	$ (8,925)	$ (9,015)	$ (9,105)	$ (9,
Asset Management			(2,000)	(2,040)	(2,081)	(2,122)	(2,165)	(2,208)	(2,252)	(2,297)	(2,343)	(2,390)	(2,438)	(2,487)	(2,536)	(2,587)	(2,6
Insurance			(3,000)	(3,030)	(3,060)	(3,091)	(3,122)	(3,153)	(3,185)	(3,216)	(3,249)	(3,281)	(3,314)	(3,347)	(3,380)	(3,414)	(3,4
Land Lease Payment			(3,200)	(3,264)	(3,329)	(3,396)	(3,464)	(3,533)	(3,604)	(3,676)	(3,749)	(3,824)	(3,901)	(3,979)	(4,058)	(4,140)	(4,2
Property Taxes			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Operation	$	-	$ (16,200)	$ (16,414)	$ (16,631)	$ (16,852)	$ (17,075)	$ (17,302)	$ (17,533)	$ (17,767)	$ (18,004)	$ (18,245)	$ (18,490)	$ (18,738)	$ (18,990)	$ (19,246)	$ (19,5
EBITDA	$	-	$ 2,281,338	$ 185,318	$ 189,401	$ 193,590	$ 197,888	$ 202,298	$ 206,823	$ 211,468	$ 216,236	$ 221,129	$ 226,153	$ 231,311	$ 236,607	$ 242,045	$ 247,6
Tax Benefits																	
Interest on Debt			(88,000)	(84,759)	(81,253)	(77,478)	(73,396)	(68,986)	(64,224)	(59,081)	(53,527)	(47,528)	(41,049)	(34,052)	(26,495)	(18,334)	(9,
Depreciation (5yr MACRS)			(619,480)	(991,168)	(594,701)	(356,820)	(356,820)	(178,410)	-	-	-	-	-	-	-	-	-
EBT	$	-	$ 1,573,858	$ (890,609)	$ (486,558)	$ (240,709)	$ (232,329)	$ (45,093)	$ 142,599	$ 152,387	$ 162,709	$ 173,601	$ 185,104	$ 197,259	$ 210,112	$ 223,711	$ 238,
Tax Benefit (Expense)			(623,248)	352,681	192,677	95,321	92,002	17,853	(56,463)	(60,345)	(64,433)	(68,746)	(73,301)	(78,115)	(83,204)	(88,590)	(94,2
Investment Tax Credit			1,093,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tax Equity Benefit (Expense)			469,952	352,681	192,677	95,321	92,002	17,853	(56,463)	(60,345)	(64,433)	(68,746)	(73,301)	(78,115)	(83,204)	(88,590)	(94,2
Debt Service																	
Beginning Balance			$ 1,100,000	$ 1,059,488	$ 1,015,734	$ 968,480	$ 917,446	$ 862,329	$ 802,803	$ 738,515	$ 669,084	$ 594,098	$ 513,113	$ 425,650	$ 331,189	$ 229,172	$ 118,3
Interest Paid			88,000	84,759	81,253	77,478	73,396	68,986	64,224	59,081	53,527	47,528	41,049	34,052	26,495	18,334	9,
Principal Paid			40,512	43,753	47,254	51,034	55,117	59,526	64,288	69,431	74,986	80,985	87,463	94,461	102,017	110,179	118,9
Ending Balance			$ 1,059,488	$ 1,015,734	$ 968,480	$ 917,446	$ 862,329	$ 802,803	$ 738,515	$ 669,084	$ 594,098	$ 513,113	$ 425,650	$ 331,189	$ 229,172	$ 118,393	$
Unlevered Cash Flow																	
EBITDA	$	-	$ 2,281,338	$ 185,318	$ 189,401	$ 193,590	$ 197,888	$ 202,298	$ 206,823	$ 211,468	$ 216,236	$ 221,129	$ 226,153	$ 231,311	$ 236,607	$ 242,045	$ 247,6
Tax Equity Benefit (Expense)		-	435,104	319,117	160,439	64,639	62,337	(9,453)	(81,902)	(83,741)	(85,629)	(87,567)	(89,557)	(91,599)	(93,696)	(95,850)	(98,
CapEx		(3,644,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Unlevered Cash Flow	$	(3,644,000)	$ 2,716,442	$ 504,435	$ 349,900	$ 258,229	$ 260,825	$ 192,838	$ 124,921	$ 127,727	$ 130,606	$ 133,562	$ 136,596	$ 139,712	$ 142,911	$ 146,195	$ 149,5