Community Solar Program- Final Report

For Austin Energy

Prepared by DNV KEMA Energy & Sustainability

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1. Introduction

Austin Energy seeks to expand its portfolio of renewable programs with an innovative community solar program. The program provides an opportunity for Austin Energy's customers, who are unable or uninterested in installing solar on their own premises, to purchase solar power.

Broadly defined, a community solar program is any solar program that has multiple participants—co-owners, lease-holders, subscribers, or donors—that each carry a relatively small portion of the project's total cost and share proportionally in the project's benefits. Because of their inherent role as an aggregator of energy supply and demand, utilities have played a role in developing community solar as a business model. And because of their community orientation, municipal utilities and electric co-ops have been leading innovators.

Austin Energy (AE), a municipal electric utility serving more than 400,000 customers in Travis and Williamson Counties, Texas, believes a community solar program may complement its existing green power program and solar rebate program offerings. The rewards of community solar appeal directly to the utility and to its customers, especially as a way to facilitate greater customer participation in the effort to achieve renewable energy goals.

Since community solar programs are relatively new and vary significantly in their design, DNV KEMA conducted a best practices review of comparable programs in existence. From that review, DNV KEMA proposed a basic framework for the program, researched the solar PV market, and developed a financial model to assess the program subscription rate and to review of the program's costs and benefits.

2. Program Design

Based on DNV KEMA team's best practices report[1], AE decided to implement a version of the utility-driven capacity-based model. This model allows customers to subscribe to 1-kW shares of a solar project and its associated benefits without physically owning a solar system. In this model, AE would install a portfolio of PV systems funded by its Capital Investment Program (CIP) budget. AE would be responsible for installing the PV systems, and maintaining them over their lifetime. Customers may subscribe to shares of the community solar portfolio (and its long-term output) in 1-kW increments for a

[1] Cliburn, J., Bourg, J. "Best-Practices Basis for an Austin Energy Community Solar Choice Program." KEMA, Inc. July 2012.

fixed monthly fee over 5 years. By the end of the 5th year, the solar subscription would be completely paid for.

For a period of 25 years (the presumed lifetime of PV systems) beginning the day a customer joins the program, the customer would be paid monthly at the Value of Solar Tariff (VOST) rate for the energy generated by the subscribed capacity portion of the program's PV-only portfolio. For example, if the program has 500 kW in its community solar program fleet, and the customer subscribes to 5 kW, then the customer would be paid 1% of the fleet's production at VOST. To further reduce the cost of solar for its customers, AE would incentivize community solar program customers by building in a discount in the program's monthly subscription rate based a dollar/Watt solar rebate.

3. Program Benefits

This program design has the following benefits to the customer:

- Creates solar power opportunity to customers who cannot or do not want to install solar on their own property, due to lack of capital, lack of south-facing rooftop space, shading, or other reasons. The capacity-based subscription approach provides customers with an alternative way to take part in a solar program.

- Offers the opportunity to invest in solar at a predictable fixed monthly program rate over 5 years. As opposed to owning a physical solar system on a home or business, a customer in the community solar program does not have a large upfront cost. Essentially, AE provides solar financing to the customer by paying for the system upfront with its CIP budget, and recouping the cost over five years from the customer.

- Provides economy of scale. Residential systems are typically less than 10 kW, but the community solar portfolio would grow to multi-MW-scale. By virtually owning a share of a PV portfolio through the Community Solar Program, a customer could take advantage of economy of scale in siting, interconnection, procurement and installation costs.

- Minimizes PV performance risk. The portfolio approach allows customers to spread PV performance risks across a portfolio of PV systems that are professionally maintained.

- Eliminates maintenance hassle. Since AE is responsible for maintaining the system, customers are assured that their virtually-owned system is professionally maintained.

- Enables geographic mobility. If a customer were to move within AE's service territory, the customer could continue to receive benefits from the solar system without having to physically move a solar system.

- Supports local economy and furthers sustainability goals. Since the PV system is in the utility territory and visible to the community, a community solar program is well-positioned to support local economic development and educational goals.

From AE's perspective, this program's benefits include the following:

- Accelerates PV penetration to meet AE's renewable energy goals.

- Increases inclusivity by creating solar power opportunities to customers who cannot or do not want to install solar on their own property.

- Requires customers' long-term commitment to solar, similar to AE's solar rebate program. This community solar program's design requires customers to make small monthly investments over 5 years in order to gain long-term benefits over 25 years.

- Gives AE more control over the system's siting, installation, operation and maintenance. By strategically siting PV systems within the utility's distribution system, AE could decrease the necessity of new investments in distribution capacity and other reliability-related improvements, such as upgrading substation transformers and distribution lines. In addition, since AE would be responsible for installation, interconnection, operation and maintenance of the PV portfolio, AE could ensure the PV systems meet the utility's technical requirements.

- Allows simple metering and billing. Instead of installing and reading revenue-grade meters at each customer site, AE would simply need to install and read revenue-grade meters at the smaller number of PV systems in the program's portfolio. In monthly bills to customers, AE would simply show the customer's program rate, the number of subscribed solar shares, and the total monthly cost. For the portion of solar generation associated with the subscribed shares, the bill would show a credit based on VOST.

- Supports local solar industry development. Since the solar is installed within the community, the program may jumpstart local solar businesses.

- Supports education goals due to high visibility of this program in the community.

4. Program Rate

The success of the community solar program hinges upon the monthly program rate. The program rate needs to be designed such that it does not overly burden the customer or the utility. Using the model described in Appendix A, DNV KEMA was able to identify an optimum range of program rates. The program rate incorporates two core elements: the expected installation cost of the PV portfolio, and a discount based on a dollar per Watt ($/W) solar rebate.

There are several key assumptions in the rate analysis. They include the following:

- A 5-year payment program where a customer pays a fixed monthly subscription fee for 5 years, with no additional charge thereafter.
- AE installs the same annual capacity of solar over 5 years[2]
- The average installed cost over the course of the 5 years of installation is $2.5/Watt, which assumes an annual adjustment of about -10%.AE does not recover the operation, maintenance, program marketing and administration cost in the program rate.
- The program PV portfolio is fully subscribed every year.
- AE provides a value of solar tariff (VOST) monthly payment at 12.8 cents/kWh with no annual adjustment.
- The PV portfolio performs at a capacity factor of 15%.
- The lifetime of each PV installation is 25 years.

The program rate is determined by taking into account the assumed cost of installing the entire PV portfolio and the discount provided by a solar rebate. Since the program rate in turn affects a customer's payback, it is important to assess how sensitive a customer's payback is to the PV portfolio cost and the solar rebate. The program rate seeks to provide a reasonable payback to the customer (between 6-8 years) without overly burdening AE. If the assumed PV portfolio cost is too high or solar rebate is too low, it will inflate the program rate, denying the customer an attractive payback. Conversely, if the assumed cost of PV is lower than the actual cost or the solar rebate is too high, the program rate will be too low from

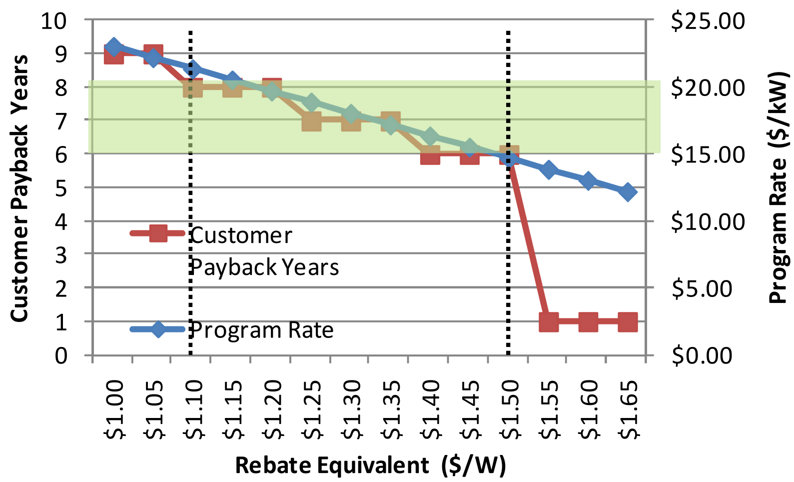
[2] Since it is generally expected that the installed cost of solar will decrease over time, if AE installs more capacity in the early years of the program, then the PV portfolio cost will be higher.

AE's perspective, and AE will bear excessive costs of the PV portfolio that are not built into the program rate.

The actual installed cost of PV is based on market conditions that are hard to predict. However, based on AE's past experience in solar procurements and DNV KEMA's solar market memo[3], an assumption of $2.5/W on average over 5 years is reasonable. To control AE's actual PV portfolio costs, the utility can set an installed cost cap during procurement to ensure the PV portfolio costs do not exceed $2.5/W. This point will be further discussed below in the section on utility benefit-cost analysis.

As for the solar rebate component of the program rate, DNV KEMA's analysis shows that a solar rebate of $1.1/W to $1.5/W would yield an optimal program rate for the customer. As shown in Figure 1 below, if the solar rebate were set between $1.1-$1.5/kW, a customer would pay a program rate of around $15-$21/kW/month. This gives the customer a payback of 6 to 8 years. If the rate were set based on solar rebate below $1.1/kW, a customer would pay greater than $22/kW/month, giving the customer a payback of 9 years or longer. If the rate were set based on solar rebate above $1.5/W, giving the customer a monthly rate of $14/kW/month or less, then the customer's monthly payment from VOST would exceed its program fees, rendering an immediate payback on Year 1.

Figure 1 Customer Payback Sensitivity to Solar Rebate Level



A program rate of $15-21/kW/month based on $1.1-$1.5/W in rebate would offer a reasonable payback to the customer. AE could provide more value to its customer by offering a higher rebate or a program rate

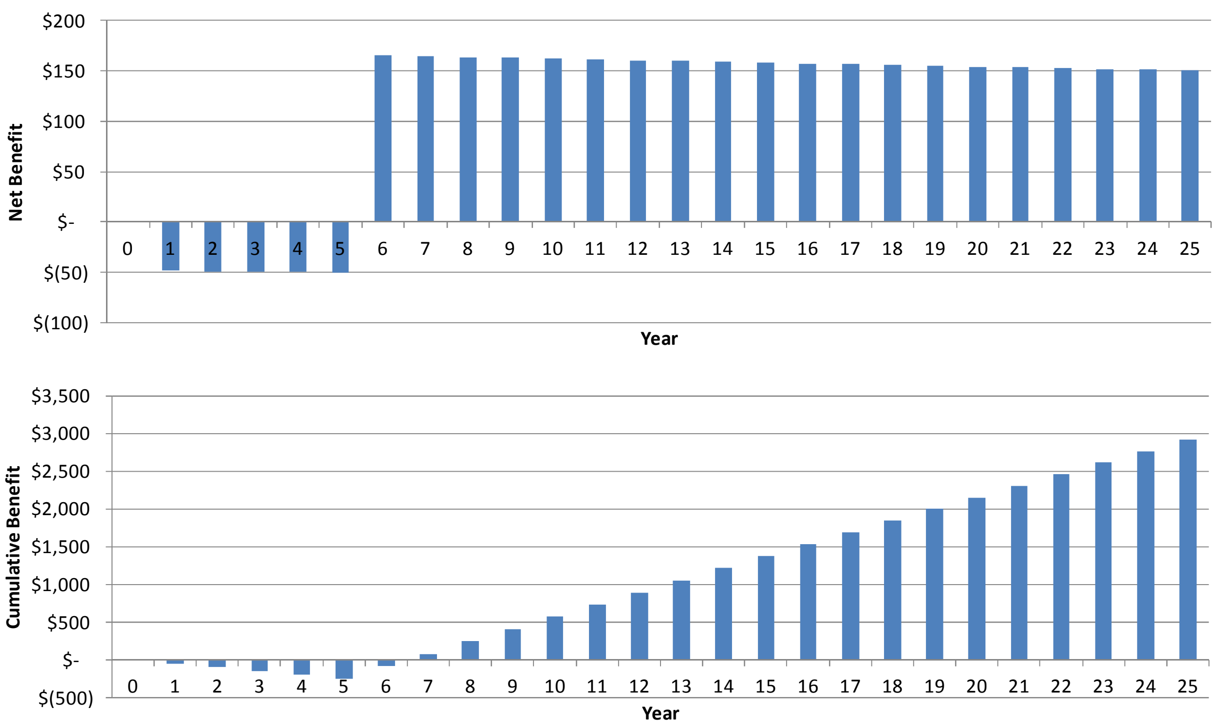
[3] Taffel, J.. "Solar Market Review and Technical Assumptions." KEMA, Inc. September 2012.

closer to $15/kW/month, or be more aggressive in hedging against its own risks by offering the program rate closer to $21/kW/month. DNV KEMA recommends a program rate of $18/kW/month (i.e., a solar rebate of $1.3/W), the mid-point of the acceptable range. For the customer, this rate would provide a reasonable payback even in case the PV fleet performs somewhat lower than expected. For AE, the mid-point will help hedge against higher than expected installed cost or low enrollment rate. The cost-benefit analysis of customers and AE is discussed in further details in the section below.

5. Customer Cost-Benefit Analysis

In the scenario where the program rate is set at $18/kW/month, a customer would have a 7 year payback period. Considering the program cost and VOST payment benefit, a customer enrolling in Year 1 of the program will pay a net $4/kW/month for 5 years. For years 6 to 25, the customer will receive an average payment of $13/kW/month.

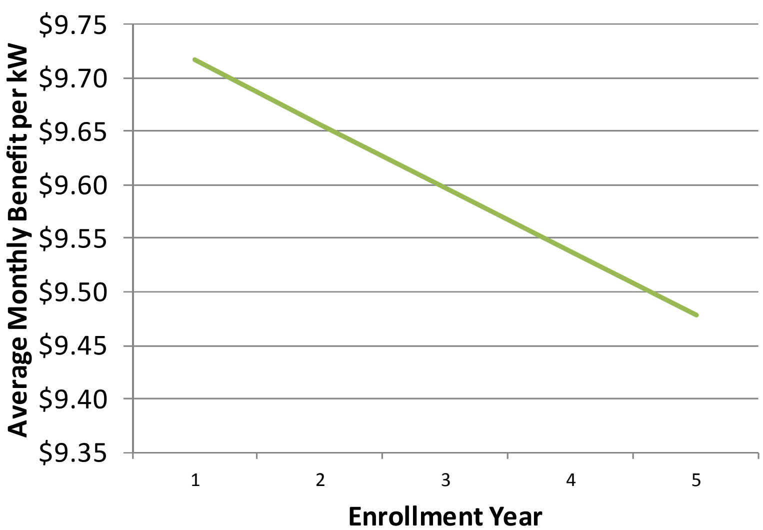
Figure 2 Customer Benefit and Cost per Year per kW



In Figure 2, the top chart shows a customer's net benefit per year. A customer makes a constant net payment in the first 5 years because the monthly program rate is larger than the VOST payments. At the start of year 6, the customer has virtually "purchased" the solar share, and he/she stops making program payments. The customer continues to receive VOST payment until his/her subscribed share retires in Year 25. As the program's PV portfolio degrades (assumed at 0.5% per year), the annual benefit also degrades by a small margin. The bottom chart shows the cumulative benefits to the customer, who achieves a payback (i.e., positive cumulative benefit) of 7 years.

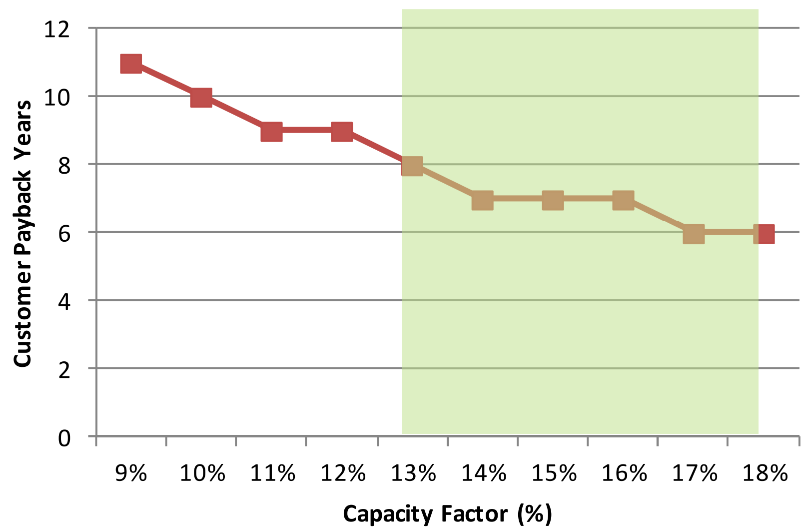
Since the program rate remains the same for all 5 years of the program, while the performance of the PV portfolio degrades over time, an early adopter has a slight advantage of a newer PV portfolio. This gives a customer who enrolls in Year 1 of the program a slight financial advantage (less than $0.5/kW/month) over customers who enroll in the program in Year 5. The payback period for all customers will remain 7 years regardless of his/her enrollment year.

Figure 3 Benefit Impact by Program Enrollment Year



In addition to the program fee, a customer's payback is contingent upon his/her VOST payments. Since the program fee is fixed for 5 years, the only uncertainty for the customers is the amount of VOST payments. Even if AE keeps the VOST at a fixed rate (12.8 cents/kWh), the total VOST payments could change depending on the performance of the program's PV portfolio. The program rate analysis assumes a capacity factor of 15% for the entire PV fleet. As shown in the chart below, assuming the program fee is $18/kW/month, if the fleet performs on average within 13% to 18%, the customer's payback would remain between 6 to 8 years.

Figure 4 Customer Payback Sensitivity to Program Portfolio's Performance



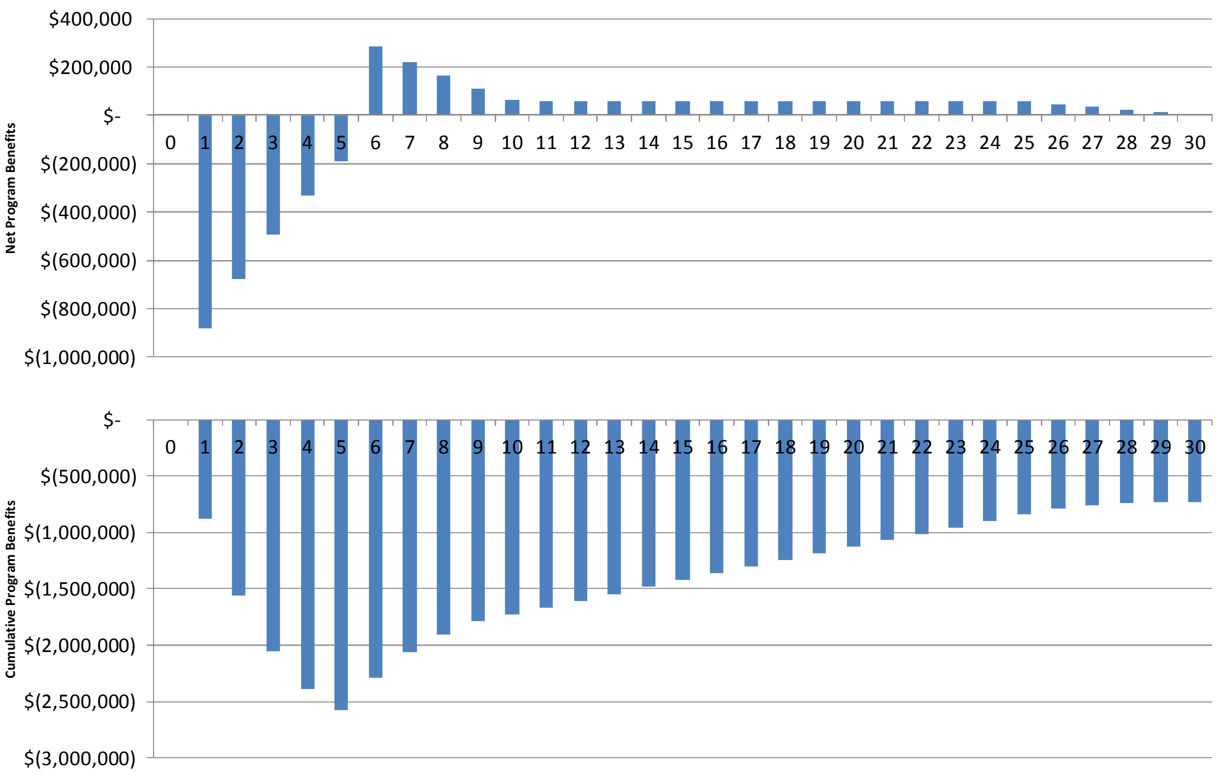
6. Utility Cost- Benefit Analysis

There are a myriad of benefits for a utility that implements a community solar program. In addition to the energy production, a community solar program also provides AE with green sustainable energy, hedge against fuel costs, transmission and distribution benefits, customer engagement, etc. The community benefits, including the opportunity to install significantly more PV, while making PV accessible and affordable to a much wider range of customers, are especially important. It is beyond the scope of this project to quantify all these benefits. However, it is worthwhile to look at the financial impact of the Capital Investment Program (CIP) budget as a result of the program. This analysis assumes the CIP funds solely the installation costs[4], and the CIP benefits from the program fees and avoided wholesale energy purchasing costs of $30/MWh.

Given AE's goal to provide adequate incentives ($1.3/W) to keep customers' payback between 6 to 8 years, AE cannot charge more than $21/kW/month to customers. Note that an implication of this rate is that AE will not be able to achieve a payback. In fact, AE subsidizes about 1.5 cents/kWh over the lifetime of the fleet. The figure below shows the net cash flow of the program.

[4] This also assumes the CIP does not fund operation, maintenance, marketing and administrative costs of the program, nor does it fund the Value of Solar Tariff payment to the customer. Since the $/W rebate is built into the community solar program rate, it is implied that CIP is providing this rebate to the customer.

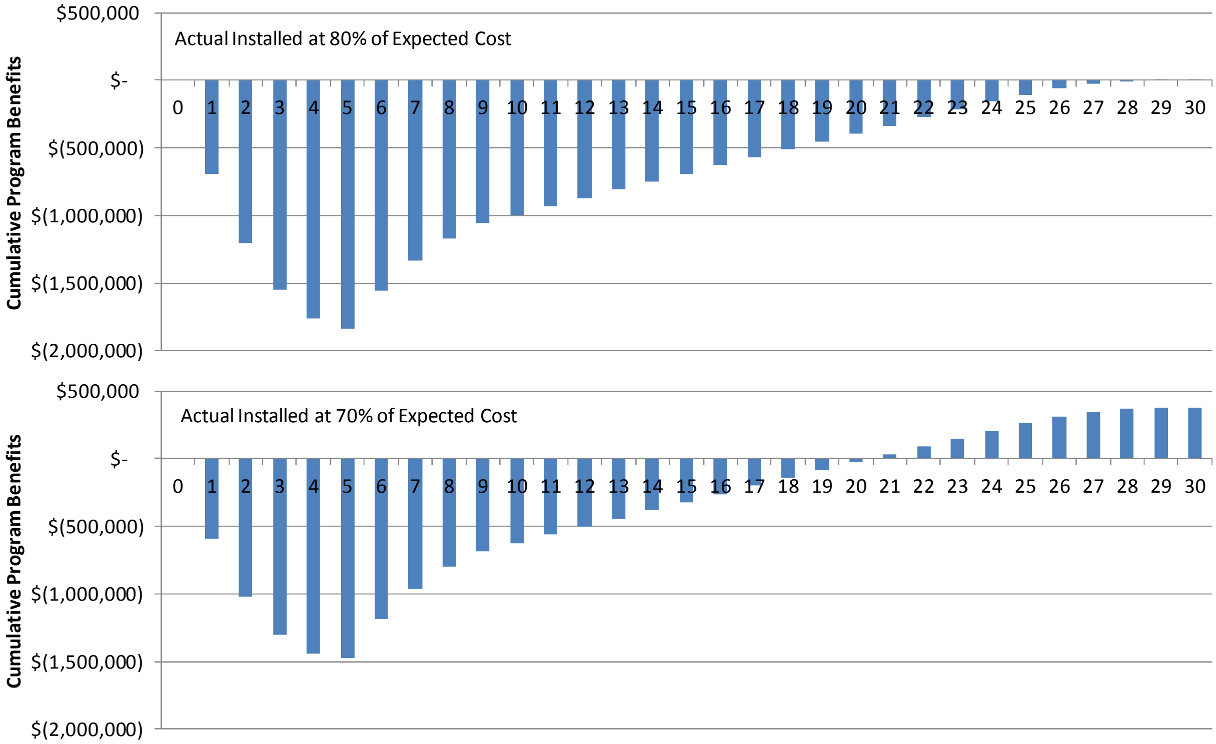
Figure 5 Program Benefit and Cost per Year over 30 years (based on 324 kW/year)



In order to provide a fixed program fee for the program's customers, AE must bear certain risks, the most significant being actual installed cost of the PV portfolio. To mitigate the risk of actual installed cost being much higher than the expected installed cost, AE could cap the installed cost in their solicitation for PV development at the expected installed costs (average of $2.5/W) upon which the program rate is determined. To account for the expected decrease in installed costs over time, AE's solicitation can incorporate a 10% decrease over the 5 program years[5]. If the actual installed cost is 20% or 30% lower than the installed cost cap, then the payback for AE would become 29 or 21 years respectively (Figure 6).

[5] A 10% expected decrease in installed costs would yield installed cost caps of $3.09 in 2013, $2.78 in 2014, $2.50 in 2015, $2.25 in 2016, and $2.03 in 2017.

Figure 6 Program Benefit and Cost over 30 years when Actual Installed Costs is Lower than Expectations



Another risk for AE is the subscription rate of the program. If the program is undersubscribed (i.e., the kW share subscription is less than the planned PV installation for that year), then AE's costs would increase. Even if the utility decides to decrease the amount of planned solar in later years, the utility's benefit-cost would still be adversely affected because the program's installed PV is front-loaded when the installed costs are higher. Conversely, if the program is fully subscribed in early years and AE decides to increase the amount of planned solar for the later years of the program, the utility's payback would shorten because more PV systems would be installed in the later years when the installed costs are lower. In effect, whenever AE can decrease the average installed cost of the PV portfolio, either by negotiating a better price with vendors, decreasing the solicitation cost cap, or delaying the installation of PV, then the economics of AE would improve. Accordingly, DNV KEMA recommends that AE minimizes the risk of under-subscription by conducting a market study to gauge their customers' interest. In addition, it is recommended that the program start with a conservative fleet capacity; if there is overwhelming interest in the program, AE can increase the fleet capacity in later years of the program to accommodate the demand without jeopardizing its benefit-cost economics.

7. Conclusion and Recommendations

Austin Energy seeks to expand its portfolio of renewable programs with an innovative community solar program. The program would serve as an alternative opportunity for Austin Energy's customers, who are unable or uninterested in installing solar on their own premises, to purchase solar power. Based on DNV KEMA team's best practices report, AE decided to implement a version of the utility-driven capacity-based model. This model allows customers to subscribe to a virtual share of a PV portfolio (based on kW capacity) and its associated benefits without physically owning a solar system. In this 5-year program, AE would install a portfolio of PV systems funded by its Capital Investment Program (CIP) budget. AE would be responsible for installing the PV systems, and operating and maintaining them over their lifetime. Customers would subscribe to shares of the PV portfolio by paying a fixed dollar per kW monthly fee; in turn, they would receive a performance-based ($/kWh) value of solar tariff (VOST) for the expected 25 year lifetime of the system. In effect, AE would provide installation, financing, operation and maintenance to the customer for a monthly charge, so that the customer can "virtually own" all the incumbent solar benefits for his/her solar share.

DNV KEMA recommends the following program elements to maximize the benefits while mitigating the risks to the utility and its customers.

- Set the program rate at $18/kW per month (which includes an effective rebate rate of $1.3/W) to give customers a payback period of 7 years. This rate is the mid-point of an acceptable range of $15-21/kW/month based on $1.1-$1.5/W in solar rebates. For customers, this rate would buffer against the PV portfolio's performance risk in case the portfolio's capacity factor falls below the expected 15% (down to 13%). For AE, this rate would hedge against high actual installed costs or low enrollment rate.

- Set an installed cost price cap when procuring PV projects. To mitigate the risk of actual installed cost being much higher than the expected installed cost, AE can cap the installed cost to its expected installed costs (average of $2.5/W). To account for the expected decrease in installed costs overtime, AE's solicitation can incorporate a 10% decrease over the 5 program years.

- To avoid under-subscription, conduct a market study to gauge customers' interest. In addition, it is recommended that the program start with a conservative fleet capacity; if there is overwhelming interest in the program, AE can increase the fleet capacity in later years of the program to accommodate the demand without jeopardizing its benefit-cost economics.

- Locate PV sites in areas to maximize the value of existing investments in distribution infrastructure.

- Select sites with high visibility, such as public spaces, schools and well-established non-profit entities, to encourage program growth.

- Allow program subscribers to participate in the selection of additional projects for the PV portfolio. Customers could be presented with a short list of screened options and subscribers would get one vote per solar share. This may create social marketing “buzz” as community facilities (from recreation centers to schools or non-profits) vie to host the next solar project.

- Structure the program so that customers never legally own individual panels or any portion of the physical solar portfolio. The customers may subscribe to the program to receive solar benefits for 25 years, but they should not be entitled to the physical ownership of the PV systems. By structuring the program in this way, AE can assure that the PV portfolio remains intact and functional up to or beyond the expected life of the PV systems.

A. Rate Design and Economics Model

Included with the delivery of this report is an Excel model that can be fully accessed and edited by Austin Energy. This model allows a user to evaluate different program design types, base the growth of the program on CIP availability or subscription expectations and to edit a wide variety of financial, technical, and default parameters. The model is built to calculate the solar rate that AE would charge to participants in the project as well as evaluate the business case on behalf of both the utility and the customer. In performing these calculations, this model provides the user with the NPV of the solar portfolio, the NPV of production, LCOE, and other metrics by which to evaluate the long term strength and integrity of the program. Through external research and an internal review, DNV KEMA has programmed the model with inputs and defaults that are specific to Austin Energy's community solar project. In this section, we will review the model run that used DNV KEMA's inputs and provide context to the outputs.

A.1 Program

The Program section serves as the model's dashboard and high-level program parameters will be set here. This run established the program start year as 2013, although this can be adjusted. There are three rate design types: Green Pricing , SolarRate, and Virtual Net Metering. Altering the rate design will affect the costs and benefit calculations on the "Utility" and "Customer" tabs. A Virtual Net Metering program will cause the model to calculate a loss of peak and non-peak retail energy sales, and it will calculate the participant's rate, and therefore program revenue, using a Solar Rate that is established in the "Finance" tab. Assigning the rate design to Green Pricing or SolarRate, assumes there will be no loss of peak or non-peak retail energy sales and will use a solar rate that includes the minimum rate needed to recover program costs less the $/kWh equivalent 5-year rebate that would available to the participant were they to receive the rebate for installing the panels on their own premise.

The Program tab then allows the user to enter a series of parameters for an existing system and the costs of the system that Austin Energy hopes to recover through the community solar program. This system will be treated as other systems that are entered as planned in the model, except that the system will be adjusted for a system life, degradation factor, and inverter replacement, based on the entered first year of operation.

Finally, the Program tab allows for planning future system capacities. This model was designed system capacities either based on CIP funds or on expected program participation demand. Altering this input will reveal one of two tables. The CIP table requests a total CIP amount for the upcoming 5 years and allows the user to enter a percentage of these funds that will be available for the community solar program. In addition, the user is able to enter a $/W cap for the installed PV systems on a yearly basis for the next 5 years as well as annual program costs as a percent of the PV portfolio costs. Using these inputs, the model calculates the PV capacities available for installation for each of the first five years of the program. Should the program capacity be based on subscription demand, the user is able to enter the total customer base size, the targeted percent who would participate each of the first five years of the program, and the average wattage acquired by one program participant. Based on these inputs, the model will calculate the capacities available for each for the first 5 years of the program.

Figure 7-1 Program Design Inputs

Program Design Decisions (Step 1)

Program Start Year (Year 1)	2013	Year			
Rate Design	Green Pricing		Payment Years	5	Years
Does the Program include exisiting PV?	No				
Capacity of the existing PV	500	kW	Cost to be recovered in the program?		
Capacity factor of the existing PV	18%	%	Cost	$1,543,210	Dollars
First year of operation	2010	Years	Recovery period	5	Years
PV planning	Based on CIP				
	2013	2014	2015	2016	2017
RFP Cap Level by year	$3.09	$2.78	$2.50	$2.25	$2.03

Whether the planned PV is based off of CIP or anticipated participation, step 2, in blue, the user is able to split each year's planned capacity between three configurations. This allows three different technical PV configurations to be deployed in stages over the first five years of the program, based on available CIP funds or anticipated participation. All three configurations in a given year must match that year's total capacity as calculated in step 1. If the configurations do not add up to the total planned, an error will be displayed in red, indicating the kW over or under. To continue, the user will configure the program's technologies.

Figure 7-2 Technology Capacity Inputs

Technology Decisions (Step 2)

Planned PV (kW)	Config 1	Config 2	Config 3	Total
2013 Planned- 324 kW	324	0	0	324
2014 Planned- 324 kW	324	0	0	324
2015 Planned- 324 kW	324	0	0	324
2016 Planned- 324 kW	324	0	0	324
2017 Planned- 324 kW	324	0	0	324

Existing PV 0 Total=1620

Additional Decisions

Step 2.1 Configure Technologies

Step 2.2 Adjust default financial assumptions

A.2 Technology

The general technology specs are a series of inputs that are common to all configurations and need only to be entered once. These include the life, degradation/year, years until a inverter replacement is required, The percent of generation that will be high tier, and estimated O&M costs for the first year. In addition, a lookup table of capacity factors is included at the top of this section. Once these fields have been populated, the user can continue onto configuring each individual system.

Figure 7-3 General Technology Inputs

General Technology Specs

Life (years)	30
Degradation/year	0.50%
Inverter replacement (years)	15
High Tier Generation	25%
1st year O&M Costs	0.005

Capacity factor	None	Single Axis	Dual Axis
Polycrystalline	18%	20%	22%
Monocrystalline	18%	20%	22%
Thin Film	12%	15%	17%

Adjust cost trends here

In addition, the assumed year 0 material and labor costs are available for editing at the bottom of this tab along with an input for an estimated annual decrease. Based on these inputs, the costs for the first 5 years of the program are calculated and used in subsequent system configuration calculations.

Figure 7-4 General Cost Inputs

Cost Trends	Year 0 Cost ($/W)	2013	2014	2015	2016	2017	Annual decrease
Polycrystalline	$ 1.06	$ 0.95	$ 0.86	$ 0.77	$ 0.70	$ 0.63	10%
Monocrystalline	$ 1.10	$ 0.99	$ 0.89	$ 0.80	$ 0.72	$ 0.65	10%
Thin Film	$ 0.84	$ 0.76	$ 0.68	$ 0.61	$ 0.55	$ 0.50	10%
Ground	$ 1.00	$ 0.90	$ 0.81	$ 0.73	$ 0.66	$ 0.59	10%
Roof	$ 1.00	$ 0.90	$ 0.81	$ 0.73	$ 0.66	$ 0.59	10%
None	$ 0.20	$ 0.18	$ 0.16	$ 0.15	$ 0.13	$ 0.12	10%
Single Axis	$ 0.50	$ 0.45	$ 0.41	$ 0.36	$ 0.33	$ 0.30	10%
Dual Axis	$ 0.75	$ 0.68	$ 0.61	$ 0.55	$ 0.49	$ 0.44	10%
Inverter	$ 0.75	$ 0.68	$ 0.61	$ 0.55	$ 0.49	$ 0.44	10%
Labor	$ 1.00	$ 1.03	$ 1.06	$ 1.09	$ 1.13	$ 1.16	-3%

Each configured system will be given one module type, one mounting type and one tracking type. All iterations of this configured system will share the same inputs for these parameters. However, the installation cycle of each configured system can be spread out over the first 5 years of the program, can be individually assigned a specific method of ownership and whether the utility owns or leases the location of the panels. The ownership of the system can be defined as: Muni Finances, Utility CIP, Third Party, and PPA. Changing this parameter will adjust the tax credits and other benefits available to the project, and will adjust interest/leasing rates as set in the subsequent finance tab. Once these inputs have been entered, lookup tables will reference the cost trends and capacity factor tables to calculate the costs, benefits, and LCOE of that each year of each configuration.

Figure 7-5 Individual Configuration Inputs

Config 1		2013	2014	2015	2016	2017
Planned capacity		200	100	153	0	153
Module type	Polycrystalline	$ 0.95	$ 0.86	$ 0.77	$ 0.70	$ 0.63
Mounting type	Roof	$ 0.90	$ 0.81	$ 0.73	$ 0.66	$ 0.59
Tracking	None	$ 0.18	$ 0.16	$ 0.15	$ 0.13	$ 0.12
Inverter		$ 0.68	$ 0.61	$ 0.55	$ 0.49	$ 0.44
Labor		$ 1.03	$ 1.06	$ 1.09	$ 1.13	$ 1.16
Capacity Factor	18%					
Ownership		Utility CIP	Muni Financed	Third party	Third party	PPA
Location		Muni property	Muni property	Lease	Muni property	Lease
Intalled Costs ($/Watt) to Vendor		$ 3.74	$ 3.50	$ 3.29	$ 3.10	$ 2.94
Tax Credit discount		0%	0%	30%	30%	0%
MACRS benefit		none	none	yes	yes	none
Vendor/Developer/Financier Margin		5%	5%	5%	5%	8%
Installed Costs to Austin Energy		$ 3.93	$ 3.67	$ 2.42	$ 2.28	$ 3.17
Present value of system to AE (including financing)		$ 792,172	$ 362,743	$ 454,907	$ -	$ 434,362
LCOE		$ 0.15	$ 0.15	$ 0.12	#DIV/0!	$ 0.13

A.3 PV Portfolio

The PV Portfolio tab displays economic and estimated production data for each configuration, broken out by each of the first 5 years of potential PV installation. It also includes a comparable block of calculations that are dedicated to evaluating economic and production data of the existing system, if included in the Program tab. The first two columns of each calculation block simply report technical data relevant to that respective system as entered in the Technology tab. Each calculation block reports on the system capacity, expected annual production, broken out by peak and off peak production, and the present value of the energy production (to be used in the LCOE calculation). In addition, costs, such as annual payment, yearly O&M costs, and expected inverter replacements are presented as well as benefits, such as the FTC and MACRS benefits. The present value of cost is included for each portion of each configuration. Finally, the portfolio aggregate at the top of the tab, provides an NPV of the solar portfolio, an NPV of the production, and a LCOE for the entire portfolio.

Figure 7-6 Aggregate PV Portfolio Outputs

Solar Program PV Portfolio

				2012	2013	2014	2015	2016	2017
			Program year	0	1	2	3	4	5
Aggregate Portfolio (5 yrs)			Capacity (kW)	200	463	616	769	922	1,075
NPV solar portfolio	**$**	**3,437,407**	Energy production kWh	315,360	739,519	986,358	1,222,676	1,483,830	1,717,662
NPV of production		**26,948,639**	On Peak production	78,840	184,880	246,589	305,669	370,958	429,415
LCOE	**$**	**0.13**	Off peak production	236,520	554,639	739,768	917,007	1,112,873	1,288,246
			Present value of energy production	315,360	711,076	911,943	1,086,955	1,268,384	1,411,793
			AE loan Due	-	1,012,276	665,656	632,137	688,644	641,772
			Loan interest	-	12,864	33,283	49,541	68,864	64,177
			Annual payment	80,000	976,560	512,018	435,485	209,325	146,859
			AE O&M	1,577	3,809	5,232	5,362	5,495	5,632
			AE Inverter replacement	-	-	-	-	-	-
			Present Value of Cost to AE	81,577	942,662	478,227	391,912	183,629	125,336

A.4 Minimum Rate

The aggregate portfolio section is then fed into the minimum rate section. Here, the model calculates the avoided wholesale energy purchase on and off peak, considers the PV production, program costs, LCOE of PV, Non-PV program costs, and total program costs to generate a $/kWh rate at which AE is able to recover their costs. These details, while calculated in detail on this tab, are also summarized at step 3 in the Program tab at the beginning of the model.

This section of the model allows AE to pass through the solar rebate value to the community solar program participant if desired. The current $/W rebate amount is set here, and deducted from the minimum SolarRate at which AE will recover their costs. Also, the value of RECs is an available input here. Ultimately, the final SolarRate is presented to the user as a $/kWh.

Figure 7-7 Rate Design Inputs

Setting rate (Step 3)

NPV solar portfolio	$ 3,846,442	
NPV of production	27,135,834	
Cost of PV	$ 2,564.2950	$/kW
Discount Program Rate by Rebate equivalent?	Yes	
Current rebate (2012)	$1.00	$/W
Rebate decline	5%	
Average 5-year rebate $/kwh equivalent	$0.0300	$/kwh
Value of RECs to AE	0	$/kwh
Final Program rate	**$26.0716**	**$/kW/month**

A.5 Utility and Customer Cost-Benefit Analysis

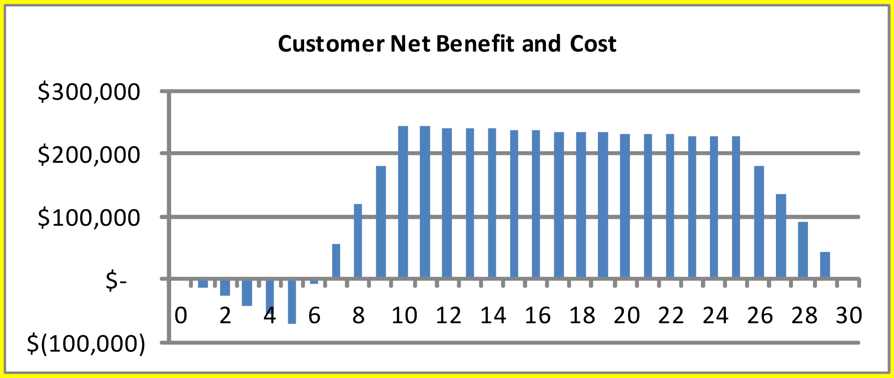
The final sections of the model perform a cost-benefit analysis for Austin Energy and a program participant. A summary of these calculations is displayed on the Program tab, while a breakout of the calculations is viewable on the "Utility" and "Customer" tabs. The Utility tab considers the present values of the portfolio energy production, costs, and benefits to the utility. It generates an NPV of the net program benefit, payback period, benefit/cost ratio, and an IRR. Included in this section is a histogram of the net program costs and benefits. Similarly, the customer cost-benefit analysis looks at the NPV of the customer's benefits and costs, calculates a benefit to cost ratio, paback period, and IRR, and displays a histogram of the customer net benefits and costs.

Figure 7-8 Utility and Customer Cost Benefit Analysis Outputs

Results

Customer

NPV of program	$	2,157,186
Payback		7
Net benefit/cost ratio		2.66
IRR		36%



Utility

NPV of program benefit	$	(6,061,332)
Payback		>30 years
PV Net benefit/cost ratio		0.31
IRR		N/A