National Community Solar Partnership Technical Assistance

Together New Orleans

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Photo by Dennis Schroeder, NREL 55200

About NCSP Technical Assistance

This product is the outcome of a National Community Solar Partnership (NCSP) Technical Assistance (TA) request. TA is provided to NCSP members at no cost and upon request. Some TA, this project included, is later generalized and published to help educate the broader community, share findings, and provide best practices.

If you have additional questions about the technical, financial, or administrative components similar but not limited to those explored in this product, you are encouraged to apply to the NCSP TA program for no-cost support.

- Join the NCSP
- Apply for Technical Assistance after joining

Contents

Definitions

- **Community Solar (CS):** Any solar project or purchasing program, within a geographic area, in which the benefits of a solar project flow to multiple customers such as individuals, businesses, nonprofits, and other groups.
- **Subscribing Customer:** The individual or household representative that claims membership in the CS project.
- **Project Developer:** The entity, which undertakes the responsibility of building and owning the CS project.
- **Subscription Rate:** Money paid by a subscribing customer to the project developer for their respective portion of the solar project.
- **Subscription Credit:** Money credited to a subscribing customer, by the electric utility, via their electricity bill.
- **Subscription Savings:** The net difference between the subscription rate and subscription credit.
  - (Credit – Cost = Savings)
- **Bill Savings:** The net reduction (+ or -) of the subscribing customers electric bill after subscription credits are applied and the subscription rate is accounted for.
  - (Electric Bill without CS subscription – Electric Bill with CS subscription + subscription rate = Bill Savings)
- **Subscriber Class:** The rate class that the subscribing customer belongs to which dictates Subscription Credit they will receive.
  - Low and Moderate Income (LMI) & Market (Non-LMI) are the only two subscriber classes discussed in this presentation.
- **Subscriber Mix:** The relative proportion of project that is subscribed to by each subscriber class.
  - E.g. 75% LMI and 25% Market
- **Net Present Value (NPV):** The present value of a cash flow, which is dependent on the interval of time and discount rate, and accounts for the time value of money to provide a comparable basis for evaluating projects.
  - All NPVs presented are from the perspective of the project developer/financier.
- **Internal Rate of Return (IRR):** A metric used in financial analysis to estimate the profitability of potential investments and one that makes the NPV of all discounted cash flows equal to zero.
  - All IRRs presented are from the perspective of the project developer/financier.

Background & Methodology

Background

- In 2019, New Orleans City Council passed Resolution R-19-111, Resolution and Order Establishing Rules For Community Solar Projects, enabling community solar in the city of New Orleans.
  - As of July 2023, no community solar projects have been developed since the passage of Resolution R-19-111 in 2019.
- Entergy New Orleans (ENO) is the regulated utility operating in New Orleans and is regulated by the City Council rather than by the state Public Service Commission (PSC).
- The City Council docket, UD-18-03 Community Solar Projects Rulemaking Proceeding, under which the CS enabling legislation and rules were passed, remains open currently to consider program rule modifications.
- Together New Orleans, a coalition of congregations and community-based organizations in the greater New Orleans area, is an active intervener in the current docket addressing CS programmatic rules.
- Together New Orleans submitted a Technical Assistance request to the NCSP aiming to obtain a third-party analysis on several rate compensation structures that could make project development more financially advantageous.

New Orleans Community Solar Program Summary

Plant MW Limit	2 MW (proposal to raise to 5 MW)
Program MW Limit	Less than or equal to 5% of the Utility's annual peak in MW for the first three years of the program.
Requirements	At least 3 customers, no customer with more than 40% share. In the same service territory (geographical area in which a single utility serves electrical customers) as generator.
Subscriber Compensation	Market customer (non-LMI): Based on avoided capacity and energy costs. Avoided energy is based on hourly LMP (locational marginal price)weighted by the modeled output of a PV system in New Orleans. Avoided capacity is 0.5 * CONE (Cost of New Entry). LMI customers: Value is full retail for the "currently effective Low-Income Subscriber's customer class tariff" (i.e. at the retail of LMI discounted rates).
LMI requirements	LMI customers qualify if they are 50% of AMI (average median income) or person eligible for a program with that income limit. (Median household income was $45,594 in 2021) A LMI facility has at least 30% LMI subscribers. Half the program is reserved for LMI facilities.

Methodology

1. Define scenarios & goal
2. Compile scenario assumptions
3. Run models – Using NREL's System Advisor Model (SAM)
4. Compile and compare results
5. Present findings, takeaways, and limitations

Modeling Considerations

An additional list of assumptions are compiled in the appendix of this report; this section addresses some of the key considerations and decisions made to perform the modeling.

- Subscription Rate
  - The subscription rate was calculated by reducing the predetermined subscription credit by 20% to generate a 20% savings based on the NCSP target of providing a bill savings of 20% to all customers.
    - This approximation was used because bill savings could not be calculated (see "considerations" section).
  - Subscription credits were calculated using Entergy New Orleans (ENO) published data from their community solar website
    - Market rate was calculated using the most recent avoided cost data published (Nov 2022).
    - LMI rate was based on the average of all values published from historical years (June 2021 - Nov 2022).
- Investment Tax Credit (ITC)
  - The ITC was assumed to be 30% and includes an approximation of the effects of the Inflation Reduction Act (IRA). Eligibility for ITC adders and bonuses could increase the ITC above 30% but are undetermined and were therefore excluded.
- Renewable Energy Credits (REC)
  - RECs are inherently hard to project due to market variation and depending on market location and type. A simple default of $2/MWh was assumed across the life of the project where applicable using best engineering judgment. This value is assumed to be slightly conservative based on current trends and historical prices for voluntary REC prices, which have risen recently. Compliance REC prices, which are most likely to apply to the current models tend to be higher, however the necessary relevant market values are lacking to make the necessary modeling assumptions.

Scenarios

Scenarios

1. Base model
   a. Uses existing rules passed by City Council under Resolution R-19-111
2. Proposed rule model
   a. Includes proposed rules updates to increase project size cap to 5 MW, extend contract to 20 years, and provide developer with REC ownership
3. Minimum compensation for breakeven (uses proposed rules base)
   a. Subscription rate for market class (non-LMI) is increased until developer Internal Rate of Return = Discount Rate (a.k.a. NPV=0)
4. Minimum compensation for baseline profit (uses proposed rules base)
   a. Subscription rate for market class (non-LMI) is increased until developer IRR = Entergy current guaranteed rate of return, 9.35% *
5. Reduced market class savings (uses proposed rules base)
   a. Investment Tax Credit is increased to 40%, market class sees no financial benefit, and LMI payment increased until developer IRR = 9.35%

*Docket No. UD-18-07: https://cityofno.granicus.com/MetaViewer.php?view_id=&meta_id=466285

Scenario 1 – Base Model

Using the existing rules as published on the New Orleans City Council Website under UD-18-03: Community Solar Projects Rulemaking Proceeding (and the available information from the Entergy New Orleans Community Solar webpage) a base model was developed.

Notable Assumptions

- Project size – 2MWac (Megawatts AC)
- PV Capital cost
  - $1.93/Wdc installed
- Contract length 10 years
- Project customer mix 70/30*
  - 70% Market
  - 30% LMI
- Subscription rate (paid to developer by subscriber)
  - $0.08925/kWh for LMI
  - $0.05582/kWh for Market
- Investment tax credit (ITC)
  - 30%
- Renewable energy credit (REC)
  - $0/MWh (no payment)

*The customer mix was determined based on the guidance from the rules that the CS program aims to reserve half of the program capacity for projects that meet a 30% threshold for LMI customer mix

Scenario 2 – Proposed Rules Model

The base model was was aligned more closely with the proposed rules under consideration per UD-18-03. Specifically, project capacity size cap, contract duration, customer mix, and REC ownership & compensation were updated.

Assumption modifications from base

- Project size – 5MWac
- Contract length 20 years
- Customer mix 60/40*
  - 60% Market
  - 40% LMI
- Subscription rate (paid to developer by subscriber)
  - $0.08925/kWh for LMI
  - $0.05582/kWh for Market
- Investment tax credit (ITC)
  - 30%
- Renewable energy credit (REC)
  - $2/MWh

* The customer mix was determined based on the guidance from the rules that the CS program aims to reserve half of the program capacity for projects that meet a 40% threshold for LMI customer mix and the NCSP target that 40% of benefits flow to disadvantaged communities per the Justice40 Initiative.

Yellow highlighted text are changes made to the baseline model (Scenario 1) to achieve the current scenario

Scenario 3 – Proposed Rules: NPV Breakeven

Scenario 2 was modified with the aim of identifying the market subscriber class subscription rate required to drive project economics to equal a NPV of $0.

A $0 NPV occurs when the IRR=Discount Rate.

Assumption modifications from proposed rules model

- Project size – 5MWac
- Contract length 20 years
- Customer mix 60/40
  - 60% Market
  - 40% LMI
- Subscription rate (paid to developer by subscriber)
  - $0.08925/kWh for LMI
  - $**TBD**/kWh for Market
- Investment tax credit (ITC)
  - 30%
- Renewable energy credit (REC)
  - $2/MWh

Yellow highlighted text are changes made to the scenario 2 to achieve the current scenario

Scenario 4 – Proposed Rules: Utility IRR

Scenario 2 was modified with the aim of identifying the market subscriber class subscription rate required to drive project economics to equal an IRR of 9.35%.

This IRR was based on Entergy's guaranteed rate of return; however, this value is conservative as a developer is exposed to greater risk than a regulated utility that has guaranteed return on their investments.

<u>Assumption modifications from proposed rules model</u>

- Project size – 5MWac
- Contract length 20 years
- Customer mix 60/40
  - 60% Market
  - 40% LMI
- Subscription rate (paid to developer by subscriber)
  - $0.08925/kWh for LMI
  - $**TBD**/kWh for Market
- Investment tax credit (ITC)
  - 30%
- Renewable energy credit (REC)
  - $2/MWh

Yellow highlighted text are changes made to the scenario 2 to achieve the current scenario

Scenario 5 – Proposed Rules: Utility IRR
No Market Subscriber savings

Scenario 2 was modified to include a more aggressive ITC rate simulating a project which received an ITC adder under the inflation reduction act.

The market subscriber class subscription rate was then increased to match the subscription credit of scenario 1 to model a no subscription savings scenario for market subscribers.

The LMI subscription rate was then increased until the project obtained an IRR of 9.35%.

Assumption modifications from proposed rules model

- Project size – 5MWac
- Contract length 20 years
- Customer mix 60/40
  - 60% Market
  - 40% LMI
- Subscription rate (paid to developer by subscriber)
  - $**TBD**/kWh for LMI
  - $0.06977/kWh for Market
- Investment tax credit (ITC)
  - 40%
- Renewable energy credit (REC)
  - $2/MWh

Yellow highlighted text are changes made to the scenario 2 to achieve the current scenario

Results & Findings

Scenario 1

System Characteristic	
System Capacity	2 MWac (2.4 MWdc)[1]
Annual AC energy in Year 1	4,228,700 kWh
DC capacity factor in Year 1	20.10%
Energy yield in Year 1	1,762 kWh/kW

Financial Details	
Net capital cost	$4,628,910
CAPEX Rate	$1.93/Wdc
REC revenue in Year 1	$0
NPV Net present value	-$1,901,936
IRR Internal rate of return	-14.95%
Subscription Rate ($/kWh)	
LMI	$0.08925
Market	$0.05582
Subscription Credit ($/kWh)	
LMI	$0.11156
Market	$0.06977

- Under prevailing program rules, while providing both customer classes a 20% savings on their subscription, a developer will fall short of recouping project costs and obtain no profit from the project.
- If a private developer is unable to recoup costs and secure a profit large enough to cover the risk of project development, projects are unlikely to materialize.

[1] The inverter loading ratio (ILR) also referred to as the DC/AC used for modeling is 1.2 (see Assumption slide), which is a reasonable assumption based on industry data.

Scenario 1 - Discussion

- Even if the entire Scenario 1 project was based on LMI customers only (no market subscribers) and the LMI subscription rate and credit were equal ($0.11156), meaning the subscriber had no guaranteed savings, the project would still yield an IRR of -2.15%.
- This is due in in part to a short contract with only 10 years guaranteed.
- Assuming a 100% LMI subscriber class is unrealistic unless the program is designed to provide developers with some risk reducing measure. This was included for comparative purposes.
- Similarly, NCSP aims to provide customers with bill savings, especially for LMI customers and thus supports subscriptions which provide a net customer savings between subscription rate and credit (unlike the theoretical scenario presented on this slide).

Scenario 2

System Characteristic	
System Capacity	5 MWac (6 MWdc)
Annual AC energy in Year 1	10,571,650 kWh
DC capacity factor in Year 1	20.10%
Energy yield in Year 1	1,762 kWh/kW

Financial Details	
Net capital cost	$11,572,277
CAPEX Rate	$1.93/Wdc
REC revenue in Year 1	$211,433
NPV Net present value	-$1,861,806
IRR Internal rate of return	2.50%
Subscription Rate ($/kWh)	
LMI	$0.08925
Market	$0.05582
Subscription Credit ($/kWh)	
LMI	$0.11156
Market	$0.06977

- Using the proposed rules, including extending the project contract, increasing the LMI customer mix, and adding REC income, the project still provides a negative NPV for the developer.
- Under proposed rules, project development appears unlikely due to the negative NPV.

Scenario 3

System Characteristic	
System Capacity	5 MWac (6 MWdc)
Annual AC energy in Year 1	10,571,650 kWh
DC capacity factor in Year 1	20.10%
Energy yield in Year 1	1,762 kWh/kW

Financial Details	
Net capital cost	$11,572,277
CAPEX Rate	$1.93/Wdc
REC revenue in Year 1	$211,433
NPV Net present value	$336
IRR Internal rate of return	8.86%
Subscription Rate ($/kWh)	
LMI	$0.08925
Market	$0.08062
Subscription Credit ($/kWh)	
LMI	$0.11156
Market	$0.09674

- Under proposed rules, to break even with a NPV of ~$0 (aka an IRR=discount rate), while providing customers a 20% savings on their subscription, would require increasing the market subscription rate ~44% to ~$0.081/kWh, correlating to a subscription credit of ~$0.097/kWh.
- A NPV of $0 does not provide market conditions that are likely to support project development since a developer will simply recoup costs with no effective profit.
- Scenario 3 provides a floor from which to compare additional scenarios which are more advantageous to project development.

Scenario 4

System Characteristic	
System Capacity	5 MWac (6 MWdc)
Annual AC energy in Year 1	10,571,650 kWh
DC capacity factor in Year 1	20.10%
Energy yield in Year 1	1,762 kWh/kW

Financial Details	
Net capital cost	$ 11,572,277
CAPEX Rate	$1.93/Wdc
REC revenue in Year 1	$211,433
NPV Net present value	$105,612
IRR Internal rate of return	9.35%
Subscription Rate ($/kWh)	
LMI	$0.08925
Market	$0.08202
Subscription Credit ($/kWh)	
LMI	$0.11156
Market	$0.098424

- To ensure a developer receives a 9.35% IRR with the same conditions as scenario 3 would require increasing the market subscription rate even further to ~$0.082/kWh, correlating to a subscription credit of ~$0.0984/kWh.
- This scenario still guarantees all subscribers a 20% subscription savings while making development more likely.
- The subscription rate assumes the developer secures REC payments, a 30% ITC payment, and can completely fill all subscriptions in year 1 through 20.
- Any lower REC payments or unsubscribed portion of the project will decrease financial benefits and either reduce project likelihood or require revenue to be made up through another avenue.

Scenario 5

System Characteristic	
System Capacity	5 MWac (6 MWdc)
Annual AC energy in Year 1	10,571,650 kWh
DC capacity factor in Year 1	20.10%
Energy yield in Year 1	1,762 kWh/kW

Financial Details	
Net capital cost	$ 11,572,277
CAPEX Rate	$1.93/Wdc
REC revenue in Year 1	$211,433
NPV Net present value	$106,402
IRR Internal rate of return	9.35%
Subscription Rate ($/kWh)	
LMI	$0.08964
Market	$0.06977
Subscription Credit ($/kWh)	
LMI	$0.11156
Market	$0.06977

- Scenario 5 provides an alternative to scenario 4 and retains the developer 9.35% IRR and base case subscription credits but increases the ITC to 40% and modifies the subscription rate thus affecting the net subscription savings a customer will receive.
- With an additional 10% ITC, by setting the market customers subscription savings to 0 (aka subscription rate and credit are equal), the LMI subscription rate only needs to be reduced marginally (<1/10th of a cent) barely reducing savings to just below $0.022kWh (aka ~ 20% savings).

Scenario 5 Discussion

- Scenario 5 shows that even with the benefits of RECs and ITC payments and a market customer class that receives no subscription savings, the LMI customer class would still be just shy of a 20% savings while returning a 9.35% developer IRR.
- Furthermore, like scenario 4, this model assumes a perfect subscription rate and no financial shortfalls, which if considered, would decrease the LMI savings through an increase in the subscription rate or another mechanism.
- Also worth noting, a subscription savings does not guarantee a bill savings, and in the case of the market customer, a subscription savings of 0 as outlined in this scenario is likely to reveal a premium subscription.
- A premium subscription means that bill savings a customer receives would be negative and cost a customer more than it would save them. This occurs if the subscription savings (0 in this case) is less than the difference between the subscription credit and utility rate for the subscriber. The CS rules currently state that market subscribers receive a credit at the avoided cost rate, which is almost certainly below residential rates leading to a net negative for market subscribers in this scenario.

Considerations

- The scenarios modeled assumed a customer class breakdown/mix to qualify the project as an LMI facility per the CS rule requirements. A developer will consider the tradeoff between increased potential subscription rate payments from LMI customers (under current rules) which comes with an increased acquisition/retention cost and risk to determine the ideal customer mix. The customer mix will differ from that exactly modeled, however comparative results from the modeling performed will remain valid.
- As discussed in scenario 5, subscription savings does not equal bill savings. A bill savings is not guaranteed for market customers even in scenarios 1 through 4 where a subscription savings is modeled since the subscriber's utility rate is unknown. The 20% subscriber savings was deployed as a best practice in place of being able to verify a bill savings. When modeling bill savings if the utility rate is known, it is best to use a subscription that is as close to actual household usage as possible to have the most accurate bill savings calculation.
- A topic not addressed in the modeling here is upfront subscription payments. All subscription rates were assumed to be monthly ongoing costs with no payment at the outset. Some programs or projects include an upfront payment by subscribers to assist with project finances at early stages. Front loaded subscription rates will increase the value to both the project developer and owner as future money is worth less than current money in finance terms. However, an upfront payment can often be a barrier to entry for subscribers, especially for LMI customers, which makes upfront payment inclusion a tradeoff between customer enrollment and project finances.
- Technical model parameters affect the financial outcome, especially system generation. If the solar system produces less energy than predicted, project cashflow will be negatively affected. The model assumes a standard 1-axis tracking solar array located in New Orleans. Without site specifics, more precise production modeling is impossible. A generic model is acceptable since the work performed is representative and not specific. Values presented should be used for education purposes and as guiding principals rather than inflexible and exact predictions.

Findings & Takeaways

Designing a community solar program requires consideration of numerous moving and interacting components. Below is a discussion of some important components that may impact the New Orleans program. The changes discussed are not the only potential changes and may have a different impact if other components are modified simultaneously.

- Current and proposed rules provide a developer inadequate cashflow to incentivize project development.
- An increased subscription credit, thus allowing for an increased subscription rate, may help provide developers with adequate cashflow to finance projects.
- Under current program rules, a developer is incentivized to charge LMI customers with a higher subscription rate than market customers.
  - The incentive arises since a developer hoping to attract customers by providing a set subscription savings can charge LMI customers more while still providing the same percent savings when compared to market customer due to higher subscription credit for LMI customers.
- Subscription credits can be set by correlating them to retail rates and then back calculating what subscription rates to consider that will also create an advantageous cashflow for project development.
- Bill savings can only be calculated and/or guaranteed if the subscription credit is linked to the retail rate and subscription rates are less than the subscription credits.
- A balance between customer savings and developer profit is important to ensure the program is attractive to both customers and developers.
  - Without this balance projects are unlikely to be developed and/or built projects will struggle to attract customers, reducing future development likelihood.

Assumptions & Disclaimer

Assumptions

- Location (Lat/Long): 29.9537, -90.0777 [TMY weather file used from NSRDB]
- Nameplate Capacity: 2,400 kWdc (2,000 kWac) & 6,000 kWdc (5,000 kWac)
- DC/AC ratio: 1.2
- Ground Coverage Ratio (GCR): 1.3
- Tracking: 1-axis
- Azimuth: 180°
- Annual AC degradation rate: 0.5%
- Capital cost: 1.93 $/Wdc
- Operation & Maintenance cost: 15.5 $/kWdc-yr
- Lease cost: $70,000/yr
- Federal and State income tax rate: 21% and 5.7%
- Sales tax rate: 4.45%
- Inflation Rate: 2.5%
- Real discount rate: 6.2%
- Debt-Service Coverage Ratio (DSCR): 1.3
- Interest Rate: 5%
- REC Price: $2/MWh

The assumptions listed above were compiled using NREL best practices, industry standards, and input from the TA recipient. Data sources include NREL ATB, NREL PV cost benchmark, LBNL Tracking the Sun, and New Orleans Commission and community solar program documents.

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