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Roy Buri

Overview of a Financial Model for Inclusive Utility Investments in On-Site Solar with a Path to Ownership

LIFT Solar

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Overview of a Financial Model for Inclusive Utility Investments in On-Site Solar with a Path to Ownership

This project was supported by the US Department of Energy EERE grant DE-EE0008567/0000, Accelerating Low Income Financing and Transactions ("LIFT") for Solar Access Everywhere. The collaborative is led by Groundswell with Clean Energy Works, Elevate Energy, and Southface Institute as partners in the research.

CONTENTS OF FULL REPORT

This complete report on the second phase of research into Solar PAYS for the LIFT Solar Everywhere project consists of:

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List of Acronyms

EE	Energy efficiency
EEI	Energy Efficiency Institute, Inc.
FMV	Fair market value
IOU	Investor owned utility
IRC	Internal Revenue Code
IRR	Internal Rate of Return
ITC	Investment Tax Credit
kW	Kilowatt
LMI	Low- and moderate-income
MACRS	Modified Accelerated Cost Recovery System
PACE	Property assessed clean energy
PAYS®	Pay As You Save®
PPA	Power purchase agreement
PUC	Public Utility Commission (state utility regulatory body)
PV	Photovoltaic
TOB	Tariffed on-bill

Executive Summary

The ability to access on-site solar is often determined by whether a household can either pay cash upfront or arrange financing for a 20-year investment. Most households in the United States. are not able or willing to do either on their own. To address the resulting clean energy divide, LIFT Solar Everywhere[1] is exploring methods to accelerate access to solar for low- and moderate-income (LMI) homeowners as well as renters by identifying scalable finance and customer models, addressing both residential rooftop and community solar. One such model is a well-demonstrated method of inclusive utility investment in energy efficiency upgrades called Pay As You Save® (PAYS®).[2] It uses a system of agreements that assures consumer protections are in place, including a path to ownership for the site owner rather than expansion of a utility monopoly.

Following a white paper in 2020 investigating the viability of applying PAYS to on-site solar, LIFT Solar Everywhere advanced that thinking by quantifying the concept in an open source financial model to help more analysts explore this option in specific contexts. This white paper provides descriptive documentation for the financial model as well as four illustrative examples with input assumptions that vary based on geography, utility type (for-profit or non-profit), electricity cost, and other factors.

Results of the four illustrative cases indicate that, with an unfettered path to monetizing the federal tax credit for solar power as well as retail net metering, inclusive utility investments through a tariffed on-bill program can dramatically lower the upfront cost of an on-site solar installation. Sample results developed with the financial modeling indicate residential customers in all three of the four example case studies would be able to receive an inclusive offer of investment from their utility without an upfront copayment, but for the for-profit utilities, this would involve splitting the utility's required rate of return between participants and non-participants in recognition of the benefits of distributed energy.

Reinforcing a central finding from the first white paper, monetization of the federal solar tax credit through a direct payment is critical to achieving a cost-effective value proposition for LMI customers of non-profit utilities. The importance of this finding is underscored by the fact that 90% of persistent poverty counties in the U.S. are served by non-profit electric cooperatives, which are utilities owned by the customers they serve. To date, electric cooperatives have accounted for a majority of the U.S. utilities with experience making site-specific investments in energy efficiency upgrades based on the PAYS system, giving them an advantaged position for rapid adoption of a similar solution for on-site solar.

[1] Accelerating Low-Income Financing and Transactions for Solar Access Everywhere (LIFT), DE-EE0008567, funded by the U.S. Department of Energy.
[2] The first phase of LIFT Solar Everywhere research includes a white paper that describes the PAYS system and its applicability to on-site solar in detail. https://www.cleanenergyworks.org/2020/08/27/doe-lift-pays-for-solar-report/

Background

LIFT Solar Everywhere is exploring multiple solution sets for reaching low -and moderate-income households with affordable access to solar power. One of those options is an inclusive utility investment through a tariffed on-bill program like those already offered by 20 utilities for energy efficiency upgrades. Among those utilities, most have chosen to use the Pay As You Save (PAYS) system of agreements that allows a utility to capitalize site-specific upgrades and assure site-specific cost recovery, regardless of the income, credit score or renter status of the billpayer. As a partner organization in the LIFT Solar Everywhere project, Clean Energy Works has engaged practitioners and analysts familiar with the PAYS system to develop recommendations for utilities and policymakers who want to remove barriers to on-site solar faced by low- and moderate-income energy consumers.

To share resulting insights with the field more broadly, LIFT Solar Everywhere released a report in 2020 entitled Applying the PAYS® System to On-Site Solar to Expand Access to All.[3] The report is a product of collaboration with partners that bring deep domain expertise to open questions at the frontier of inclusive investment solutions, including Energy Efficiency Institute, Inc., NextResource Advisors, and Nancy Brockway, former New Hampshire Public Utilities Commissioner. The three-part report explores the applicability of PAYS for energy efficiency to on-site solar, the regulatory precedents for PAYS at the state level, and possible financial structures that would enable tax-exempt utilities such as rural cooperatives to adapt PAYS to monetize the federal solar tax credit for their members.

Financial Model for Applying PAYS® to On-Site Solar

In the second phase of work in the LIFT Solar Everywhere project, Clean Energy Works collaborated with NextResource Advisors to deliver a financial model that enables utilities and other interested parties to explore the value of a tariffed on-bill investment program based on the PAYS system when applied to residential solar power installations. After examining the tax laws surrounding the investment tax credit for solar power, Next Resource Advisors created a structure for capitalizing on-site solar installation on terms that assure a path to ownership for the site owner. This path to ownership is an important feature of the PAYS system, a structure that has produced broad eligibility and high participation rates for residential utility customers in gaining building energy efficiency upgrades.

The financial model allows users to change inputs to explore a host of possible scenarios. It produces outputs that show the value streams for both utilities and customers in their local economic conditions. Users of this model can calculate the expected monthly cost recovery payments and any upfront copayment required for scenarios that vary by geography, project size, and cost. The financial model also calculates the value of its benefits, including both the electricity generated and the value of the tax incentives, including the federal solar tax credit and

[3] Available for download at: https://www.cleanenergyworks.org/2020/08/27/doe-lift-pays-for-solar-report/

depreciation. Any interested analyst can access the open source financial model as an Excel file available online with LIFT Solar Everywhere resources.

Findings of Illustrative Scenarios

In the United States, federal tax credit policies fundamentally drive the economics of residential solar installations. One significant finding in the second phase of work is that the federal investment tax credit for solar power is difficult for non-profit utilities to monetize without a direct pay option.[4] Without this reform, only entities that have the ability to utilize federal tax credits (e.g. for-profit utilities and other for-profit solar developers or investors) would be able to realize the value of the tax credit. Non-profit institutions, including rural electric cooperatives, would not likely be able to monetize the tax credit at all, resulting in much higher solar project costs for their customers or member-owners.

For example, without a direct pay option passing into law, an illustrative residential customer of an electric cooperative might face an upfront copayment for on-site solar that could be $3,000 or higher. In places with those conditions, utilities offering a tariffed on-bill investment program for on-site solar installations may wish to consider seeking additional financial support to buy down the copayment of on-site solar upgrades in order to assure they are affordable and accessible for low-income households. One potential source of that support could be government entities leveraging public funds to reduce any upfront copayment needed in order to accelerate deployment of private capital by increasing the portion of households that accept the opportunity. These factors are key drivers for the pace of deployment.

The descriptive white paper for the financial model that follows below includes scenarios illustrating four different market conditions involving both for-profit and nonprofit utilities. The results show that on-site solar would be financially feasible without an upfront cost barrier in some market conditions now, and it also shows that, as the price of solar power continues to decline, more customers in more locations would be able to access on-site solar without facing an upfront cost barrier if they could opt into a tariffed on-bill program for inclusive utility investment consistent with the PAYS system.

Future Work

Even without a direct pay option, tax efficient for-profit utilities can monetize the investment tax credit for on-site solar installations capitalized through an inclusive utility investment program consistent with the PAYS system and its consumer protections. Using the financial model developed here or adaptations of it, stakeholders interested in rapidly expanding access to on-site solar for low- and moderate-income households as well as renters can more closely examine their market contexts with local installation costs and consideration of economies of scale. Next a

[4] The House of Representatives in the 116th Congress (HR 2, Section 90404) passed a provision to offer direct payment of the tax credit for solar power, but the bill was not taken up by the US Senate. The same provision has been re-introduced in the current 117th Congress (HR 848, Section 104).

regulatory commission or oversight board for a specific utility service area would need to approve a tariff consistent with the model PAYS tariff for energy efficiency, including its consumer protections and path to ownership for the site owner. A program operator experienced with the PAYS system could then help arrange the first deployments.

Description of an Open Source Financial Model for On-Site Solar through Inclusive Utility Investment based on the PAYS® System

Ancillary Research supported by the U.S. Department of Energy EERE grant DE-EE0008567/0000, Accelerating Low Income Financing and Transactions ("LIFT") for Solar Access Everywhere

Submitted to Clean Energy Works

January 15, 2021

Prepared by NextResource Advisors

Abstract

This memorandum (the "Financial Model Memo") documents the context, assumptions and conclusions formed as part of NextResource Advisors' development of a financial model to estimate customer and utility economics resulting from the application of Pay As You Save® (PAYS®)[5] to residential solar electricity systems. The memo provides a justification for compatible tax structuring when combining the PAYS system with monetizing tax credits, and it illustrates the impact of efficient tax credit monetization on customer economics. The federal investment tax credit for solar power is included in the financial model as a user input, so users can explore scenarios in which participating utilities are tax-efficient or scenarios in which a direct payment option is available (herein discussed as "Direct Pay").[6] The Financial Model Memo outlines a proposed Solar PAYS transaction and then describes how the model calculates customer savings and utility returns based on user-provided inputs. Finally, it describes the results of the financial model for scenarios in four locations where application of the PAYS system is being considered for on-site solar, and it provides some summary conclusions based on the results for initial assumptions in these four market contexts. Sensitivity analysis for the price of solar shows that, as the price of solar declines, more customers in more locations would be able to access on-site solar via an inclusive utility investment program based on the PAYS system without making a copayment.

This memo does not constitute financial advice. It has been prepared for informational purposes only, and is not intended to provide, and should not be relied on for, tax, legal, or accounting advice.

Acknowledgments

This memo could not have been prepared without the helpful support and input of interviewees, reviewers, and key stakeholders, including Harlan Lachman from the Energy Efficiency Institute, Lisa Bianchi-Fossati from the Southface Institute, Leslie Holloway from Ouachita Electric Cooperative, Nat Eng from Novogradac & Company, Jorge Medina from Pillsbury Winthrop, Kevin McSpadden from McSpadden Law, Corey Ramsden at Solar United Neighbors, and Dr. Holmes Hummel and Jenna Barron from Clean Energy Works.

[5] Pay As You Save® and its acronym, PAYS®, are trademarks awarded by the U.S. Patent and Trademark Office in 2005 and 2007, respectively, to the Energy Efficiency Institute (EEI) for a resource efficiency system defined by specific essential elements and minimum program requirements. EEI uses the trademarks in titles, section headings, and their first use in a report or document.

[6] The House of Representatives in the 116th Congress passed a provision to offer direct payment of the tax credit for solar power installations owned by eligible applicants (HR 2, Section 90404). The Senate did not vote on the bill. In the current 117th Congress, the same provision has been re-introduced (HR 848, Section 104). Both provisions have proposed an elective payment option whereby taxpayers or political subdivisions may claim a direct payment equal to 85% of the value of the tax credit.

Financial Modeler Qualifications

NextResource Advisors provides analysis and support for decision makers around renewable energy, infrastructure, and project finance challenges. Its partners bring significant relevant experience in financial modeling and tax-credit structuring for distributed solar energy systems.

Connie Chern: Ms. Chern has over 15 years of experience with tax-advantaged investments and has structured financing for over $2.5 billion of renewable energy assets. She co-founded NextResource Advisors with Benjamin Cook, providing general advisory and financial strategy services to start-ups and mature companies with renewable energy, infrastructure, and project finance challenges. Ms. Chern is also a Director at Silicon Ranch.

Prior to joining Silicon Ranch, Ms. Chern led investment banking activities in renewable energy assets as a Managing Director at NextPower Capital. Ms. Chern also has in-house experience developing financial products, managing platform operations, and raising capital as a Director in Tesla Energy's (formerly known as SolarCity) Financial Products and Structured Finance groups, where she played a leading role in structuring and raising over $1 billion in tax-equity and debt for distributed solar and battery storage installations.

Before SolarCity, Ms. Chern was with Novogradac & Company LLP, where she co-founded and developed the firm's presence in New York, providing audit, tax, and advisory services for over $1.5 billion in real estate and renewable energy assets. She is licensed as a certified public accountant in CA and holds a B.A. in Legal Studies and a minor in business administration from the University of California, Berkeley. She also holds Series 63 and 79 securities licenses.

Benjamin Cook: Mr. Cook has more than twenty years of experience in renewable energy finance, during which he has built and led renewable energy finance platforms. He co-founded NextResource Advisors with Connie Chern, providing general advisory and financial strategy services to start-ups and mature companies with renewable energy, infrastructure, and project finance challenges. He also co-founded NextPower Capital, where he is a Managing Director leading investment banking activities.

Prior to founding NextPower Capital, Mr. Cook was a Vice President in the Structured Finance & Global Markets groups at SolarCity (now Tesla Energy), where he was instrumental in creating its Structured Financing group which raised capital for over $9 billion of its projects. Earlier in his career, Mr. Cook led the finance group at Recurrent Energy, a leading solar developer, and was a Director of Structured Finance at SunPower.

Mr. Cook also developed infrastructure for Bechtel's project finance and development group, although he began his career co-founding and running SELCO, a distributed solar project developer, financier, and operator focused on emerging markets. Mr. Cook holds an MBA from the Stanford Graduate School of Business and graduated with honors in economics and physics from the University of Virginia. Mr. Cook holds Series 7, 63, and 79 securities licenses (securities-related work performed through Burch & Company, Inc).

Engagement Goals

As part of the LIFT project funded by the U.S. Department of Energy, Clean Energy Works retained NextResource Advisors to develop a financial model to illustrate potential economics for residential solar ("Solar PAYS") for low- and moderate-income ("LMI") Customers and for renters, who have been less able to participate in the potential benefits of on-site solar electricity systems. Throughout the course of this engagement, the principals at NextResource Advisors ("Authors") provided their experience and expertise with structuring tax-equity for residential solar portfolios to the PAYS system.

This assignment is a continuation of work performed by the Authors to consider potential Solar PAYS structures that could efficiently monetize solar tax credits. The purpose of this second phase is to build a financial model that enables utilities and other interested parties to change input assumptions to be consistent with the circumstances in their market in order to estimate the economics of a Solar PAYS program for both the Utility and its Customers.

While the financial model was the primary deliverable in this endeavor, the Authors also produced this Financial Model Memorandum in order to provide context for the financial model and describe results from its use in four Utility examples accompanied by a sensitivity analysis of key variables in the model.

The specific deliverables for this engagement were:

1. Financial Model
   For this study, the Authors built a Microsoft Excel-based financial model (the "Financial Model") for use by potential stakeholders and advisors, described in this Financial Model Memo and in Appendix A.

2. Financial Model Memorandum
   This Financial Model Memorandum provides context for the proposed transaction structure, the financial model construction, and describes how to use the model. It also uses the model to evaluate and compare initial results for four Utility service areas across the country and provides summary conclusions.

3. User Guide
   The section "Understanding the Financial Model" of this Financial Model Memorandum can be considered a user guide to help potential stakeholders input their own assumptions and understand the related results.

4. Transaction Document List
   List of documents, attached as Appendix B.

Importance of Monetizing Tax Credits In Driving Solar Affordability

This Financial Model was developed to help utilities and their stakeholders project the potential economics of a Solar PAYS program. While the model is built with the flexibility to input an investment tax credit (ITC) assumption of 0% to consider a case where the tax credit was not used, the opportunity cost of such a decision would substantially limit attractive Solar PAYS locations. Therefore, the most successful Solar PAYS program would be structured to allow solar tax credits to be utilized.

In the United States, federal tax credit policies fundamentally drive the economics of residential solar installations. Solar installations benefit from a federal Investment Tax Credit,[7] enabling the owner of a solar system to claim a tax credit that in 2020 was worth 26% of the value of the equipment installed.[8] Therefore, before proposing the transaction structure and discussing the financial model, it is useful to first consider the impact that monetizing tax credits has on Customer economics in the first place. Below the Financial Model Memo first outlines why tax credit monetization is important to widespread adoption of Solar PAYS, and it illustrates the related impact through a numerical example.

Unfortunately, those without sufficient tax liabilities against which to apply the tax credit may not be able to enjoy the same benefits as those with such tax liabilities. For example, in order to receive full value of the tax credit, a household that installs a solar rooftop system must be able to pay the full cost of the system at the time it is installed, then wait until filing income taxes for that year to claim up to 26% of the cost of that system as a credit - if the household owes enough in federal taxes to cover that portion of tax credit, often many thousands of dollars.

Many households either do not have the upfront cash or enough tax liability to take advantage of the ITC as a tax credit. Lower-income Customers have historically been shut-out of the opportunity to benefit from the solar tax credit unless they were able to externally monetize it, for example, by signing a long-term Power Purchase Agreement (PPA) with a third-party system owner that can efficiently use the credit. Inclusive utility investments made through a tariffed on-bill program provide an alternative path to monetizing the value of the tax, expanding the eligible population of Customers that can access affordable on-site solar electricity.

Significant structuring was required to allow the goals of the PAYS approach to work effectively with tax laws. Under the Model PAYS Tariff,[9] Utilities pay energy efficiency ("EE") service providers for EE upgrades delivered as an essential Utility service. In return, Customers make initial copayments, if required, as well as monthly on-bill payments for cost recovery under a

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[7] Solar tax credits include Internal Revenue Code ("IRC") Section 46 investment tax credits (more specifically, IRC Section 48 energy credits, also called the investment tax credit ("ITC"), for businesses and IRC Section 25D individual / residential credits.

[8] IRC Section 46 and IRC Section 25D, as a percentage of eligible costs, 26% for 2020 and 22% for 2021; beginning in 2022, the IRC Section 46 investment tax credits and IRC Section 25D individual credits are, as a percentage of eligible costs, 10% and 0%, respectively, unless renewed.

[9] EEI maintains the most recent editions of a Model PAYS Tariff available at no cost here: https://www.eeivt.com/implementing-pays-in-your-state-or-at-your-utility/

PAYS tariff to the utilities. When the Utility costs are recovered, the upgrades belong to the site owner.

The importance of the ITC to Customer savings becomes clear when quantified. Through this engagement, the Authors developed the Financial Model to help provide a more detailed illustration of the expected investments and returns to the Utility and participating Customer over the life of a Customer-sited solar PV system. Users of this model can calculate the expected Customer monthly PAYS payments and upfront copayment required based on the costs of the solar installation. The Financial Model also calculates the value of its benefits, including both the electricity generated and the value of the tax incentives, including the tax credit and depreciation. An example on-site solar electric system capitalized through an inclusive utility investment program consistent with PAYS is provided below.

Example System

To illustrate the importance of the federal investment tax credit, and for use more generally throughout this Financial Model Memo, we consider an example residential rooftop solar installation[10] (the "Example System") in order to consider the upfront copayment required of the customer (if any), the monthly Solar PAYS tariff, and net savings for this system in the three scenarios:

- *Fully efficient use of the ITC:* The participating Utility has the necessary taxable income to be able to fully utilize the ITC with a value of 22%, consistent with current policy for 2021.

- *Direct Pay Option:* The participating Utility can claim a direct payment equal to 85% of the value of the ITC, which is 18.7%.[11]

- *No ITC:* This case assumes the ITC is not utilized, so the input value is 0%.

Table 1: Impact of ITC utilization on Solar PAYS economics

	Full ITC	Direct Pay	No ITC
Install Date	3/31/2021	3/31/2021	3/31/2021
PAYS Term	24	24	24
Upfront Investment	-$18,000.00	-$18,000.00	-$18,000.00
Required Copayment (Base)	$1,849.85	$2,444.01	$5,810.05
Total Investment Tax Credits	$3,960.00	$3,366.00	$0.00
Net Utility Investment	-$12,190.15	-$12,189.99	-$12,189.95
Required Copayment (Inst-Sale)	$3,611.94	$3,611.63	$3,611.56

[10] Residential household in Wichita, KS, modeled using PVWatts software https://pvwatts.nrel.gov/pvwatts.php. Values chosen for illustrative purposes only, and Wichita chosen simply due to mid-level insolation. Assumptions can be changed by model user; more information and references for model assumptions can be found in Figure 12
[11] The 85% factor is sourced from the GREEN Act (HR 848, Section 104) introduced in the 117th Congress. Technically, the Direct Pay benefit may not be realized for several months until the next tax filing deadline (and/or refund period). As a simplifying assumption, the model does not adjust the timing of the tax credit value received.

For the Example System, allowing the Utility to monetize the tax credit through a direct pay option versus not monetizing the tax credit at all could save the Customer approximately $3,000 in copayments, thereby reducing upfront cash needs and increasing the Customer's net savings. In short, not efficiently monetizing the solar tax credits will cause an inclusive utility investment program based on the PAYS system to have a higher Customer co-payment and achieve lower Customer savings. Therefore, the proposed structure outlined in this memo for the financial model focuses on solutions that combine the PAYS system used for energy efficiency with necessary structures to ensure the ITC for solar can be harnessed. This approach reduces Customer copayments and maximizes Customer net savings while helping meet Utility financial performance benchmarks.

Combining PAYS® with a direct pay solar tax credit

Monetizing the federal investment tax credit for solar power through the PAYS structure is not without complication. Under the PAYS structure applied to building efficiency upgrades, ownership of installed equipment is automatically assigned to the building owner once the Utility has recovered its costs for the upgrades, including its cost of capital. However, in the case of solar systems receiving tax credits, this automatic assignment in the terms of the PAYS tariff could jeopardize the Utility's ability to claim the credit by calling into question whether the Utility or the Customer should be deemed to be the owner of the system and, therefore, the appropriate beneficiary of the tax credit. To avoid challenges to the claim of tax credit ownership for utilities, the Utility should offer the solar assets to participating Customers (or site owner, if different) on the basis of a "fair-market-value" purchase option to be exercised only after the end of the five-year tax credit recapture period. Given these intentions and constraints, the Authors have worked with Clean Energy Works to create a structure that is consistent with the aspects of the PAYS system that has produced broad eligibility and high participation rates for building energy efficiency upgrades while also considering the tax laws surrounding the ITC for solar power. The following section outlines our proposed approach.

Proposed Solar PAYS® Structure

Following is a description of the proposed Solar PAYS Structure, outlined chronologically from the starting system quote and installation through the end of system life.

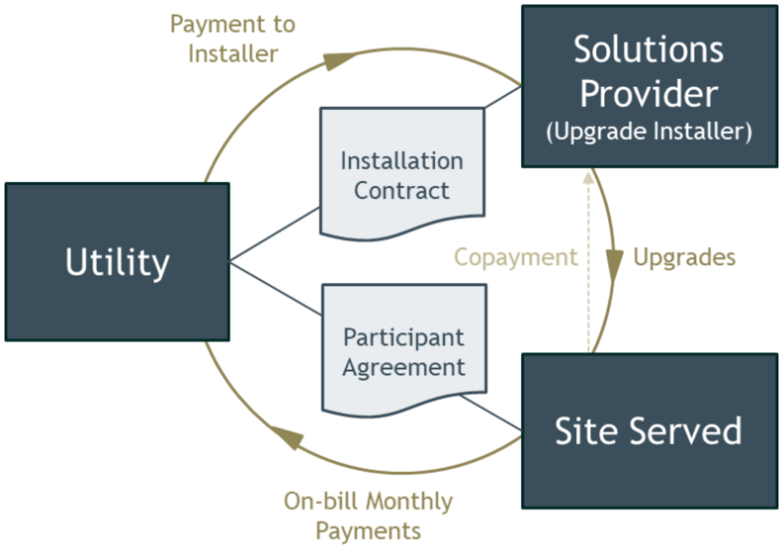


Figure 1: Simplified Structure Chart for Solar PAYS

Initial Transaction Sizing & Installation

A potential Customer would likely first consider an on-site solar system when provided with a quote from an upgrade installer / solar installer ("Solutions Provider"). This Solutions Provider, working with the Utility, could provide a preliminary system design projecting the system electricity output over its useful 30+ year life.[12] Production can be considered a function of four key model input assumptions:

- Estimated year-1 production (kWh/kW)
- Seasonality (% each month)
- Degradation Rate (%/year)
- Useful Life (years)

Additional modeling assumptions:

- Solar generation is net-metered
- Productive life of the solar system is 30 years, and cost recovery via the PAYS structure occurs within 80% of that time horizon

[12] The useful life of a solar system is estimated at between 25 and 40 years, according to the National Renewable Energy Laboratory (NREL). https://www.nrel.gov/analysis/tech-footprint.html

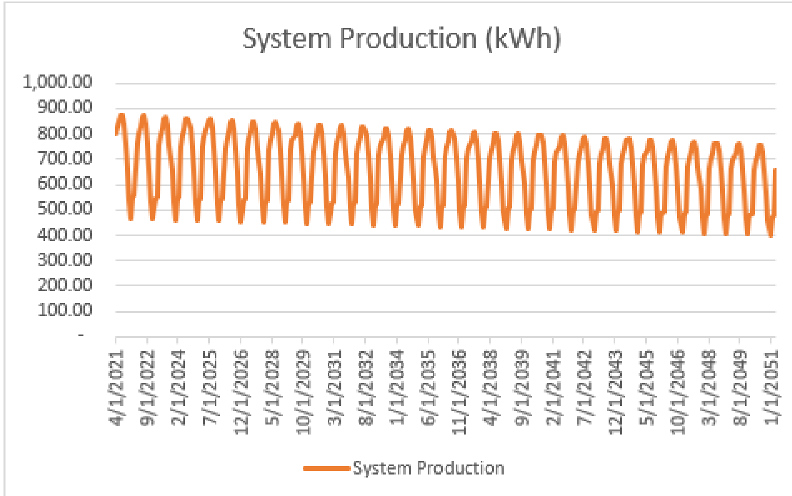


Figure 2. System Production for Example System

In the Example System, the 6 kW solar array produces an estimated 1,292 kWh per kW per year (production rate), and it would generate approximately 7,800 kWh/year during the first year (i.e. 6 kW x 1292 kWh/kW/year = 7800 kWh/year). This production would decline at its degradation rate over 30+ years until the end of its useful life. Figure 3 visually displays the Example System production by month over its useful life.

This system production (kWh/year), multiplied by the customer's avoided Utility rate ($/kWh) for the Customer location of the Solar PAYS program, will determine the avoided retail utility electricity cost, which is the fundamental value of the system to be considered relative to the On-Bill PAYS Payment.

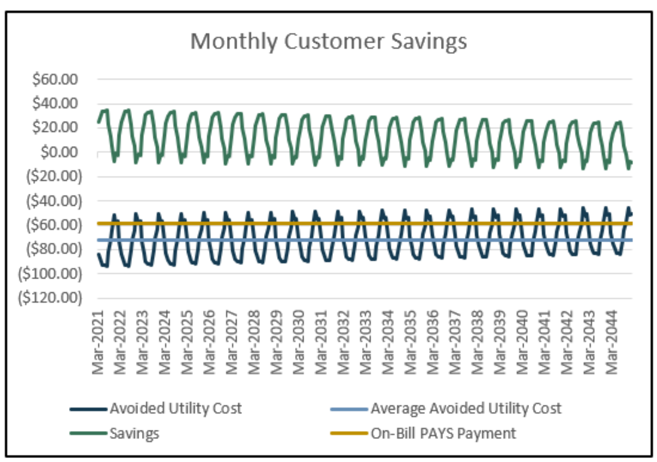


Figure 3: Monthly Customer Savings based on Example System

Using this avoided retail utility electricity cost, the installation cost, and other information, the Solutions Provider (or Utility) could calculate an On-bill PAYS Payment and Copayment that would allow the Utility to meet its required internal rate of return ("Utility Required Project

IRR"),[13] during an investment cost recovery period that spans no more than 80% of the useful life of the solar installation. In order to ensure Solar PAYS Customers would save money on an average monthly basis even in the first year, the maximum monthly cost recovery charge ("Max Tariff")[14] in the proposed Solar PAYS structure is calculated at 87% of the avoided retail utility electricity cost.[15] To the extent this Max Tariff would not deliver the Utility's Required Project IRR, the Customer would be required to provide an upfront copayment[16] in order to participate. The presence of any remaining copayment requirement would diminish the ability for low- and moderate-income households to accept the Solar PAYS offer, so a critical threshold indicator for a viable Solar PAYS solution in this analysis is a PAYS offer with no copayment. Once the on-bill PAYS payment and copayment amounts have been calculated for the on-site solar system, the Utility would be able to offer a Participant Agreement that the Customer could decide to accept or decline. If the Customer accepts, the Utility would then pay for the installation of the solar equipment at the Customer's site.

The Utility or Solutions Provider could also offer energy efficiency upgrades at the same time or another time. Because the estimated useful life for energy efficiency upgrades is shorter than the warranty period for solar panels, these upgrades would be two separate transactions even if they occur at the same time. Sequencing energy efficiency upgrades could diminish the size of the solar system for existing loads until such time as the residence is electrified over the next 24 years with the addition of electric heat pumps to replace gas or a smart charger for an electric vehicle. For that reason, an Energy Efficiency PAYS offer is not a prerequisite for a Solar PAYS offer.

Cost Recovery Period

Once installed and interconnected, the solar installation would be expected to generate electricity through its 30+ year useful life. On a monthly basis, the installed solar system would produce electricity which is assumed to be net-metered with the utility-provided electricity.[17]

Figure 4 on the prior page illustrates the monthly electricity savings for the example Customer. As with other PAYS programs, the goal is that participating Customers save money through Total On-Bill Solar PAYS Charge (shown as gold-colored line), which should be a lower charge than the average customer avoided Utility electricity cost (shown as blue-colored line). The projected Customer monthly savings is shown as a green-colored line. Further description of the

[13] The Utility Required Project IRR may be driven by its opportunity cost of capital, cost recovery requirements for this type of investment, or weighted average cost of capital, among other considerations. Generally Solar PAYS payments are structured around cost recovery to the Utility, which may also be expressed as a Required Project IRR based on the weighted average cost of capital, or the required return for this type of investment (as the overall rate of return allowed under PUC may differ from the project-specific internal rate of return).

[14] The calculation of a maximum tariffed charge for on-site solar consistent with the PAYS system is further discussed in the initial white paper on Solar PAYS, *Applying the PAYS System to On-Site Solar to Expand Access for All*: https://www.cleanenergyworks.org/2020/08/27/doe-lift-pays-for-solar-report/

[15] In the financial model, the customer's avoided Solar PAYS utility cost is calculated based on the value of solar electricity generated at year 24, which is 80% of the conservatively assumed solar installation useful life of 30 years because that would be the final year of the Solar PAYS cost recovery period.

[16] The copayment may be reduced in the event there are upfront incentives from local authorities or the Utility available to the Customer.

[17] Net Metering rules are currently in place in 40 states and Washington DC. http://www.dsireusa.org

chart can be found later in this Financial Model Memo in the description of a Customer Dashboard.

The two key summary metrics describing the value proposition to the Customer are (1) Cumulative net Customer Savings generated over the life of the solar equipment and (2) the portion of any upfront copayment required to be paid by the Customer. For a given solar installed cost, locations attractive for Solar PAYS will be where the required Customer portion of a copayment is zero or low relative to overall Customer savings. This Financial Model Memo distinguishes between the required Solar PAYS copayment and customer portion of such copayment because it is possible that state, utility, or other interested parties may be a source of funding for such required copayment, given policy objectives or other economic motivations.

Conversely, cases where Customer portions of copayments are high relative to overall Customer savings indicate a less attractive Solar PAYS opportunity. Note that this is simply a relative comparison, and that all locations should be considered. As well, timing and market conditions are likely to change: while some solar and utility economic parameters may not currently offer Customer savings opportunities under Solar PAYS today, the installed cost of solar PV is projected to continue to decline, and potential Customer economics would correspondingly improve.

Customer Purchase Option and Installment-Sale

As previously noted, the Utility should offer to sell the solar assets to participating Customers (or site owner, if different) through a fair-market-value ("FMV") purchase option to be exercised only after the end tax credit recapture period. The Solar PAYS Participant Agreement should include a Customer right t or around year 7 to exercise an option to purchase the solar installation.[18] It is important for this model that the Fair Market Value determination for the solar asset be made at point of option exercise, rather than before solar installation is interconnected to the Utility, in order to avoid potential ownership challenges to the tax credit.

The Financial Model considers the Customer exercising its option to purchase the system and entering into a purchase of the system as an installment sale ("Installment Sale" or "Inst-Sale"), at a Fair Market Value that is based on the remaining value to the Utility.[19]

The Installment Sale by the Utility to the Customer is modeled as an Installment Sale period over the remaining Solar PAYS term.[20] The tariffed on-bill monthly sale installment payments ("TOB Solar PAYS Purchase Charges") would be subject to the same PAYS tariff requirement such

[18] Year 7 was selected because it is safely after the end of the 5-year recapture period for the tax credit, and after the accelerated tax depreciation period under the modified accelerated cost recovery system ("MACRS") for 5-yr property, which generally spans 6 tax years. Structuring the purchase option timing to be shortly after the end of these periods is common in solar financing structures.

[19] Please note that the proposed purchase option has been structured around existing laws and market norms for tax-credit financing and should be reviewed by experienced tax counsel. The Fair Market Value assumption in the model is a simplifying assumption for illustrative purposes and not intended to be a true valuation.

[20] For a 24-year Solar PAYS structure, the first payment for the Installment-Sale is assumed for modeling purposes to be made at year 7 and the final installment payment would be at the end of year 24, resulting in 17 years of tariffed on-bill Solar PAYS Purchase Charges.

that, at their maximum, they would be no more than 87% of avoided retail utility electricity costs. In the event that these maximum TOB Solar PAYS Purchase Charges cannot provide the Utility with its required return, a sale copayment ("Installment-Sale Copay") may be required.

Major Maintenance and Decommissioning

The Financial Model considers costs required to be spent on maintenance over the useful life of the system. Solar electric systems are considered to require low levels of maintenance. Systems do not require refueling and the solar modules themselves do not generally require scheduled maintenance during its expected lifespan. There are some components that may require scheduled replacement. Inverters, which convert direct-current (DC) electricity into alternating current (AC) electricity, often require replacement every 10-15 years. The model allows users to budget for up to two inverter replacements before the systems' retirement date. There are no other maintenance costs considered.

The Financial Model also budgets for system decommissioning at its retirement. When decommissioned, the system must be removed, and repairs made to any building envelope penetrations to avoid water damage. The model considers these decommissioning costs, net of any salvage value the remaining equipment may have.

In order to cover these major maintenance and decommissioning costs, a monthly reserve is funded out of the monthly Solar PAYS payment, starting with the first payment. Monthly reserve amounts are sized such that by the time the first inverter replacement is projected, the necessary amount of the inverter replacement cost has been accrued in the reserve account.

- Reserve Account event assuming no Installment Sale: If the Customer does not exercise its option to purchase the system through an Installment-Sale at year 7, the Utility is expected to keep accruing the monthly maintenance reserve amounts and apply that amount to cover the first and second inverter replacements when they are required, as well as system decommissioning at its end of life. *See "Model" worksheet, column AW to trace Base case reserve amount through system life.*
- Reserve Account event of Installment Sale: If the Customer exercises its option to purchase the system through an Installment-Sale, the Utility is expected to keep any already accrued maintenance reserves and apply that amount to its Utility Required Project IRR calculations. In addition, for the Installment-Sale period, the monthly reserve set aside for major maintenance and decommissioning adjusts, as required, to accommodate the fact that the Utility will no longer be the owner, and the Customer must accrue for inverter replacements (but will generally not be required to decommission the system). Note that the Installment-Sale monthly reserve amounts would initially be higher than the pre-Installment Date monthly reserve amounts, given that there is a shorter accrual period to fund the first inverter replacement. By way of simple example, if inverter replacement is expected in year 12 then, starting reserve accrual at year 7 from zero balance requires 12/7x the monthly reserve additions as would have been required had accrual started in year 1. At the end of the Installment Sale period, any unused reserves are assumed to be applied to any final Customer Installment Sale balance. After first inverter replacement, the monthly reserve amounts would be similar to the base-case,

since the second inverter reserve accrual period would be the same in either Base case or Installment-Sale case. *See "Inst-Sale Model" worksheet, column AZ to trace Base case reserve amount through system life*.

Understanding the Financial Model

The primary user type for this model is a utility or energy solutions provider assessing the financial viability of installing customer-based solar on a specific individual home. This section was prepared to assist Excel-savvy users of the Solar PAYS financial modeling tool by providing an orientation to the Financial Model and advice with how to use it efficiently and appropriately. In particular, it:

- provides an overview of model architecture;
- introduces model inputs and indicates how to change them;
- outlines model mechanics and functionality;
- explains model outputs and how to interpret them; and
- provides certain caveats and considerations when using the model.

Model Architecture

This section provides a brief description of the inputs, calculations, and outputs in the Financial Model across the base and installment-sale scenarios for the Utility and Customers.

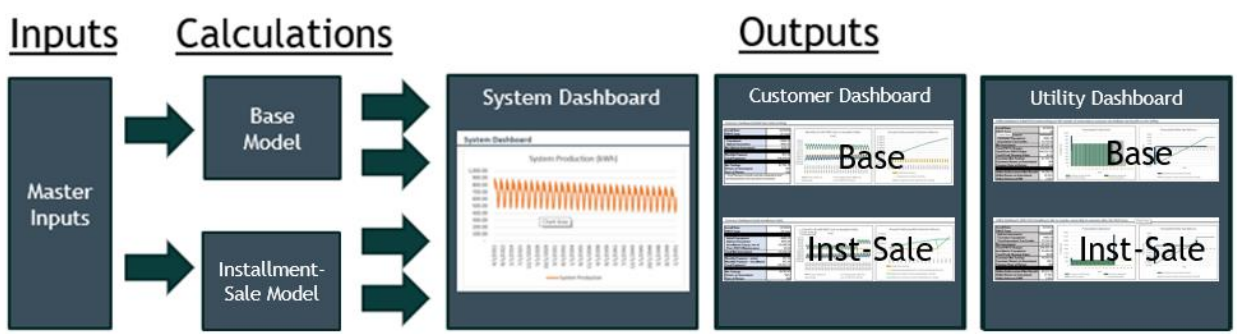


Figure 4: Summary Diagram of Financial Model Architecture

The "Master Inputs" tab allows users to choose the input parameters considered in the calculations. Calculations are performed in two worksheets, *Model* and Installment-sale Model. Outputs are considered on the *System Dashboard*, *Customer Dashboard*, and *Utility Dashboard*.

The Financial Model operates by running macros which calculate, for a given system, the level of TOB Solar PAYS Charge and upfront copayment that are required for the Utility to reach its Utility Required Project IRR during the PAYS cost recovery period based on the specific system economics and incentives, and subject to the Solar PAYS program requirements. The following section outlines some of the considerations that should be noted when utilizing the Financial Model.

Model Considerations

- **The model uses Microsoft Excel**.

Macros required: *The model runs macros to perform its calculations. Users should have macros enabled on their MS Excel spreadsheets before attempting to manipulate the model.*

- Model macros button highlighted in Figure 6, when selected, will enable macro to calculate the Customer copayment[21] such that the Utility generates its Utility Required Project IRR on its investment, as input in Model Input cell D84
- Model macros (refer to button) will calculate the installment-sale copayment such that the Utility generates its Utility Required Project IRR on investment. If the installment-sale copayment will be less than $0, then the macros will calculate the reduced monthly payment (or shorter PAYS term if the user input toggle to shorten the PAYS term is set to "YES" on the "Master Inputs" tab) such that the Utility generates its required IRR on investment, as input in Row 84.

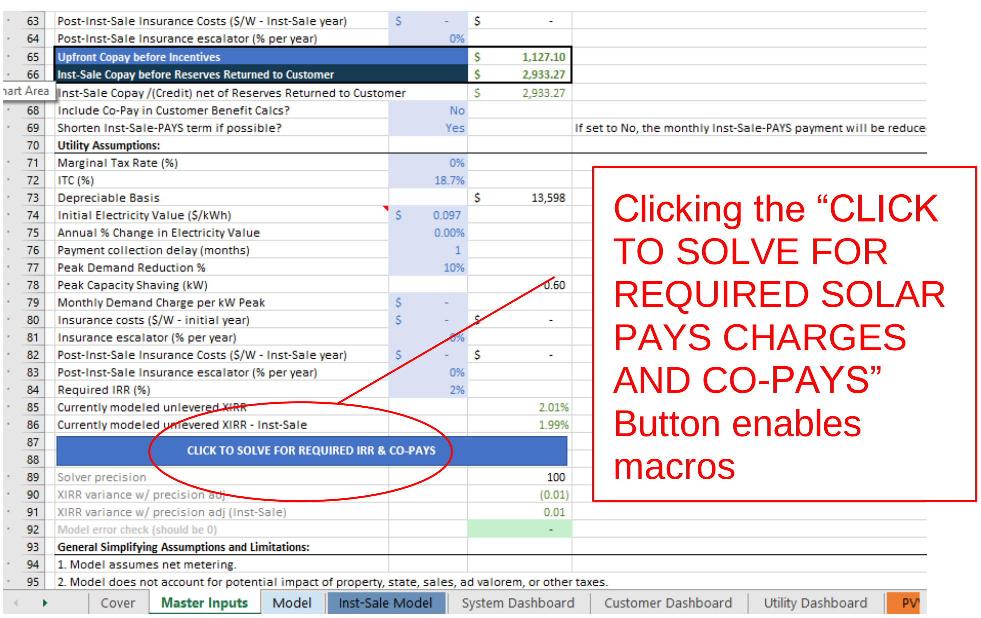


Figure 5: Identifying the Macro Button on Model Inputs tab

General Assumptions

Please keep the following general assumptions in mind when running the Financial Model:

- Model assumes net metering.

[21] Note that the TOB Solar PAYS Charge may be reduced if the required copayment would calculate to be less than $0

- Model does not account for potential impact of property, state, sales, ad valorem, or other taxes, which are highly specific to local geographies and generally not significant drivers of residential solar program economics, so not included in this high-level model. We recommend further investigation into these before program implementation to confirm economics.
- Model assumes there are no short tax years when calculating depreciation.
- Model begins with the first full month of production and goes out 35 years.
- As a simplifying assumption, degradation is applied annually, beginning after year 1.
- The Utility will not elect bonus depreciation or a depreciation method other than the MACRS half-year convention.
- A portion of Customer payments will be set aside for maintenance reserves.
- The Solar PAYS cost recovery term should be limited to 80% of the estimated useful life of the system (or an error flag will pop up).
- The system remains property with the Utility after the Solar PAYS cost recovery term, unless Customer exercises the purchase option at year 7.
- Model assumes 100% of system cost is eligible for tax credits.
- Assumes inverter replacements are expensed by the Utility in the period the maintenance occurs unless an installment-sale occurs, and the maintenance becomes the Customer's responsibility.
- Upfront incentives for solar PV (such as state-level rebates, renewable energy credits, and other incentives for solar) are expected to benefit the Customer rather than Utility and result in lower upfront copayment requirements (if otherwise required).

Installment-Sale Specific Simplifying Assumptions and Limitations

- Installment-sale occurs at the beginning of year 7 and assumes all original assumptions are still valid unless otherwise stated.
- Installment-sale assumes any reserves set aside prior to year 7 are released to the Utility; new reserves required to be funded are for the benefit of the Customer.
- Installment-sale assumes the FMV of the system at year 7 will be paid by monthly on-bill payments and an additional installment-sale copayment (if required) at the end of the PAYS term.[22]
- As a simplifying assumption, the installment-sale assumes the FMV of the system at refinance (total payments required from Customer to purchase system) will deliver the same Utility Required Project IRR to the Utility.
- As a simplifying assumption, the Installment-Sale does not calculate the impact of imputed interest income on the Utility's taxable income, and installments are included in taxable income when billed.

[22] Inst-Sale Copayment required from Customer at end of PAYS Cost Recovery term may be offset by the amount of any unused maintenance reserves to be returned to the Customer.

- This analysis assumes that title transfers to Customer after the final installment is made to Utility.[23]

Model Inputs

On the "Master Input" tab, users should choose input assumptions specific to their geography and situation. Note that the Example System was chosen strictly for illustrative purposes and *should not be considered relevant in market comparables for Solar PAYS programs.*

	C	D	E	F
1	Solar PAYS Master Inputs and Assumptions			
2	Draft for discussion purposes only.			
3				
4	Tax Efficient Structure Model Inputs			
5	**System Cost Assumptions:**	Inputs	Relevant Calcs/In	Notes
6	Size (kW)	6.00		
7	Cost ($/W)	$ 3.00		
8	Cost ($)		$ 18,000	
9	**System Production Assumptions:**			
10	Est Year 1 Production (kWh/kW)	1,419		**Use the PVWatts website to estimate system production**
11	Annual Degradation Rate (%)	0.50%		**https://pvwatts.nrel.gov/pvwatts.php**
12	Seasonality		Initial kWh/yr	
13	January	6.42%	546	
14	February	6.56%	558	
15	March	8.89%	757	
16	April	9.45%	805	
17	May	9.73%	829	
18	June	10.23%	871	see worksheet "PV Watts Input Translator if needed
19	July	10.30%	877	
20	August	9.87%	841	
21	September	8.96%	763	
22	October	7.83%	666	
23	November	6.28%	534	
24	December	5.50%	468	
25	**System Life & Maintenance Assumptions:**			
26	Installation Date	3/31/2021		
27	Useful Life (Yrs)	30		
28	Approx. Retirement Date		3/31/2051	
29	Maintenance Costs (Required Cash Reserves)			
30	1st Inverter Replacement Year	12	3/31/2033	
31	1st Inverter Replacement Cost	$ 1,200.00		
32	1st Inverter Replacement - Monthly Reserve		$ 8.33	Monthly Reserve Funded (yrs 1-12)
33	2nd Inverter Replacement Year	24	3/31/2045	
34	2nd Inverter Replacement Cost	$ 1,200.00		
35	2nd Inverter Replacement - Monthly Reserve		$ 8.33	Monthly Reserve Funded (yrs 13-24)
36	Decomissioning Cost at Retirement	$ 750.00		
37	Decomissioning - Monthly Reserve		$ 10.42	Monthly Reserve Funded (yrs 25-30)
38	Installment-Sale Date		3/31/2027	
39	Post Inst-Sale - 1st Inverter Replacement - Monthly Reserve		$ 16.67	Monthly Reserve Funded (yrs 7-12)
40	Post Inst-Sale - 2nd Inverter Replacement - Monthly Reserve		$ 8.33	Monthly Reserve Funded (yrs 13-24, or until end of PAYS term if shorter)
41	Reserve balance at end of Inst-Sale term		$ (0.00)	
42	**MACRS HY Depreciation Assumptions:**			
43	Year			
44	1	20.00%		
45	2	32.00%		
46	3	19.20%		
47	4	11.52%		
48	5	11.52%		
49	6	5.76%		
50	**Customer Assumptions**			
51	Upfront Incentives ($/W)		$ -	
52	Intital Avoided Rate ($/kWh)	$ 0.107		
53	Annual % Change in Avoided Rate	0.00%		
54	Initial Monthly On-Bill PAYS Pmt (% of avoided cost on generated kWh)		87.00%	
55	Initial Monthly On-Bill PAYS Pmt ($)		$ 58.86	
56	Inst-Sale Monthly On-Bill PAYS Pmt (% of avoided cost on generated k\		87.00%	
57	Inst-Sale Monthly On-Bill PAYS Pmt ($)		$ 58.86	
58	Initial Solar PAYS Term (Yrs)	24.0	3/31/2045	
59	Insurance Costs ($/W - initial year)	0%	$ -	
60	Insurance Escalator (% per year)	0%		
61	Inst-Sale Solar PAYS Term (Yrs, including initial period)		24.0	Could be shorter than original PAYS Term if "Shorten Inst-Sale-PAYS term if possibl
62	Inst-Sale Solar PAYS Final Payment Date		3/31/2045	
63	Post-Inst-Sale Insurance Costs ($/W - Inst-Sale year)	$ -	$ -	
64	Post-Inst-Sale Insurance escalator (% per year)	0%		
65	**Upfront Copay before Incentives**		**$ 1,863.27**	
66	**Inst-Sale Copay before Reserves Returned to Customer**		**$ 3,555.03**	
67	Inst-Sale Copay /(Credit) net of Reserves Returned to Customer		$ 3,555.03	

Cover | Master Inputs | Model | Inst-Sale Model | System Dashboard | Customer Dash

Figure 6: Model Inputs Screenshot reflecting Example System

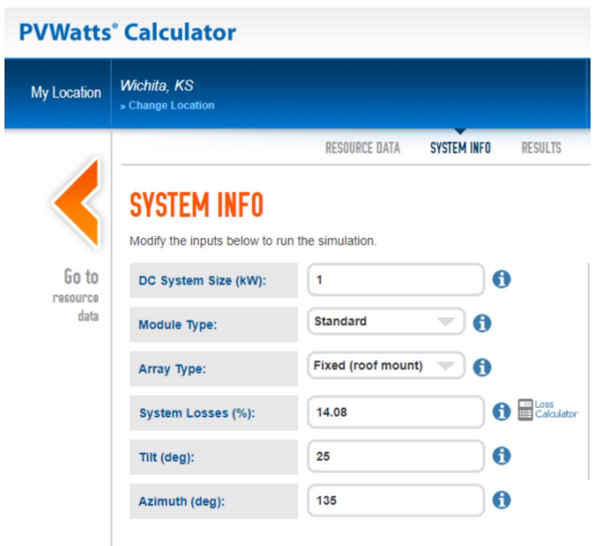
Note: Users should only enter inputs into the blue shaded – blue text cells. Changing non-blue-shaded cells has the potential to break formulas and result in misleading outputs or broken model

[23] Confirmation still required from legal counsel whether legal title to solar asset will stay with Utility until last payment made.

Key assumptions driving the model include:

- **System Production**
  The amount of electricity generated by the system, expressed on a kWh/kW annual figure. Sunnier areas of the country will achieve higher solar production and greater Customer savings from a given solar investment. For a system sized in kWp, the production-related inputs are:
  - "Est Year 1 Production" (kWh/kWp) - row 10
  - "Seasonality" (%) - rows 13-24

  Users can consult the free *PV Watts Calculator* provided by the National Renewable Energy Laboratory to estimate the year 1 system production and monthly breakdowns for a location of interest. The calculator can be found at: https://pvwatts.nrel.gov/pvwatts.php.

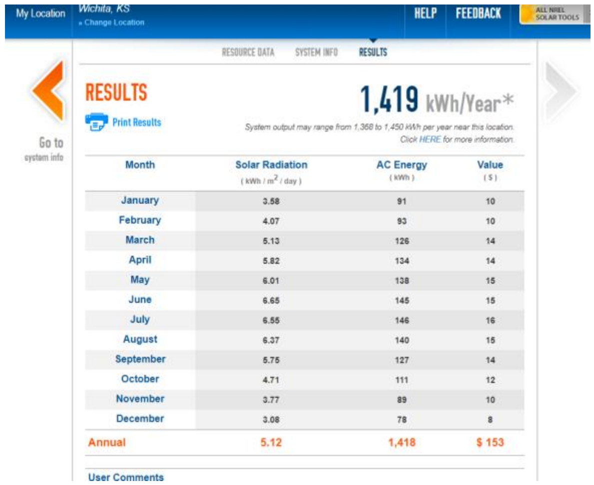


The following standard inputs in the PV Watts web-based Calculator's "SYSTEM INPUT" screen are recommended and shown at left:

- DC System Size - 1kW
- Module Type - Standard
- Array Type - Fixed (roof mount)
- System Losses (%) - 14.08
- Tilt (deg) - 25
- Azimuth (deg) - 135

Figure 7: NREL's PVWatts Calculator Screenshot "System Info"

The next screen will be "RESULTS".



Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Value ($)
January	3.58	91	10
February	4.07	93	10
March	5.13	126	14
April	5.82	134	14
May	6.01	138	15
June	6.65	145	15
July	6.55	146	16
August	6.37	140	15
September	5.75	127	14
October	4.71	111	12
November	3.77	89	10
December	3.08	78	8
Annual	5.12	1,418	$ 153

Figure 8: NREL PVWatts Calculator Screenshot "Results"

See tab "PV Watts Input Translator" in the Financial Model. On the "AC Energy" column on the Results tab will have monthly kWh figures which will sum to the annual total. Users can convert these monthly figures into percentages or see the worksheet "PVWatts Input Translator" for a quick calculator to do so easily.

- **System Cost**
  This is the all-in upfront cost paid by the user, considered on a dollar-per-watt unit basis. Lower installed costs are highly correlated with Customer savings. Current US installed costs vary by market and are declining quickly as the industry grows and equipment costs continue to fall. Current installed residential rooftop system prices are estimated at between \$2.51 to \$3.31/watt.[24] Our Example System considers an installation cost of \$3.00/W, and our scenarios consider costs at \$3.00/W, \$2.50/W, and \$2.00/W.

- **Initial Avoided Rate**
  The value of the electricity generated by the solar equipment, expressed as the per-kilowatt-hour cost of avoided electricity purchases from the Utility during the first year of solar production. Higher avoided rates correlate to greater Customer savings from solar equipment. Avoided power rates are specific to customers and utilities, so they should be confirmed for the Utility service territory and specific tariff under consideration. Assuming the location has retail net metering offered by the Utility, the avoided rate is that retail electricity rate; this can generally be found on a retail electricity bill. To the extent the location does not offer net metering, users should consult their Utility or other credible expert to determine the initial avoided rate which should be used as an input in the model.

[24] Source: Retrieved from Energysage, a residential solar information site, on 11/30/2020: https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/

- **Required Utility IRR**
  This is the level of return required by the Utility for its investment, expressed as an IRR percentage. Lower Utility required IRR% allows for lower monthly payments and lower or fully eliminated upfront copayments.[25]

Additional assumptions include:

- **Solar Equipment Useful Life**
  The number of years the system would be expected to be operational based on technology warranty and field data.[26]

- **Annual Degradation Rate**
  The rate of reduction in solar module performance that should be projected through its life, expressed as an annual percentage rate. Annual degradation at a rate of 0.5% is a standard industry assumption. The National Renewable Energy Laboratory (NREL) provides a summary of research on degradation.[27]

- **Inverter Replacement Costs & Dates**
  Solar power systems include one or more inverters, which convert the direct current (DC) electricity produced by solar modules into alternating current (AC) electricity utilized by the Customer. The expected useful life of the inverter is typically less than the overall solar equipment, so it must be replaced during the useful life of the solar power system. The inverter replacement costs[28] and dates can be input into the model. The model presumes the Solar PAYS program maintains a reserve account funded from monthly PAYS payments, and those reserves are used to pay the inverter replacement costs at their projected replacement dates.

- **Decommissioning Costs**
  Costs associated with removing the solar equipment at the end of its useful life. The model assumes that decommissioning costs are paid by the Utility, unless the Customer (with agreement from the site owner, if different) exercises its buyout option, in which case the Customer site owner would be responsible for these costs since they are presumably the owner at that time.

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[25] A utility's required IRR may be driven by its opportunity cost of capital, cost recovery requirements for this type of investment, or weighted average cost of capital, among other considerations. Generally Solar PAYS payments are structured around cost recovery to the Utility, which may also be expressed as a required IRR based on the weighted after cost of capital, or the required return for this type of investment (as the overall rate of return allowed under PUC may differ from a project-specific IRR).
[26] Refer to footnote 12.
[27] NREL provides links to research papers summarizing lab and field research findings: https://www.nrel.gov/pv/lifetime.html
[28] Replacement inverter costs are estimated at $0.15/W, plus the cost of installation. At 6kW system at $0.15/W = $900 plus tax, shipping, handling and installation. This analysis has conservatively assumed $1200/unit for installation all-in with all necessary margins, but users should reconfirm with local installers based on local supply/demand and shipping/taxes/labor costs.

- **Peak Shaving Value**
  The benefit to the Utility ascribed to the solar equipment based on its ability to reduce Utility demand charges. Peak shaving potential is based on a combination of the Utility's peak demand period each month and the concurrent amount of solar power expected at that time. PVWatts can be helpful in observing the expected solar power production for each hour and then recording those values for the utility's reported peak periods. The value of peak shaving is calculated as the potential reduction in peak demand (measured in kWp capacity) multiplied by its monthly demand charge per kW peak. Because demand charges are assessed with terms that vary by utility, this value may need to be calculated separately in PV Watts where the productivity of the solar system can be predicted hourly over many years, and those values can be referenced for the periods of peak demand (monthly or annually) that determine the monthly bill. For some months, the value may be zero, while it might be 30% in others. In future work, consideration of on-site solar plus on-site storage would make this a significant factor.

- **Insurance**
  As a simplifying assumption, this Financial Model Memo assumes that the Utility would be able to add the solar assets to its existing policies without significant impact. Insurance costs are included as an input assumption with a cost of zero. Users should confirm this assumption and input the appropriate insurance costs for their situation.

- **Investment Tax Credit (%)**
  The ITC percentage input in row 72 of the Master Inputs is a hard-coded input provided by User. If assuming Direct Pay, User should reduce to 85% of the expected ITC level.[29] For example Direct Pay in 2021 should be 22% (the ITC for 2021) multiplied by 85% or 18.7%. The User is required to enter that calculated number in Master Inputs D72.

- **Other**
  Additional model inputs include assumptions such as Utility Marginal Tax Rate, Investment Tax Credit %, and other static variables such as the MACRS depreciation curve which are generally not expected to change across utilities.[30]

Model Calculations

The financial model was built to consider the economics for the Customer and Utility in each of the two scenarios considered:

[29] The 85% factor is sourced from Section 90404 of the The Moving Forward Act (H.R. 2), which passed the House of Representatives in 2020.

[30] The Financial Model was originally built for tax-efficient entities, so MACRS depreciation is presented as a static (and simplifying) assumption. For tax-inefficient users, the input for Utility Marginal Tax Rate may be adjusted (i.e. to 0%). In addition, a tax-exempt utility may not be eligible for MACRS depreciation or investment tax credits without further structuring. At the time of publication, the Authors believe a tax-exempt utility may qualify for Direct Pay as passed in the House in 2020 in the Moving Forward Act (HR 2, Section 90404) and re-introduced in the GREEN Act in 2021 (HR 848, Section 104), but further work may be required to vet a tax-exempt utility scenario.

- "Base" case, *without* an exercised purchase option after the tax period, which means the customer has not exercised the option to pursue the pathway to ownership. In this case, the Utility would continue to own the system through its remaining life.
- "Installment-Sale" scenario, *with* an exercised purchase option that provides a pathway to ownership of the system by the Customer (or site owner, if different) by the end of the PAYS cost recovery period.

For each of these scenarios, the model calculates the level of Customer savings and Utility returns by considering the cash and tax impacts to each party. Following is a description of the cashflows and tax impacts to the Utility and Customer for each scenario a user creates in the model.

Base Case Model Calculations

In the Base case, we consider the value streams assuming the Customer does not choose to exercise its purchase option in Year 7, so the Utility would continue to own the solar equipment from inception until the end of its useful life. This scenario does not maximize value for the Customer, and one of the benefits of calculating this case is to compare it with the results of the case in which the Customer does exercise that option in order to see the value of the pathway to ownership under the assumptions of any given scenario. Evaluating the economics to the Utility and the Customer in this Base Case requires estimation for each of the cost and benefit streams impacting them. Following is an outline of those value streams, with "+" indicating that such items are improvement to economics and where "-" indicates erosion of economics:

- Utility: The Base case in the model considers Utility economics based on:
  - − Investment (system installation cost), as reduced by any upfront copayment received,
  - \+ Investment Tax Credit,
  - \+ MACRS depreciation benefit,
  - \+ monthly PAYS tariff charge,
  - \+ peak shaving value (reduction in demand charges),
  - − operating costs including maintenance and insurance, and
  - \+ the value of electricity generated after the PAYS cost recovery period.
- Customer: The Base case in the model considers Customer economics based on
  - \+ Utility avoided cost,
  - − monthly PAYS tariff charge, and
  - − any upfront copayment required, as may be reduced or offset by the availability of upfront incentives.

In the Financial Model, the worksheet "Model" calculates each of these cost and benefit streams.

Installment-Sale Model Calculations

In the Installment-Sale scenario, we consider the value streams generated after the Customer chooses to exercise its purchase option in Year 7. The Utility offers an Installment Sale of the system to the Customer (or the site owner, if different), and the Customer pays the Utility in installments until the utility's cost recovery is complete. Similarly, to the base case, evaluating the economics to the Utility and the Customer in this installment-sale scenario requires estimation for each of the costs and benefit streams impacting them. Following is an outline of those value streams:

- Utility: The Installment-Sale model considers Utility economics based on:
  - − Investment (system installation cost), as reduced by any upfront copayment received,
  - + Investment Tax Credit,
  - + MACRS depreciation benefit,
  - + monthly PAYS tariff charge (before and during installment-sale period),
  - + peak shaving value (reduction in demand charges,
  - − operating costs including maintenance and insurance, and
  - + Changes in reserve requirements upon entering into the Inst-Sale as well as any installment-sale copayment received.

- Customer: The Installment-Sale case considers Customer economics based on
  - + Utility avoided cost,
  - − monthly PAYS tariff charge (before and during installment-sale period),
  - − any upfront copayment required, as may be reduced or offset by the availability of upfront incentives,
  - − any installment-sale copayment required, as may be reduced or offset by maintenance reserves returned,
  - − maintenance costs not covered by reserves, and
  - + the value of electricity generated after the PAYS period.

In the Financial Model, the worksheet "Inst-Sale Model" calculates each of these cost and benefit streams.

Summary of Calculation Adjustments between Models

The following table highlights the differences between the Base Model and Installment-Sale Model in considering the Utility and Customer economics.

Table 2: Differences between the Base Model and Installment-Sale Model

	Base Case	Differences in Installment-Sale Model
Utility	− Investment (system installation cost) + Tax benefits (ITC and depreciation) + Monthly On-Bill PAYS ("OBP") Tariffed Charge + Peak shaving (Reduction in Demand Charges) − Operating Costs including maintenance and insurance, and + the value of electricity generated after PAYS cost recovery period	+/- Diff w/ Monthly OBP in Inst-Sale period + Inst-Sale copayment (if required) +/- Operations Expenses & Reserves − Value of electricity generated after PAYS cost recovery period
Customer	+ Utility avoided cost − monthly OBP tariffed charge, and − upfront copayment (if required)	+/- Difference with OBP in Inst-Sale period − Inst-Sale copayment (if required) +/- Operations Expenses & Reserves + Value of Electricity Generated After PAYS

Model Output Dashboards

In order to efficiently evaluate the results of the model scenarios, the model includes dashboards which highlight the key output information.

System Dashboard

The system dashboard visually outlines the overall system production from the solar equipment during its useful life. The System Production chart was shown as Figure 3 earlier in this memo. System performance can be considered a function of five key model input assumptions:

- System size (kW)
- Est. year-1 production (kWh/kW) via PVWatts data on solar insolation
- Seasonality (% each month)
- Degradation Rate (%/year)
- Useful Life (years)

System production (kWh/year) multiplied by the avoided retail utility cost ($/kWh) for the location of the Solar PAYS program is the fundamental value of the system, to be considered relative to the On-Bill PAYS Payment. The model performs these calculations and provides outputs on the Customer Dashboard described below.

Customer Dashboard

The Customer Dashboard summarizes model information related to Customer economics, both in the case of the initial PAYS investment, and considering an installment-sale at year 7. Key Information presented in the dashboard for each case includes:

- Installation Date
- PAYS cost recovery term (in years)
- Upfront Copayment, if required[31]
- Monthly PAYS Tariffed Charge
- Customer Net Savings

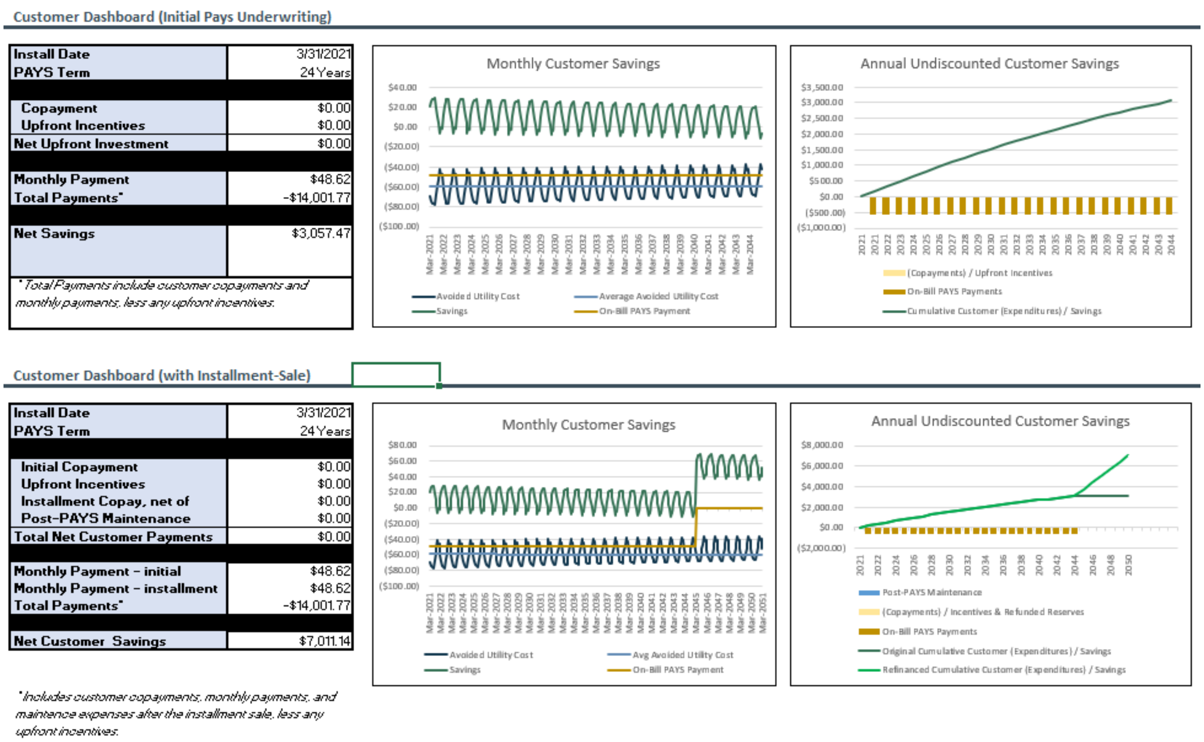


Figure 9: Customer Dashboard Screenshot

Description of Graphs:

- Graph of "Monthly Customer Savings" depicting TOB Solar PAYS Charge vs Customer Avoided Retail Utility Costs

[31] Upfront copayments may be reduced by available Utility or local incentives (e.g. rebates). A user of the Financial Model may also view Customer economics on the Customer Dashboard with or without copayments by toggling the "Yes" or "No" input for "Include Co-Pay in Customer Benefit Cals?" (see "Master Inputs" row 68)

  - *Customer Avoided Utility Cost* (dark blue line): This line displays the monthly amount of money that would have been required to purchase utility electricity which is avoided due to power coming from the Solar PAYS system.
  - *Average Customer Avoided Utility Cost* (straight light blue line): This is the annualized average of the dark blue line and shows the expected average solar electricity value for the Solar PAYS participant.
  - *On-Bill PAYS Payment* (straight gold line): This is the monthly TOB Solar PAYS Charge. Comparing this gold line with the light blue line allows an easy view of monthly Customer savings.
  - *Net Savings* (green line): This is the monthly net savings, given the monthly customer avoided retail utility cost and Solar PAYS payment. Note that seasonal differences in production but fixed Solar PAYS monthly payments will lead to higher savings in summer months than winter months.

- Graph of "Annual Undiscounted Customer Returns"
  - *On-bill PAYS payments* (gold bars): This is the annual sum of Solar PAYS monthly payments in a given year.
  - *Copayments* (yellow bars): This represents the upfront copayment from the Customer (if required by the conditions of the scenario, less any upfront incentive available), and in the installment-sale scenario, any additional installment-sale copayment (less any reserves returned) and maintenance expenditures not covered by reserves.
  - *Cumulative Customer Expenditures (Savings):* This is the cumulative Customer savings over the life of the Solar PAYS system. Initially this may be negative if there is a copayment made but will improve over time. Failure to achieve positive undiscounted Customer return over time is a strong indication the potential Solar PAYS program stakeholders should strongly reconsider their expectation of program success without additional incentives, or changes to assumptions.

- Annual Cash Flow Proformas
  - Also available on the dashboard worksheets are annual cashflow proformas
  - Unhide row grouping #3 to reveal rows 25-71 (for Base) and 93-142 (for Inst-Sale)

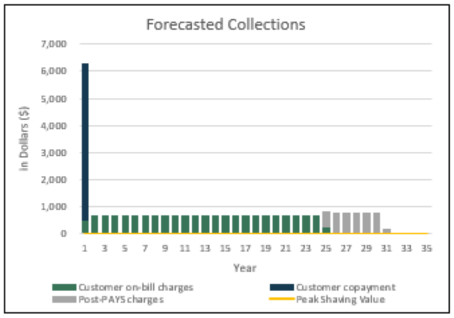
Utility Dashboard

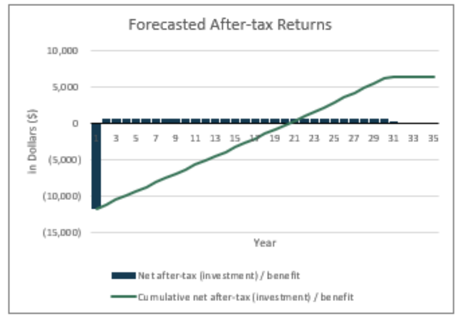
The Utility Dashboard summarizes information related to Utility economics. Following is a reduced-size screenshot of Utility Dashboards as a visual representation of the dashboards for Base Model and Installment-Sale Model. Key Information presented in the dashboard includes:

- Initial Investment
- Forecasted Cashflow over PAYS cost recovery term
- Forecasted After-tax Returns

Utility Dashboard: Initial PAYS Underwriting w/ NO transfer of ownership to customer (to facilitate tax benefits to the Utility)

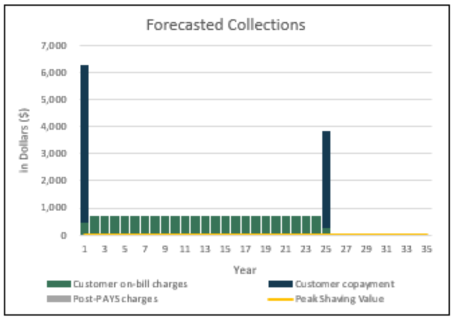
Install Date	3/31/2021
PAYS Term	24
Upfront Investment	-$18,000.00
Customer Copayment	$5,809.81
Investment Tax Credits	$0.00
Net Investment	-$12,190.19
Total PAYS Charges	$16,950.35
Total Post-PAYS Value	$4,786.259
Total Peak Shaving Value	$0.00
Customer Net Savings	-$2,108.48
Customer Return on Invest	-36%
Cutomer Rate of Return	-3.88%
Utility Undiscounted Net B	$6,396.42
Utility Return on Investmer	35.54%
Utility Unlevered IRR	3.00%





Utility Dashboard: With PAYS Installment Sale to transfer ownership to customer after the PAYS term

Install Date	3/31/2021
PAYS Term	24
Upfront Investment	-$18,000.00
Customer Copayment	$5,809.81
Total Investment Tax Cre	$0.00
Net Investment	-$12,190.19
Total PAYS Charges	$16,950.35
Installment Copayment	$3,612.04
Total Peak Shaving Value	$0.00
Customer Net Savings	-$934.26
Customer Return on Invest	-10%
Cutomer Rate of Return	-1.01%
Utility Undiscounted Net B	$5,972.20
Utility Return on Investmer	33.18%
Utility Unlevered IRR	3.00%



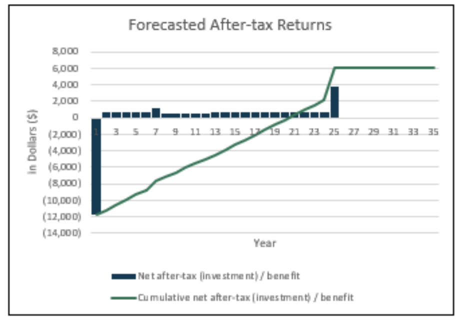


Figure 10: Utility Dashboard

- Graph of "Forecasted Collections" (Annual over life of system)
  - This chart shows the Utility's collections from customers over time as well as value associated with Peak Shaving.
  - Dark blue bars represent customer copayments paid, if applicable
  - Green bars represent the Customer on-bill charges
  - Yellow line represents peak shaving value
  - Gray bars represent the value to the Utility after the end of the PAYS cost recovery period. As the continued owner of the solar electric system after the PAYS cost recovery period, the Utility receives value in the form of the monthly electricity production from the system.
  - Note that with a PAYS Installment Sale, the monthly payments may increase at/after year 7 to reflect the higher monthly maintenance reserve payments, as long as they still can stay below the Max Tariff level.

- Graph of "Forecasted After-Tax Returns" (Annual over life of system)
  - The chart shows the Utility's annual investment and returns as blue bars
  - The green line represents cumulative net after-tax position on the investment.

- Annual Cash Flow Proformas
  - Also available on the dashboard worksheets are annual cashflow proformas
  - Unhide row grouping #3 to reveal rows 25-71 (for Base) and 93-142 (for Inst-Sale)

Solar PAYS® Utility Scenarios

Once the model was completed, the Authors utilized it to consider four Solar PAYS scenarios across the country. Based on assumptions for each of these locations provided by Clean Energy Works, we ran the model to assess the economics of Solar PAYS based on market conditions in Camden (AR), Ahoskie (NC), Denver (CO), and Stockton (CA).

Figure 11: Map of Scenario Locations

These locations were chosen to consider a variety of solar production, avoided retail utility electricity cost environments, and utility types and related return thresholds. For each location, the scenarios include a sensitivity analysis for the price of solar as well. Following is a description of System Cost and Production Assumptions[32]input assumptions considered for each:

PV Watts Assumptions	Example	Camden	Ahoskie	Stockton	Denver
Module Type:	Standard				
Array Type:	Fixed (Roof Mount)				
System Losses (%):	14.08				
Tilt (deg):	25				
Azimuth (deg):	135				

PV Watts Outputs	Example	Camden	Ahoskie	Denver	Stockton
Year 1 Production	1,419	1,293	1,350	1,535	1,503
Seasonality					
January	6.42%	6.37%	6.59%	6.19%	4.46%
February	6.56%	6.22%	6.74%	6.78%	5.46%
March	8.89%	8.06%	8.67%	9.00%	8.12%
April	9.45%	9.21%	9.70%	9.39%	9.78%
May	9.73%	9.90%	10.74%	9.91%	11.04%
June	10.23%	10.21%	10.00%	10.37%	11.31%
July	10.30%	10.21%	10.07%	10.50%	11.71%
August	9.87%	10.28%	9.19%	9.71%	10.91%
September	8.96%	8.98%	8.44%	8.60%	9.45%
October	7.83%	7.90%	7.78%	7.43%	8.12%
November	6.28%	7.06%	6.59%	6.45%	5.66%
December	5.50%	5.60%	5.48%	5.67%	3.99%

Global Assumptions		
System Size	6.00	kW
Cost Scenario-- High	3.00	$/W
Cost Scenario-- Med	2.50	$/W
Cost Scenario-- Low	2.00	$/W
Annual Degradation Rate	0.50%	%
Useful Life	30	years

Local Assumptions	Example	Camden	Ahoskie	Denver	Stockton
Required IRR-- Low	3%	2%	1%	3%	3%
Required IRR-- High				8%	8%
Avoided Utility Rate	0.107	0.097	0.104	0.111	0.156

Figure 12: Tables of Scenario Assumptions

[32] PV Watts outputs and avoided utility rates based on location inputs and PV Watts assumptions provided in table.

Scenario Results

Following are descriptions of the results of the four illustrative cases and the related scenarios generated for each by varying key input assumptions.

Camden, AR: Copayment would be needed, or full value of solar

Ouachita Electric Cooperative Corporation (OECC) currently offers the HELP PAYS program through a tariff approved by the state utility commission, and it is open to both residential and commercial customers seeking cost effective building energy efficiency upgrades. The utility's tariff allows the same terms to be applied to on-site solar power systems, and in response to consumer demand, OECC has applied HELP PAYS to on-site solar in several locations. The terms of that program are different from the Solar PAYS program modeled here.

Table 3: Camden Scenario Table

	Camden $3, 2%	Camden $2.5, 2%	Camden $2, 2%
Install Date	3/31/2021	3/31/2021	3/31/2021
PAYS Term	24.00	24.00	24.00
Upfront Investment	-$18,000.00	-$15,000.00	-$12,000.00
Required Copayment (Base)	$3,551.99	$1,127.10	$0.00
Total Investment Tax Credits	$3,366.00	$2,805.00	$2,244.00
Net Utility Investment	-$11,082.01	-$11,067.90	-$9,756.00
Required Copayment (Inst-Sale)	$2,955.32	$2,933.27	$1,465.55

Figure 13 shows the Customer savings and upfront Co-payment required in the Financial Model for the Base case and Installment-Sale case. These results are shown for each of the cost levels considered, and customer net savings increased as costs declined. At a cost level of $3/W, there is a copayment required but not a separate copayment during the recovery of the Fair Market Value after Year 24. Copayment requirements for the Installment-Sale scenario were reduced in the $2.50/W and $2.00/W cases, but not eliminated.

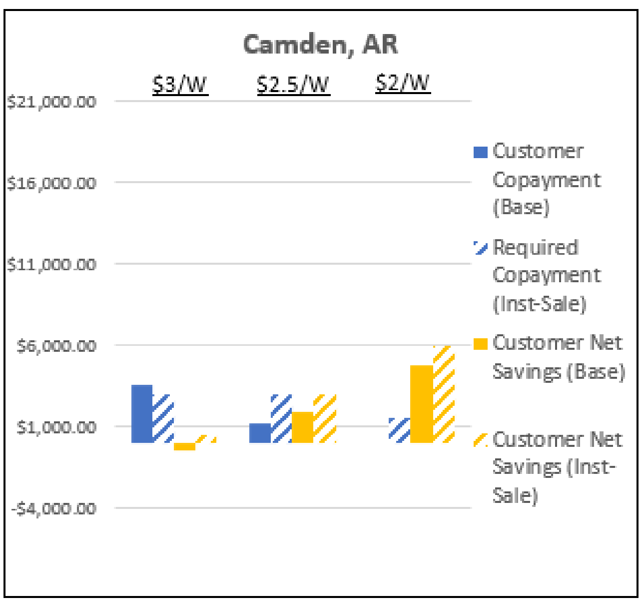


Figure 13: Camden Scenario Savings Chart

The utility offers net metering consistent with state policy, though no other benefit of on-site solar is considered in the value proposition. The full value of solar may be needed to justify bringing the customer copayment to zero.

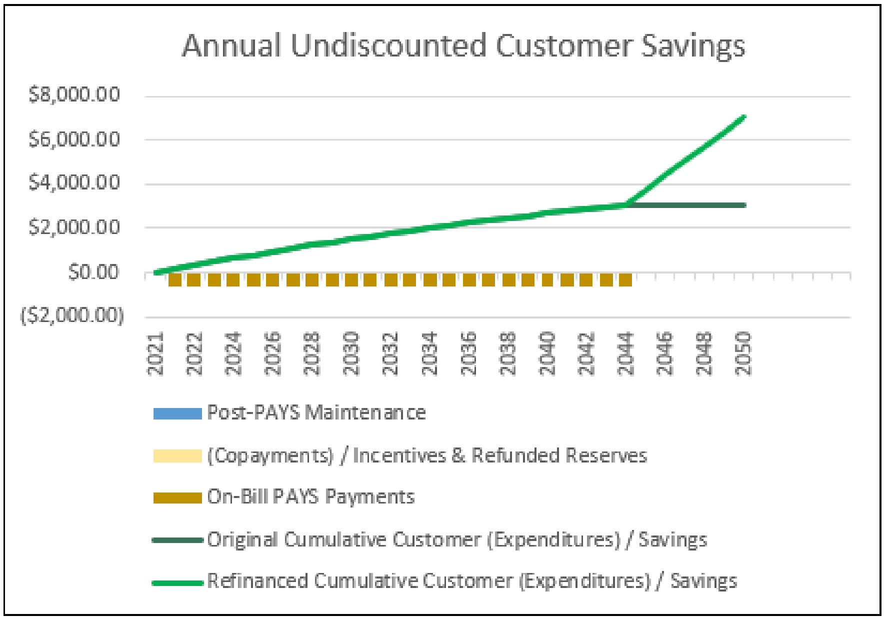


Figure 14: Camden Scenario Undiscounted Customer Savings Chart

Ahoskie, NC: PAYS applied to on-site solar is financially viable in each case.

Roanoke Electric Cooperative offers a program called Upgrade to $ave based on the PAYS system. The upgrades are currently limited to energy efficiency and demand response. This scenario considers an expansion of their program offerings to include on-site solar.

Table 4: Ahoskie Scenario Table

	Ahoskie $3, 1%	Ahoskie $2.5, 1%	Ahoskie $2, 1%
Install Date	3/31/2021	3/31/2021	3/31/2021
PAYS Term	24.00	24.00	22.14
Upfront Investment	-$18,000.00	-$15,000.00	-$12,000.00
Required Copayment (Base)	$25.51	$0.00	$0.00
Total Investment Tax Credits	$3,366.00	$2,805.00	$2,244.00
Net Utility Investment	-$14,608.49	-$12,195.00	-$9,756.00
Required Copayment (Inst-Sale)	$3,559.51	$1,328.14	$0.00

Figure 15 shows the Customer savings and upfront co-payment required in both the Base case and Installment-sale case. Relative to Camden, residents in Ahoskie have approximately 25% avoided higher cost of electricity. Roanoke Electric has a lower cost of capital, and therefore, the Utility required IRR% is lower. As a result, even at a cost level of $3/W, there was no copayment required in any case. As expected, Customer net savings increased as costs declined.

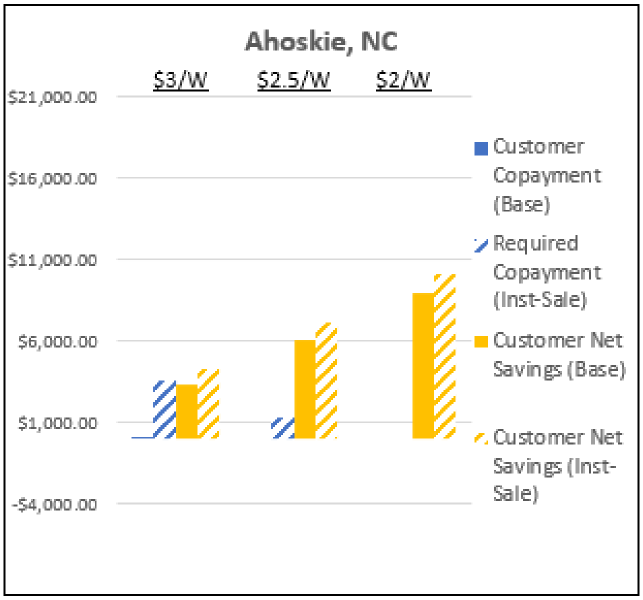


Figure 15: Ahoskie Scenario Savings Chart

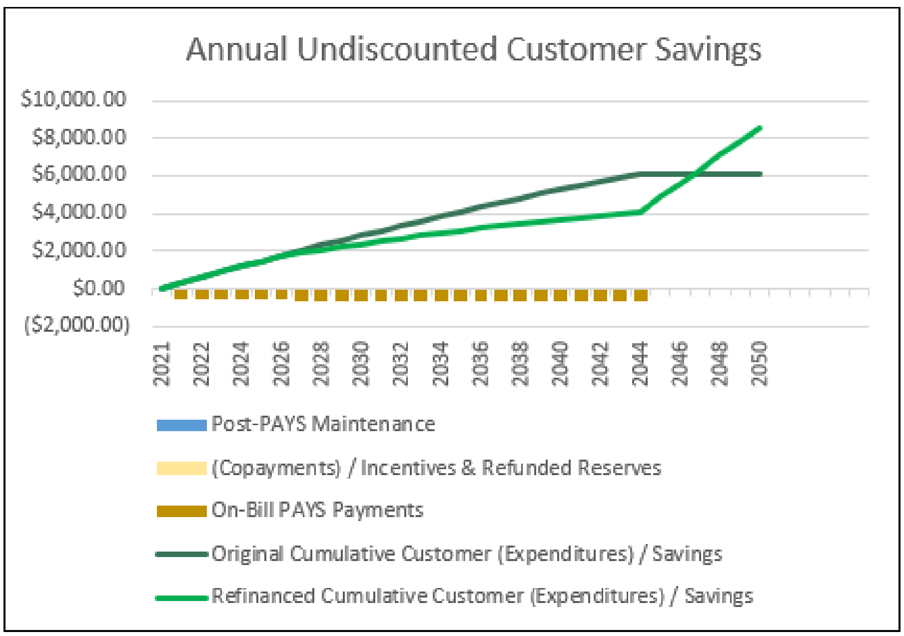


Figure 16: Ahoskie Scenario Undiscounted Customer Savings Chart

Denver, CO: Sharing the regulated return for a for-profit utility can lead to faster deployment

Next we considered Denver, where the local Utility, Xcel, is an investor-owned utility (IOU) instead of a cooperative. The difference results in potentially higher utility required IRR. We ran the scenario twice to explore two program implementation designs regarding the allocation of cost for the utility's state regulated revenue requirement. In the first case, the utility required IRR% is assumed to be 8%, and the required copayments are significantly higher. In the second, the customers participating in the Solar PAYS program would cover the first 3% of the utility's revenue requirement, and the rest would be charged to all other ratepayers who are benefiting from the individual's choice to add renewable energy to the grid. As expected, these scenarios produce significantly different levels of Customer savings and required copayments. Figure 17 below shows the Customer savings and upfront co-payment required in both the base case and Installment-sale case.

Table 5: Denver Scenario Table

	Denver $3, 8%	Denver $2.5, 8%	Denver $2, 8%	Denver $3, 3%	Denver $2.5, 3%	Denver $2, 3%
Install Date	3/31/2021	3/31/2021	3/31/2021	3/31/2021	3/31/2021	3/31/2021
PAYS Term	24.00	24.00	24.00	24.00	24.00	21.46
Upfront Investment	-$18,000.00	-$15,000.00	-$12,000.00	-$18,000.00	-$15,000.00	-$12,000.00
Required Copayment (Base)	$6,553.51	$4,118.73	$1,683.90	$711.49	$0.00	$0.00
Total Investment Tax Credits	$3,366.00	$2,805.00	$2,244.00	$3,366.00	$2,805.00	$2,244.00
Net Utility Investment	-$8,080.49	-$8,076.27	-$8,072.10	-$13,922.51	-$12,195.00	-$9,756.00
Required Copayment (Inst-Sale)	$3,236.94	$3,210.32	$3,183.98	$4,128.73	$1,737.89	$0.00

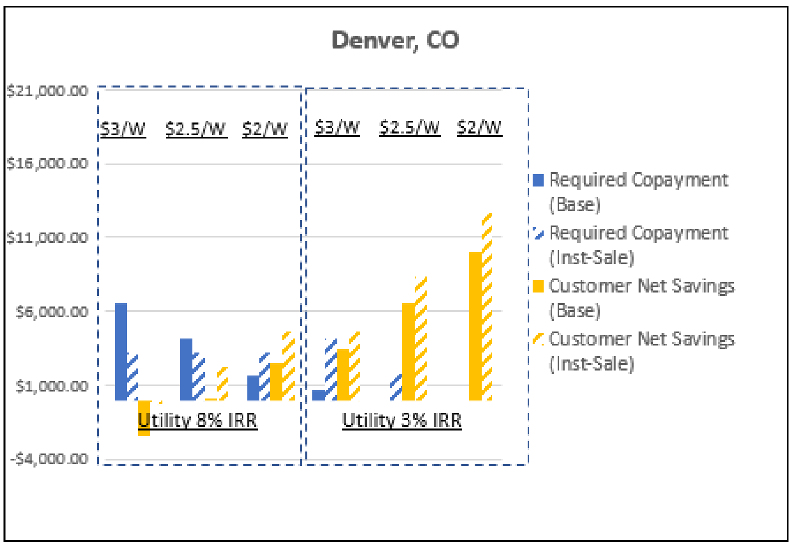


Figure 17: Denver Scenario Savings Chart

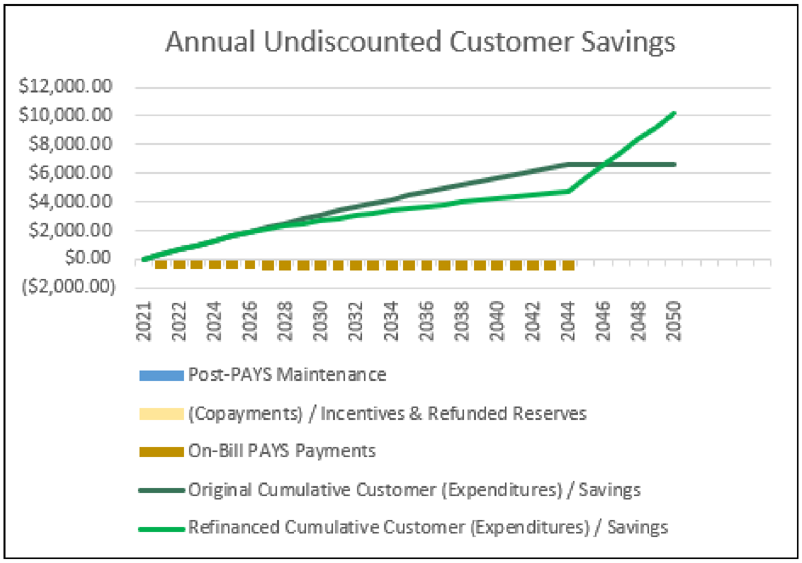


Figure 21: Denver Scenario Undiscounted Customer Savings Chart

Stockton, CA: Lowest level of Customer copayment of the scenarios considered

Finally, we look at Stockton, where the local Utility, PG&E, is also a for-profit, investor-owned utility, similarly resulting in higher expected utility required IRR. With regard to regulated return, the pair of scenarios explored for Stockton is the same as in the Denver scenarios, in which the Customer responsibility for the returns required by the Utility is either 8% or 3% (with the other 5% coming from other ratepayers benefiting from the clean energy), resulting in significantly different levels of Customer savings and required copayments.

Table 6: Stockton Scenario Table

	Stockton $3, 8%	Stockton $2.5, 8%	Stockton $2, 8%	Stockton $3, 3%	Stockton $2.5, 3%	Stockton $2, 3%
Install Date	3/31/2021	3/31/2021	3/31/2021	3/31/2021	3/31/2021	3/31/2021
PAYS Term	24.00	24.00	22.18	22.47	19.09	16.11
Upfront Investment	-$18,000.00	-$15,000.00	-$12,000.00	-$18,000.00	-$15,000.00	-$12,000.00
Required Copayment (Base)	$3,072.63	$641.02	$0.00	$0.00	$0.00	$0.00
Total Investment Tax Credits	$3,366.00	$2,805.00	$2,244.00	$3,366.00	$2,805.00	$2,244.00
Net Utility Investment	-$11,561.37	-$11,553.98	-$9,756.00	-$14,634.00	-$12,195.00	-$9,756.00
Required Copayment (Inst-Sale)	$4,845.81	$4,798.91	$0.00	$0.00	$0.00	$0.00

Figure 22 below shows these scenario conditions produce the lowest level of Customer copayment of the 4 utilities considered, and the highest net savings in both the Base case and Installment-sale case

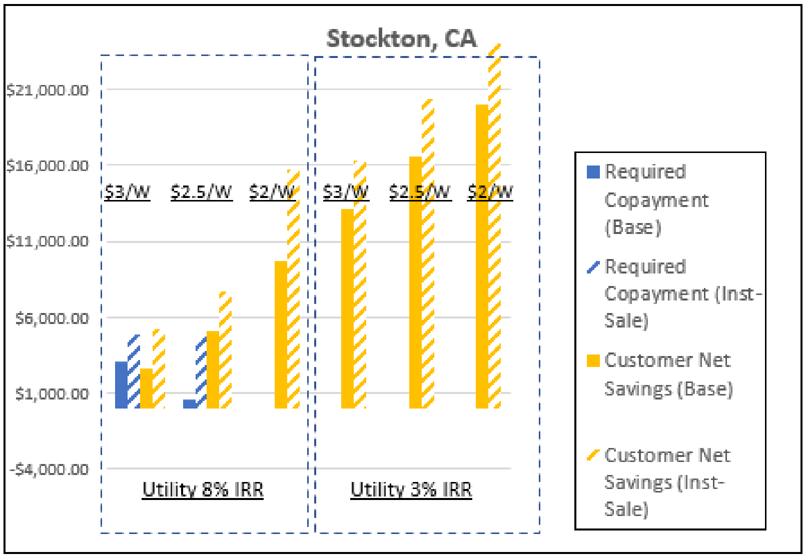


Figure 22: Stockton Scenario Savings

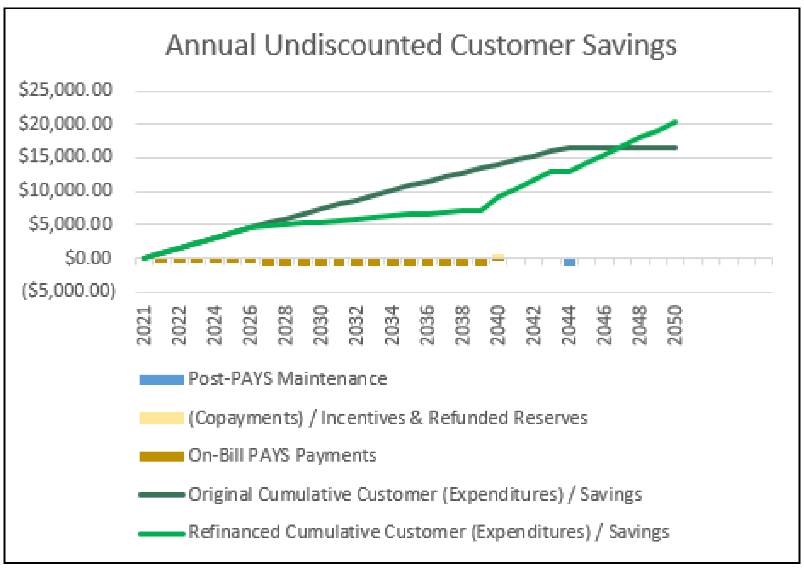


Figure 23: Stockton Scenario Undiscounted Customer Savings Chart

Scenario Conclusions

These examples highlight four things which are important to keep in mind when considering Solar PAYS:

- *Utilities' required rate of return* for Solar PAYS programs has a large impact on the potential for Solar PAYS programs to save Customers' money. In the Stockton $2/W system cost scenario, the difference between 8% and 3% required return corresponds to the following Customer economics: no upfront copayment required but customer net savings of $15,771.71 with 8% IRR and $24,084.19 with 3% IRR, a difference of more than $8,000.

- *Installed solar electricity system cost* had a large impact on potential Customer savings. As shown by each of the examples, the difference between $3/Watt vs $2/Watt is quite significant. In Denver, a $3/W installation at 3% Utility IRR requires Customer copay of $4,128.73 for net savings of $4,684.45 (yielding Customer a 37.35% return), but if costs can decline to $2/W, there is no required copay, and $12,630.77 net savings. Costs are declining rapidly across the solar industry as economies of scale improve and the industry becomes more mature and efficient, so it is not a question of if but how quickly costs will fall to the point that Solar PAYS programs economics could offer potential Customer savings regardless of location.

- *Avoided Retail Utility Electricity Costs and Net Metering.* Higher avoided retail Utility electricity costs favor on-site solar systems overall. It is well understood that the parts of the country that have net metering and the most expensive electricity, including Hawaii, California, and the northeast, all have a vibrant solar sector. When the value of exported electricity to the grid is highest, relative to its installed cost, the location has a significant opportunity to save Customers' money, inside or outside of a Solar PAYS program. The Stockton example is particularly illustrative of this conclusion, evidencing the largest Customer savings opportunity of the four sites by a large margin. The $0.156/kWh avoided utility cost calculation was almost 50% higher than the other sites.

- *Solar power production potential.* The level of power production depends on location and siting, and these are important factors to consider at a site-specific level in a Solar PAYS investment program. Assuming orientation of the panels due South with a no-axess tilt that maximizes productivity over the course of the year, the Example Customer, reduced from 1,419 to 1,080 kWh/kW/year (i.e., going from Wichita, KS to Portland OR- level), would see an increase copay requirement to $5,837 and lower net savings to $-1,938 while increasing it to 1,690 kWh/kW/year (i.e. Palm Springs, CA- level) would remove any copay requirement and increase savings to $6,158.

Additional Areas of Focus

While the research team was able to create the desired PAYS with solar model using the stated assumptions, there were many additional aspects of the Solar PAYS framework and financial modeling that were not considered given limited time and scope. We were tasked specifically with building out the financial model, and the tool is now available to assist potential stakeholders in considering Solar PAYS programs. That said, we could not consider many of the resulting topics and questions brought up in the course of building this model, but which the Authors believe could be useful to revisit in the future. These include:

- Model refinements, edge cases, and additional functionality: This Financial Model is a working prototype model produced in a short timeframe and designed to be used to provide indicative feedback on potential Solar PAYS markets. As this model is used, the Authors hope that such use will help identify opportunities for improvement and further refinements. For example, as the model is used, it will encounter datasets which will cause the model to calculate results which are incorrect or otherwise "break" the model, and code will need to be adjusted as those cases are identified.

- Incorporation of **API** to **PVWatts** Solar Production calculator. This paper recommends users utilize NREL's **PVWatts** software to estimate likely system production, unless they have credible on-the-ground site-specific estimates. This Financial Model does not automatically connect to PVWatts, which could be readily done through API programming.

- Value of Utility Peak Demand Reductions. We understand that solar generation provides many benefits to the electric utility, one of which is reducing the need to purchase additional power on the wholesale market during periods of peak demand. The model provides Users ability to input "Peak Demand Reduction" in Row 77 and "Monthly Demand Charge" per kW Peak in row 79 of the Master Inputs. Model calculations use these (along with system size) to calculate Utility benefit. Further work will be needed to quantify the impact distributed solar PV in general and Solar PAYS programs in particular could have on Utility peak demand reduction and therefore how benefits of such peak demand should be considered.

- Third-party tax-equity (i.e. Sale Leaseback providers working with non-tax-efficient Utilities). This model focused on the Direct Pay of the tax credit, but it would be worth further exploring use of third-party tax-equity structures such as sale-leaseback models.

- Location-specific tax identification: There are a number of location-specific costs, such as property, state, sales, ad valorem, or other taxes, which could not be added to this Financial Model given the short timing and limited scope. It may be possible to integrate other sources of this data if readily available.

- Residential Battery Storage. There is potential to expand the scope of this model to consider residential battery storage in a Solar PACE framework.

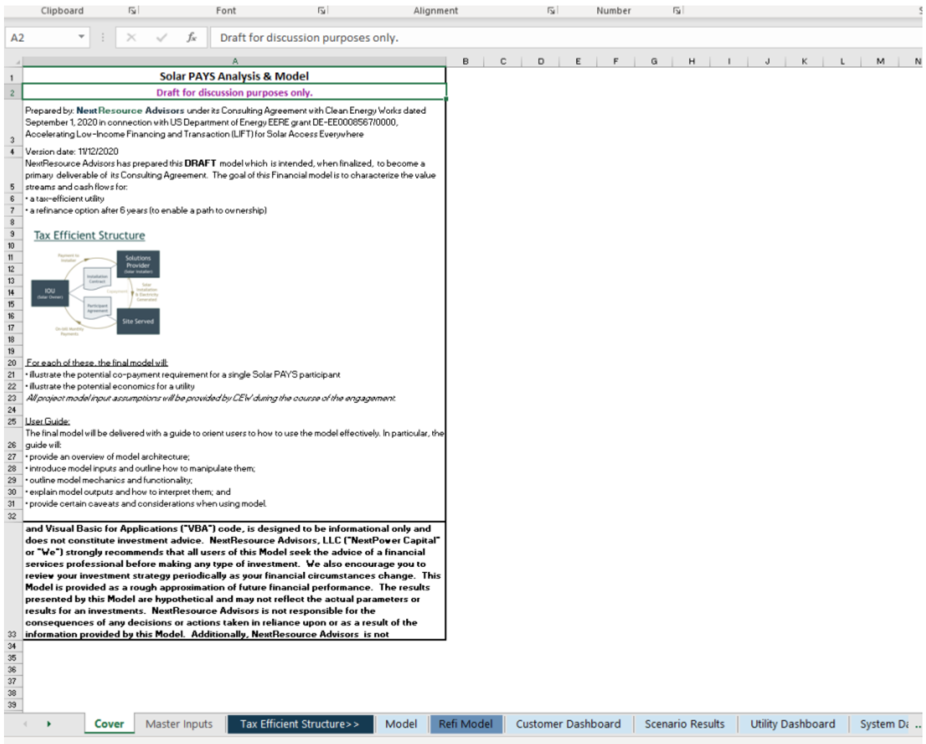
- Utility Rate of Return Calculations. One conclusion from this Financial Model's use with the four scenarios presented in this Financial Model Memo is the importance of Utility IRR in Customer economics. While this model does build in the functionality to adjust the required Utility rate of return, we could not explore the appropriate policy-level characterization or appropriateness of the rates chosen. Given its high degree of impact, this is a worthwhile area of further inquiry.

- Net Metering impacts

- Other

Appendix A: Financial Model

The financial model is hosted on the LIFT Solar Everywhere website. To access the financial model, please click on the graphic below:



Appendix B: Transaction Documents

The major transaction documents required for an inclusive utility investment program based on the PAYS system are likely to include the following:

- **Installation Agreement.** This is the agreement outlining the installation of the on-site solar system on the Participating Customers' site, executed between Utility and participating solar installer partner.
- **Operations & Maintenance Agreement.** This is the agreement outlining the operations and maintenance of the on-site solar system, executed between the Utility and the O&M contractor, which is often the participating installer partner.
- **Participant Agreement.** This is the agreement between Utility and Participating Customer, outlining the expected performance of the on-site solar system, the benefits and obligations of the Participating Customer under the terms of the tariff, each party's respective rights and obligations under the agreement. It would also include the following related documents as appendices or attachments:
    - Site Control Agreement, enabling the utility to access the solar system at the Customer's site during the period of cost recovery.
    - Sale of Power and Energy, outlining the sale of electricity generated by the solar system at the Participating Customer's site.
    - Interconnection Agreement, allowing the on-site solar system to connect to the electricity grid.
    - Customer purchase option, assuring the customer the right to purchase the on-site solar system at a defined point after the end of the recapture period for the tax credit.