



# Minnesota On Site Solar Procurement Workshop

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Paul Schwabe

September 18, 2019

# NREL Financing Analysis Examples

**ON THE PATH TO SUNSHOT**

## Emerging Opportunities and Challenges in Financing Solar

May 2016  
NREL/TP-6A20-65408  
LIFE, TRENDS

SunShot  
U.S. Department of Energy

RENELEY LAW

NREL

U.S. DEPARTMENT OF ENERGY Office of Indian Energy

## Solar Energy Prospecting in Remote Alaska

An Economic Analysis of Solar Photovoltaics in the Last Frontier State

by Paul Schwabe, National Renewable Energy Laboratory

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## Q1/Q2 2018 Solar Industry Update

David Feldman, NREL  
Robert Margolis, NREL

August 2018

NREL/PR-6A20-72036

NREL  
NATIONAL RENEWABLE ENERGY LABORATORY

## Terms, Trends, and Insights PV Project Finance in the United States, 2017

David Feldman and Paul Schwabe  
National Renewable Energy Laboratory

This brief is a compilation of data points and market insights that reflect the state of the project finance market for solar photovoltaic (PV) assets in the United States as of the third quarter of 2017. This information can generally be used as a simplified benchmark of the costs associated with securing financing for solar PV as well as the cost of the financing itself (i.e., the cost of capital).

In this brief, we look at three sources of capital—tax equity, sponsor equity, and debt—across three segments of the PV marketplace:

- Distributed portfolios of mostly residential systems but which could include some commercial systems that typically have a total transaction value greater than \$50 million
- Utility-scale projects and portfolios that typically have a total transaction value greater than \$50 million
- Small-sized deals consisting of individual commercial, community, or utility-scale projects, or portfolios of residential, commercial, or utility-scale projects that typically have a total transaction value that is less than \$25 million.

We compiled a simple and adjusted weighted average cost of capital (WACC) across these segments for use in a variety of analyses, such as levelized cost of energy (LCOE) assessments or financing inputs to models such as the National Renewable Energy Laboratory's System Advisor Model (SAM). Additionally, industry stakeholders can use these estimates to compare their actual costs to both the ranges and the median values of each capital source.

This work represents the second U.S. Department of Energy (DOE) sponsored effort to benchmark financing costs across the residential, commercial, and utility-scale PV markets, as part of its larger effort to benchmark the components of PV system costs.<sup>1</sup> These research efforts aim to facilitate transparency in the PV market, thereby assisting in the drive to measure and ultimately reduce the cost of solar energy in line with the goals of DOE's SunShot Initiative.

All data compiled for this report are derived from a combination of bank, literature review and interviews with industry professionals. We presented a partnership flip tax equity arrangement<sup>2</sup> to interviewees and asked what changes, if any, occurred between 2016, when we last performed this analysis, and 2017 on financing terms for the debt, tax equity, and sponsor equity in the capital structures. We also requested general commentary on the trends and developments in the capital markets that may not be captured in the financing metrics directly.

Figure 1 (on next page) represents a schematic of a simplified partnership flip structure, which serves as the basis for this analysis. Several variations of this structure are currently employed by solar developers and financiers.<sup>3</sup>

The first report to which Terms, Trends, and Insights PV Project Finance in the United States, 2017 (Terms, Trends, and Insights 2017) is a partnership flip structure equity investment. In this case the sponsor will be equity investors, which partners to finance and own the project or group of projects and assets. Figure 1 is a schematic of a Partnership Flip that allows an investor to temporarily hold the debt of the project rather than project itself. Partnership flip structures can vary based on whether the project ultimately becomes a partnership structure. These structures may be based on the loan equity's target rate ("fixed loan") flip.

NREL is a national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

- Emerging Financing Opportunities
- Location- Economic Analyses
- Twice-yearly PV Industry Update
- Market pricing updates

Available at NREL's Publication Database

# On-Site Solar Energy Financing Options

- Direct ownership
  - Cash
  - Traditional finance mechanisms such as bonds
- On-site purchaser of energy
  - Power purchase agreement
  - Leases
  - Lease-purchase

**Lower risk and  
upside**

**Risk and reward spectrum**

**Higher risk and  
upside**

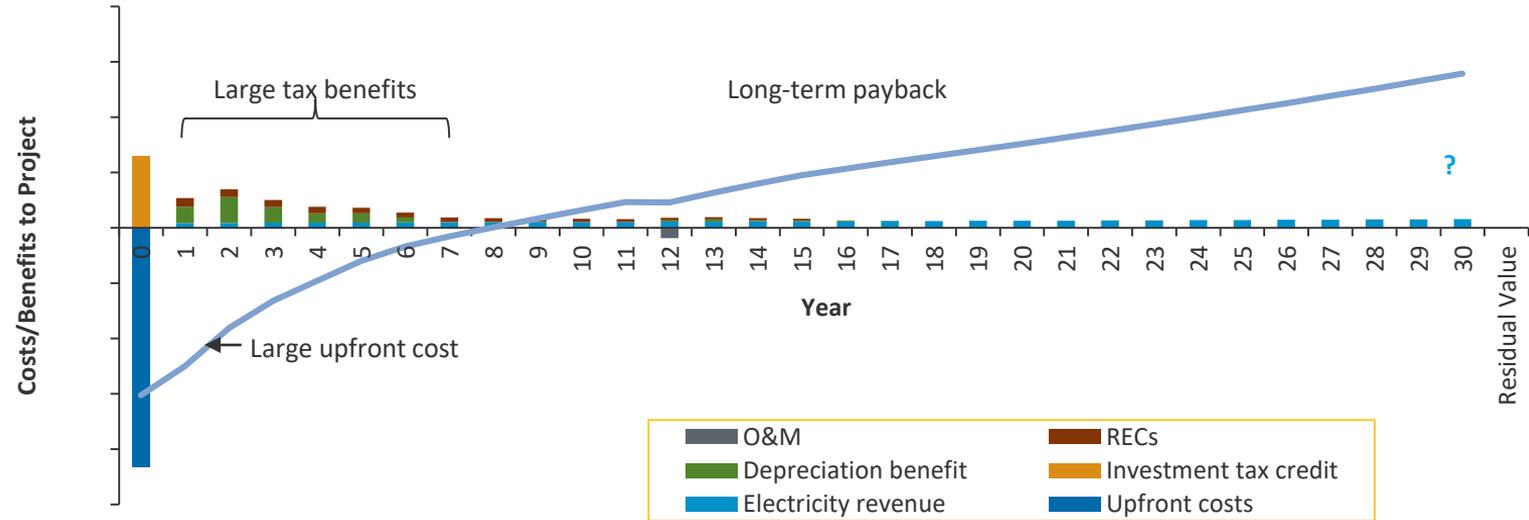


# Renewable Energy Federal Tax Incentive Overview

- **Two** Primary Federal Tax Benefits Available for Solar:
  1. Investment Tax Credit (ITC) equal to 30% of qualifying costs  
and
  2. Accelerated Depreciation
- **In combination**, ITC or PTC (1) and accelerated depreciation (2) can represent up to 50% of a project’s capital costs (depending on declining value of PTC or ITC and project’s actual capital costs)
- **However**, renewable energy owners may not have enough taxable income (aka “tax appetite”) to utilize fully
- **Therefore**, a separate developer “tax equity” investor can be required to utilize tax benefits
- **Looking ahead**, declining or fully-expired tax credits may alter financing practices (discussed later)
  - Commercial-Owned ITC at 10% with not set expiration (favors 3<sup>rd</sup>-party ownership)
  - Accelerated deprecation with not set expiration (favors 3<sup>rd</sup>-party ownership)
  - Commercial “begun-construction” qualifying criteria (favors 3<sup>rd</sup>-party ownership)

		2015	2016	2017	2018	2019	2020	2021	Future
<b>Wind PTC</b>		Full	Full	80%	60%	40%	0%	0%	0%
<b>Solar ITC</b>	Utility	30%	30%	30%	30%	30%	26%	22%	10%
	Commercial-Owned	30%	30%	30%	30%	30%	26%	22%	10%
	Residential Host-Owned	30%	30%	30%	30%	30%	26%	22%	0%

# Example of Costs and Benefits of Energy Projects

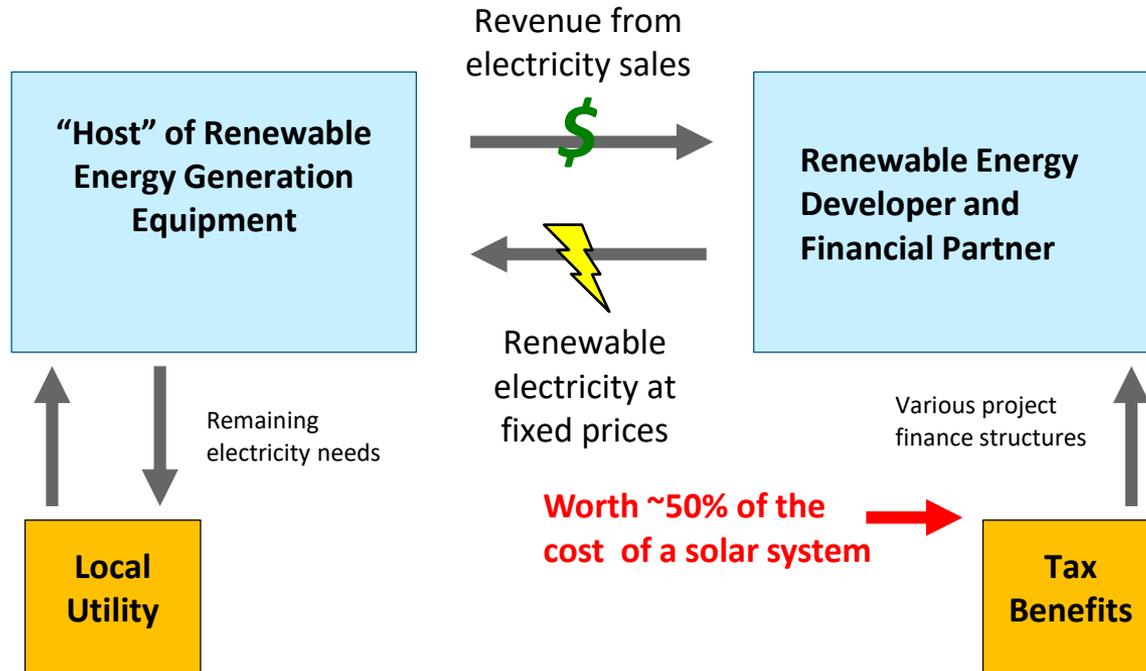


- In this example the project needs to find investor willing to make a large upfront investment for a long-term payback.
- Investors will also need a high tax liability to offset the tax benefits.
- Cash flow from operations have varying degrees of certainty, due largely to energy offtaker contract length – the shorter the contract the higher the risk (and the more important the “residual value” is to the owner).

Note: all figures are only representational; individual projects will vary by location and project specifics.  
All values are net of taxes

# Third Party Power Purchase Agreement

The customer agrees to **host** the system and **purchase** the electricity with remaining electricity coming from the utility (or utility may also provide the PPA)



# Cash Purchase Considerations

## Pros

**Less  
complexity**

**Likely lowest  
cost option per  
watt**

**Easier early  
termination  
issues**

## Cons

**Large initial  
cash outlay**

**Requires  
ongoing  
maintenance  
and repairs**

**Requires  
ability to use  
tax benefits**

# 3<sup>rd</sup> Party Ownership Considerations

## Pros

**Low/No  
Upfront Costs**

**No O&M  
Duties**

**Easier to Use  
Tax Benefits**

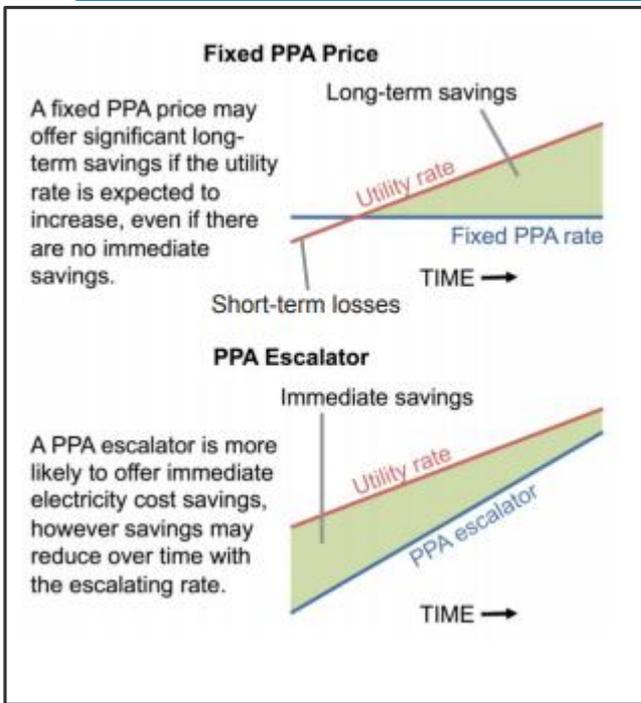
## Cons

**Involvement of  
additional  
party**

**Contract  
commitment  
10 to 20 years**

**More complex  
buyout options**

# Wealth of PPA Resource for Municipal Facilities



Explainers

Resources (see)

<https://www.nrel.gov/docs/gen/fy16/65567.pdf>

<https://www.nrel.gov/analysis/standard-contracts-downloads.html>

<https://irecusa.org/2015/05/new-toolkit-to-help-local-governments-with-solar-financing/>

**Solar Power Purchase Agreement**

This Solar Power Purchase Agreement (this "Agreement") is entered into by the parties listed below (each a "Party" and collectively the "Parties") as of the date signed by Seller below (the "Effective Date").

<b>Purchaser:</b>	<b>Buyer:</b>	<b>Seller:</b>	<b>Seller:</b>
Name and Address:	Name and Address:	Name and Address:	Name and Address:
Phone:	Phone:	Phone:	Phone:
Fax:	Fax:	Fax:	Fax:
E-mail:	E-mail:	E-mail:	E-mail:
Premises Ownership:	Additional Seller Information:		

This Agreement sets forth the terms and conditions of the purchase and sale of solar generated electric energy from the solar panel system described in **Exhibit 2** (the "System") and installed at the Purchaser's facility described in **Exhibit 2** (the "Facility").

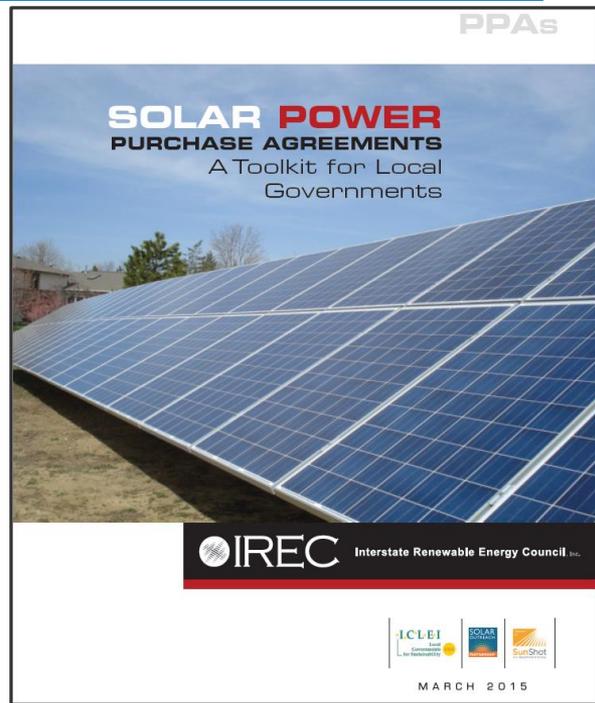
The exhibits listed below are incorporated by reference and made part of this Agreement.

**Exhibit 1** Basic Terms and Conditions  
**Exhibit 2** System Description  
**Exhibit 3** Credit Information  
**Exhibit 4** General Terms and Conditions  
**Exhibit 5** Form of Memorandum of License  
**Exhibit 6** Form of Easement Agreement

**Purchaser:** \_\_\_\_\_ **Seller:** \_\_\_\_\_  
 Signature: \_\_\_\_\_ Signature: \_\_\_\_\_  
 Printed Name: \_\_\_\_\_ Printed Name: \_\_\_\_\_  
 Title: \_\_\_\_\_ Title: \_\_\_\_\_  
 Date: \_\_\_\_\_ Date: \_\_\_\_\_

SAPC Solar Power Purchase Agreement Version 1.1  
May 27, 2014

Templates



Toolkits

# Common Contractual Questions in Solar PPA / Leases

## Access Questions

- How will the municipality provide legal site access to a contractor for up to 20 years?
- What is the protocol for contractor to be able to access the site and how might that impact municipal functions?
- How might future buildings or renovations impact a solar system's ability to produce electricity?

# Common Contractual Questions in Solar PPA / Leases

## Operational Questions

- Why is this contract being held or assigned to a company other than the solar company we have selected?
- What happens if the solar system doesn't produce as expected?
- What are the responsibilities for the municipality?
- What happens when the roof needs to be replaced?
- Will the panels on the roof reduce the life of the roof?
- Who uncovers the snow from the solar panels in winter?

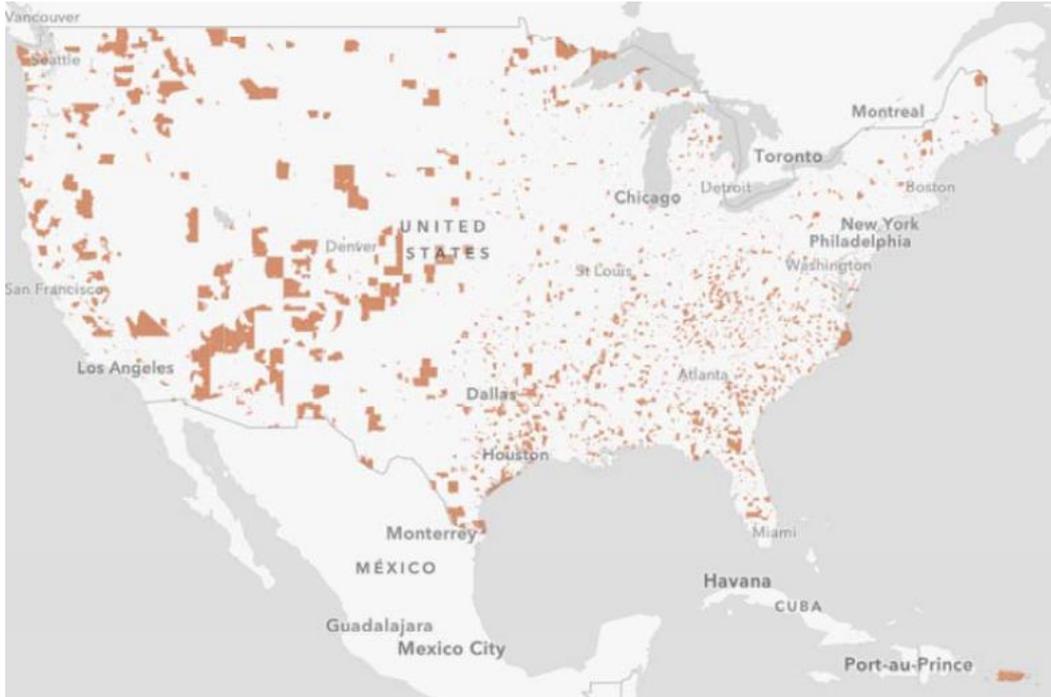
# Common Contractual Questions in Solar PPA / Leases

## “Change in plan” questions

- What if we want to install batteries later?
- What happens if Xcel rates change during the term of the contract?
- What happens to the panels at the end of the contract term?
- What if the municipality wants to buy out the PPA contract early?
- What would the price be if the municipality wanted to purchase out the contract?

# Opportunity Zones

# Opportunity Zones



- “An Opportunity Zone is an economically-distressed community where new investments, under certain conditions, may be eligible for preferential tax treatment”
- Qualified Opportunity Zones (QOZs) were created by the Tax Cuts and Jobs Act on December 22, 2017.
  - In 2018, states nominated low-income communities, which were then designated as opportunity zones by the treasury.
  - There are QOFs in all 50 states (and territories); they are home to 35 million people, and are in rural, suburban, and urban areas.

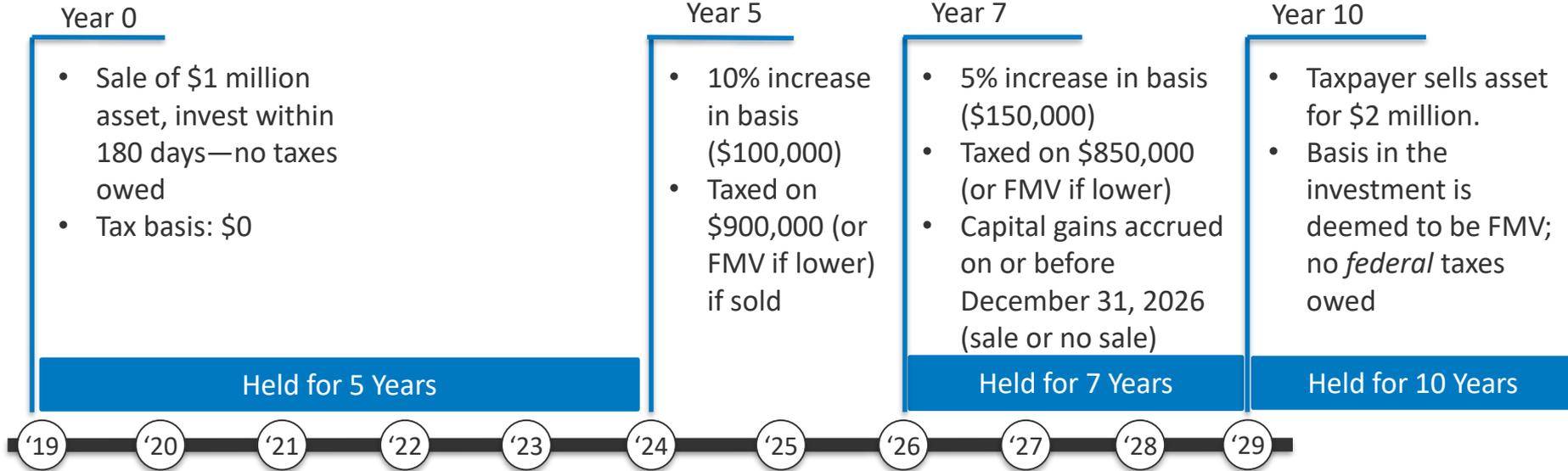
# Tax Benefits of Investing in an Opportunity Zone

- **Deferral of Capital Gains:** Investors can take proceeds from the sale of capital, invest in a qualified investment in an opportunity zone, and not pay capital gains from that sale until the *earlier* of (1) the date the investment is sold or (2) December 31, 2026.
- **Step-Up in Basis** (i.e., partial “haircut” to amount of income taxed): If the qualified investment is held for five years, 10% of investment is excluded from capital gains; if it is held for seven years, 15% is excluded from capital gains.
  - Due to the 2026 deadline, investors must invest capital gains before 2020 to be eligible to receive the 15% exclusion (i.e., seven years)
  - Capital gains are further reduced if the FMV of the investment (when taxes are owed) is less than the initial investment of capital gains.
- **Additional Gain is Not Taxed:** If an investor holds their investment for 10 years, they are not required to pay taxes on any additional capital gains (beyond those paid December 31, 2026), no matter how much the asset appreciates.

# Tax Benefits of Investing in an Opportunity Zone

## Example

- Five-year deferral and 10% step-up in basis reduces the capital gains tax, in real terms, by 29%.
- Seven-year deferral and 15% step-up in basis reduces the capital gains tax, in real terms, by 40%.
  - \$0 tax basis could also mean a reduction in value of solar depreciation expense by 7%.
    - The percentages may not be of equivalent value based on the equity contribution versus the total cost of the project.

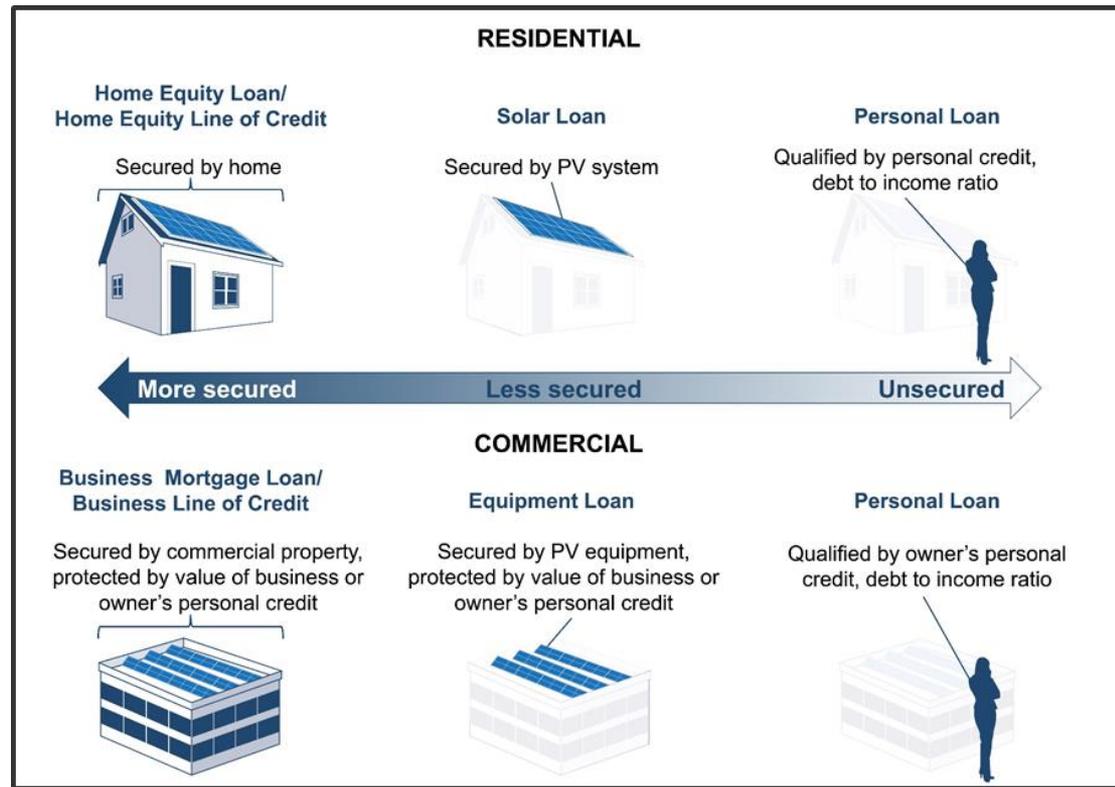


# Community Financing Facilities

# Types of PV Loans

Three basic types of PV loans to date (with variations)

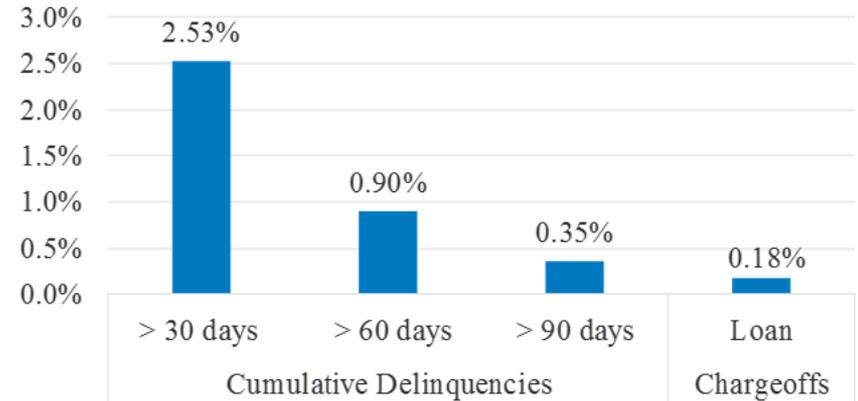
- Secured with the underlying real estate asset (i.e. home or commercial property)
- Secured based on the solar equipment itself
- Based solely on the credit, and outstanding debts and income of the borrower



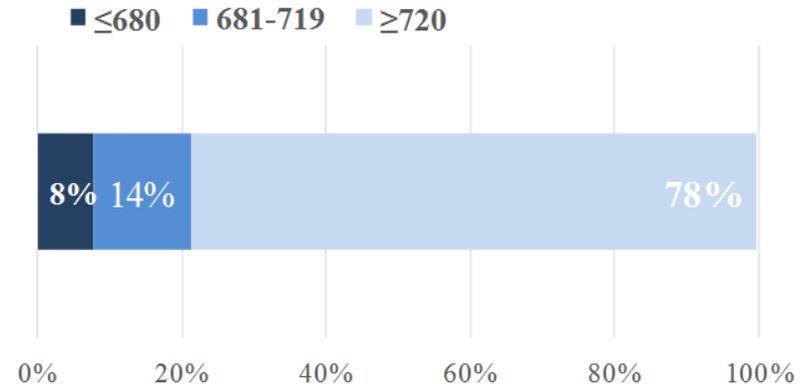
# Performance of PV Loans from 6,770 loan sample

- Data on 6,770 loans representing over \$186 million in lending suggest PV loans are performing very well to date—although these results must be put in the context by:
  - *high credit quality of borrowers*
  - *early state of the loans, and*
  - *recent robust economy*

Key Performance Indicators of CRFI Loan Portfolio (6,770 Solar Loans)



Borrower's Credit Score Profile (6,770 Solar Loans)



# Thank You

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[www.nrel.gov](http://www.nrel.gov)

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