Terms, Trends, and Insights

PV Project Finance in the United States, 2017

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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 computed 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) assessment or as 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.[1] 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 a basic literature review and interviews with industry professionals. We presented a partnership flip tax equity arrangement[2] 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 structure. 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.[3]

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[1] The first report is titled, *Terms, Trends, and Insights PV Project Finance in the United States, 2016* (Feldman, Lowder, and Schwabe 2016.).

[2] A partnership flip involves equity investors, in this case the sponsor and tax-equity investors, which partner to finance and own the project and share in its risks and rewards. Figure 1 is a schematic of a Partnership Flip that utilizes so-called "back leverage" (i.e., debt at the sponsor rather than project level).

[3] Partnership flip structures can vary based on whether the project allocations flip according to a predetermined date ("fixed-date" flip) or are based on the tax equity's target yield ("yield-based" flip).

As shown in Figure 1, a lender (i.e., debt provider), a project sponsor, and a tax equity investor participate in this financial transaction example; each investor provides a certain percentage of the total investment and expects a certain return. Respondents of the interviews provided either a single value or a range of values for each data field in Table 1; we present these data for a "High-Cost," "Low-Cost," and "Mid-Cost" financing scenario. The "High-Cost" and "Low-Cost" scenarios use the highest- and the lowest-cost values collected in our data set (respectively),[4] while the "Mid-Cost" represents the median value for these ranges. We also provide the number of data points we received for each value to give a sense of the robustness of each field; however, it should be noted that many of the values with smaller numbers of data points are fairly consistent with values reported in the previous year's benchmark.

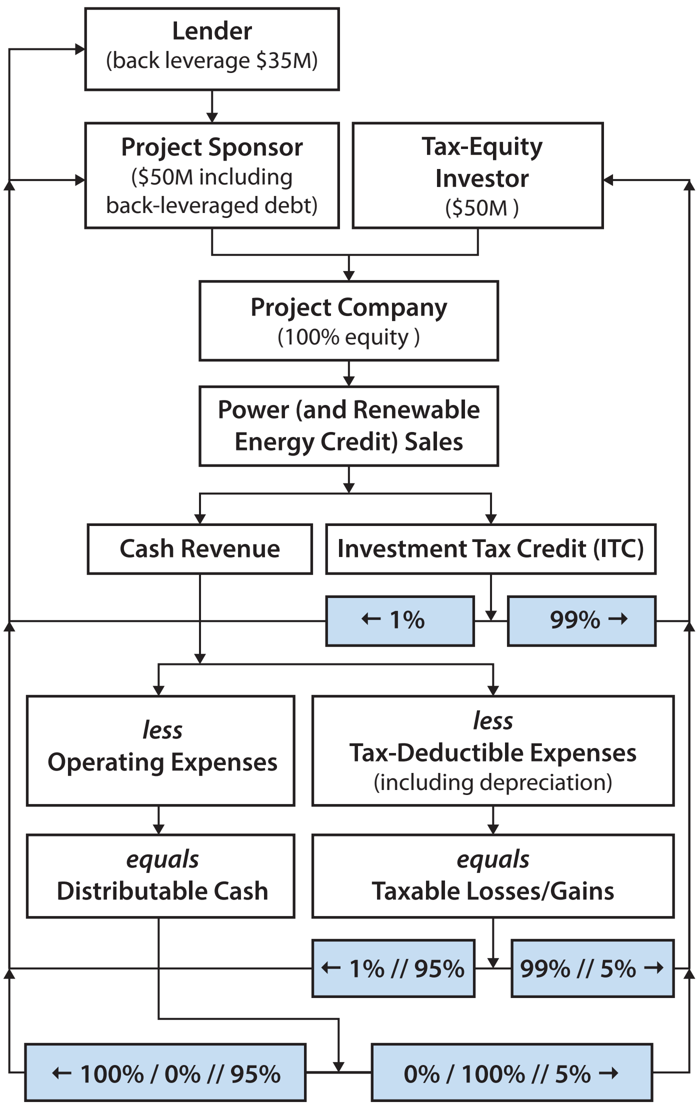

Figure 1. Partnership flip structure example. / = first flip point in transaction where distributions ratios are initially altered. // = second flip point in transaction where distribution ratios are again altered.

Based on the values reported in Table 1 compared to those reported previously, as well as discussions from respondents, from 2016 to 2017 there was a modest reduction in the cost of equity for PV projects, while debt interest rates remained approximately the same. It is important that readers consider the data presented here as illustrative of trends and general market conditions rather than specific financing rates or investment requirements. This is particularly true given the limited sample size of respondents and that this represents one of many financing approaches currently used in the marketplace.

Insights on Changes in Project Finance

In addition to benchmarking financial terms, we interviewed industry professionals and reviewed literature regarding 2017 project finance trends for PV assets. The following topics represent major themes mentioned by multiple sources.

There was reportedly increased competition by equity financiers, causing lower required returns for equity investments and more favorable terms for developers. It was noted that there are more tax equity investors than in previous years, including the entrance of non-traditional/non-financial institutions (e.g., insurance companies, pensions, and private equity) chasing a limited number of projects in 2017. A significant portion of the solar pipeline was exhausted in 2016 due to previous expectations of the expiration of the 30% federal investment tax credit (ITC). Because of the five-year extension of the ITC, developers and electricity offtakers have had a chance to pursue new PV project opportunities; investors expect a rebound of available PV projects in 2018.

There are also more entrants into the sponsor equity market, reportedly including foreign participants that are analyzing the U.S. market for investment. Yields for sponsor equity are reportedly low enough that

Tequity investors may also employ a combination of financing structures, such as an inverted lease built into a partnership flip. Newer tax-equity investors, however, are more likely to prefer a basic partnership flip, to keep transactions more straight-forward.

[4] Because debt is a lower-cost source of capital than either source of equity, a lower percentage of debt in the capital structure makes for a higher cost project.

Table 1. Ranges for Solar Finance Terms

	Large Distributed Portfolios (above $50MM)				Utility-scale PV Projects (above $50MM)				PV Projects (below $25MM)			
	Low-Cost	Mid-Cost	High-Cost	# of Data Points	Low-Cost	Mid-Cost	High-Cost	# of Data Points	Low-Cost	Mid-Cost	High-Cost	# of Data Points
Tax equity												
% of project	30.0%	41.0%	50.0%	5	25.0%	41.0%	50.0%	5	30.0%	40.0%	43.8%	3
After-tax return at flip	8.0%	8.4%	9.0%	5	7.0%	7.5%	8.5%	5	9.0%	10.0%	12.0%	3
After-tax return after flip	9.0%	9.3%	13.0%	4	8.0%	9.0%	14.0%	5	10.0%	13.0%	15.0%	3
Sponsor equity												
% of project[a]	20.0%	18.0%	10.0%	N/A	25.0%	16.5%	10.0%	N/A	20.0%	17.5%	16.2%	N/A
After-tax return	7.0%	9.0%	20.0%	6	6.5%	8.5%	11.0%	6	8.5%	10.0%	20.0%	3
Debt												
% of project	50.0%	41.0%	40.0%	4	50.0%	42.5%	40.0%	4	50.0%	42.5%	40.0%	4
Interest rate	4.60%	4.80%	5.25%	5	3.50%	4.25%	5.25%	5	5.25%	6.38%	7.00%	4
Other Financing Metrics												
Debt service coverage ratio	1.30	1.34	1.50	5	1.25	1.30	1.33	5	1.25	1.30	1.5	4
Term debt maturity (years)[b]	18	7	5	4	5	13	20	5	18	13	5	4
Upfront Financing Costs ($MM)	$1.0	$1.1	$1.1	3	$1.0	$1.1	$1.1	3		$0.5		1
Simple WACC	**5.5%**	**6.6%**	**9.8%**		**4.7%**	**6.2%**	**9.4%**		**6.3%**	**8.6%**	**11.5%**	
Adjusted WACC[c]	**6.2%**	**7.6%**	**12.7%**		**5.6%**	**7.2%**	**9.6%**		**7.2%**	**8.9%**	**13.7%**	

[a] The values of the percentage of sponsor equity in a project for each case displayed represent the remainder of project capital after debt and tax equity contributions, so that the three percentages add to 100%. Actual low and high values collected in our analysis were: distributed PV (2% - 25%); utility-scale PV (2% - 20%); and small-scale PV (15% - 20%).

[b] Term debt with a maturity of 4–7 years are typically "mini-perms," which are products with a long-term amortization schedule but a short-dated maturity, such that a large "balloon" payment is due when the maturity is up. This balloon payment may be refinanced into another 4–7 year mini-perm.

[c] See "Adjusted WACC" section (page 4) for the formula and detailed discussion. In addition to the values in the formula, the other assumptions used to calculate the adjusted WACC are (1) a tax equity flip-date of 8 years, at which point tax equity ownership is purchased by sponsor equity, (2) a combined stated and federal tax rate of 38.9%, and (3) a debt amortization of 18 years.

some sponsor investors that are not project developers themselves may take on construction and sometimes even development risk in the search for higher yields. Some tax efficient strategic investors want to act both as the sponsor and tax equity positions and are purchasing projects outright at competitive pricing due to the efficiency of this financing strategy.

Profitability is often prioritized over the rate of returns for tax equity investors. While the average return is seemingly lower, there continues to be a lot of variation in the marketplace. Part of this reason—beyond differences in project fundamentals and electricity offtake agreements—is the focus that tax equity investors have on profitability. Tax equity investments are relatively short in term, as the ITC is typically taken in the first year of a project, and more than 50% of depreciation is incurred in the first two years. Therefore, many tax equity investors appear to be more interested in maximizing the absolute profitability for their firm rather than maximizing their annualized rate of return of the investment. In fact, while rate of return is an important metric, many investors are more focused on the total profit generated by an investment. For example, a 10% annualized return on a $1 million investment with a one-year period would result in a gain of $100,000; however, a 5% annualized return on a $1 million investment with a five-year period would result in a gain of a much larger $276,000 despite the lower rate or return.

The possibility of changes in corporate tax rate has not had a large impact on the ability of projects to find financiers. The president and members of Congress stated in 2016 and 2017 that tax reform would be a legislative priority, including the lowering of the marginal corporate tax rate from the current 35% to 15% or 20%. To the degree marginal tax rates decline, the value of tax credits and depreciation expense also decline as does the demand for them. In the beginning of 2017, some investors did not enter the marketplace due to this uncertainty. Since then, some deal structures have evolved to include language and terms in contracts that place the risk of changes to corporate tax rates on the developer, while still making the developer comfortable with the risks. Part of this comfort stems from the profitability of PV investments due to the rapid reduction in system costs as well as the fact that many investors had already been modeling sensitivity analyses around various corporate tax rates. Another mitigating factor to possible changes to the corporate tax rate is the ability of investors to elect “bonus depreciation” through 2019. Many tax equity investors have not historically elected bonus depreciation, “which provides 50% bonus depreciation for projects placed in service from 2015 to 2017 and 40% and 30% bonus depreciation for projects placed in service in 2018 and 2019, respectively” (Feldman and Bolinger 2016) because the “flip” in ownership would occur too quickly. Martin (2017) states, “If you do not make any structural changes, the flip would move out as the tax rate is reduced. Electing bonus depreciation is one way to mitigate some of the effects of a potential tax rate change.” While investors may continue not to elect bonus depreciation now, this may change if the federal tax rate were reduced.

Financial transactions are becoming more complicated. Transactions for PV systems have generally become more complicated due to a larger pool of investors, possible increased liability due to political and market uncertainties, new offtaker agreements (e.g., corporate power purchase agreements and community solar programs), and the pursuit of better returns. These complexities can also be caused by renewable energy credits (RECs), hedges, basis risk, or environmental concerns with a PV project. Martin (2017) also reported that some tax equity investors will allow back-leveraged lenders to have a lien on project assets in exchange for forbearance for five years and a carve-out for preferred distributions.

Interest rates for debt products in the PV space have remained relatively stable, and more products are now being offered. In June 2017, the U.S. Federal Reserve raised the benchmark interest rate for the third consecutive quarter, to 1.25% (up from 0.5% in November 2016). However, the increase in fundamental debt levels has not caused a significant rise in the cost of debt for PV products to date, as these increases were expected and were priced into the cost of swaps (i.e., interest rate derivatives that exchange a variable interest rate for a fixed one). Additionally, more developers are using mezzanine and corporate-level debt products to raise capital, which have different structures and risk profiles.

Adjusted WACC

The method for calculating “Adjusted WACC” presented in Table 1 differs from what is typically used to determine WACC. This section discusses the reasoning and methodology behind calculating WACC differently.

Discount rates are one of several tools used to assess financial investments. They are used to normalize cash flows to account for the time value of money and the relative risk profile of investors. Discount rates can be used to compensate for inflation, the cost of capital for debt and equity investors, and the uncertainty of future cash flows, to name a few. When a discount rate is used, it is important to determine which risk factors and time horizons are being compensated for in its use.

In the previous edition of this report, we used the reported financial terms to calculate a WACC for utility-scale and distributed PV investments. However, WACC leaves out key financial and temporal elements, and therefore, using it can be misleading.

The standard formula for WACC is:

$$WACC = \left(\frac{E}{V} \times R_E\right) + \left(\frac{D}{V} \times (1 - T) \times R_D\right)$$

Where:

V = total project investment

R_E = return on equity

R_D = return on debt

E = equity investment

D = debt investment

T = tax rate

WACC has historically been used as a discount rate when performing a discounted cash flow analysis to assess a company’s economic potential. However, the use of WACC is based on the assumption that a corporation’s debt-to-equity ratio remains constant. Many projects, including renewable energy assets, do not however work that way and debt is amortized over a specific period of time. This is particularly impactful to the WACC formula, as it adjusts the debt portion to account for the tax deductibility of interest expenses. However, if the loan is amortized, the loan’s principal is reduced and so too are its interest payments.

Table 2. Differences in Calculated Values between WACC and Adjusted WACC

	Distributed PV			Utility-scale PV			Small Deals		
	Low-Cost	Mid-Cost	High-Cost	Low-Cost	Mid-Cost	High-Cost	Low-Cost	Mid-Cost	High-Cost
WACC	5.5%	6.6%	9.8%	4.7%	6.2%	9.4%	6.3%	8.6%	11.5%
Adjusted WACC	6.2%	7.6%	12.7%	5.6%	7.2%	9.6%	7.2%	8.9%	13.7%
Basis Point Difference	70	100	290	90	100	20	90	30	220

Furthermore, the time horizon for some equity investors (e.g., tax equity investors) is shorter than the life of the project and often the term of the energy contract. Therefore, calculating WACC using the project's initial deal terms would not capture these economic realities.

In many financial models, analysts will calculate a different WACC for each period to account for these changes. However, as many models do not allow for the input of multiple discount rates, we calculate a single WACC value which compensates for (1) the diminishing tax shield caused by the reduction in debt over time, (2) the benefit of making an equity investment over the course of the amortized loan via principal payments, as opposed to an upfront investment, and (3) accounting for the shorter length of economic involvement of tax equity investors and debt providers:

$$Revised\ WACC = \frac{E_S + PV\ (E_T) + PV\ (E_P) + PV(D_I) \times (1-T)}{V} \times R_E$$

Where:

V = total project investment

R_E = sponsor equity return

PV = present value, Re

E_S = initial sponsor equity investment

E_T = cash flow to tax equity investors

E_P = principal payments of loan

D_I = interest payment of loan

T = tax rate

While the revised WACC formula produces the same result if all parties remain in the transaction, at the same level, for the economic life of the project, it can produce noticeably different results when using existing market conditions. Table 2 summarizes the difference in values between WACC and adjusted WACC using data from Table 1.

Additional Considerations

While the formula for adjusted WACC accounts for economic factors made while financing renewable energy projects, it does not account for possible adjustments made to the original financings after the initial investment. For example, if the sponsor equity investors can refinance the back-leveraged debt after tax equity investors exit the deal—by either bringing in a larger loan or extending the amortization of the loan—they can significantly lower the cost of capital for the project. This is not difficult to imagine, because while the typical amortization schedule of a loan is eighteen years, the median loan term reported in Table 1 for a utility-scale project was eight years.[5] For example, if the sponsor equity investor is able to refinance after eight years and extend the amortization schedule of the loan from eighteen to the full economic life of the project (i.e., thirty years) the adjusted WACC drops from 7.2% to 7.0% (based on the mid-cost case for a utility-scale project in Table 1). The adjusted WACC could drop further if sponsor equity refinanced with a larger loan. Their ability to refinance, however, is dependent on any changes in market conditions (such as interest rates), the length of the contracted cash flows, their perception of project value beyond the contract, and the terms of the economic attractiveness of the electricity purchase agreement.

[5] At the end of eight years, the equity investors must pay off the balance of the loan in a single lump sum. This often happens by the equity investor arranging another loan to pay off the original loan.

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