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Terms, Trends, and Insights

PV Project Finance in the United States, 2016

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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 2016. 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). 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 also include some commercial systems
- Utility-scale projects and portfolios
- Small-sized deals of individual commercial, community, or utility-scale projects, or portfolios of residential, commercial, or utility-scale projects that typically have a total transaction value less than $25 million.

We computed a 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 data to contrast their experience against both the ranges and the median values of each capital source.

This work was conducted as part of a U.S. Department of Energy (DOE)-supported effort to benchmark the components of PV system costs across the residential, commercial, and utility-scale markets. Together, 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.

The Data

All data compiled for this report and assumptions behind the WACC calculation are derived from a synthesis involving a basic literature review, an analysis of proprietary project finance data sets, and interviews with industry professionals. The WACC calculation (based on a modeled financial transaction—see *Financial Structure* below) is designed to represent a typical project finance deal in the marketplace. However, our data and interviews revealed that there is a wide distribution of finance structures in today's market, owing to several factors, including the diversity of project types; investor preferences; the availability of state incentives; and, more generally, the evolving maturity of the solar marketplace. This variability and the reasons behind it are detailed further below.

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 approach does not capture project-specific factors that are subjective or difficult to quantify, but that may exert an influence on project financial terms. Such factors include the existing banking relationship between parties, the perceived strength and experience of a project team, or the extent of a developer's access to capital.

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Financial Structure

Based on our research, one of the most common tax equity structures employed in solar project finance today is the partnership flip. Figure 1 below represents a schematic of a generalized partnership flip structure, which served as the basis for this analysis. Several variations of this structure are currently employed by solar developers and financiers (for more information on this and deal size variability, see *Insights on Tax Equity* below).

We presented this partnership flip tax equity arrangement to interviewees and asked what the finance terms would be for the debt, tax equity, and sponsor equity in the capital structure. We then used the data ranges collected through this process (and supplemented by the literature and data review) to calculate a WACC for three types of deals: distributed portfolios, utility-scale projects and portfolios, and small deals. Table 1 presents these data, and the WACC calculation for a "High-Cost," "Low-Cost," and "Mid-Cost" financing scenario. The "High-Cost" and "Low-Cost" scenarios were calculated using the most and least expensive estimates of the reported ranges (respectively) for most categories,[1] while the "Mid-Cost" represents the median value for these ranges.

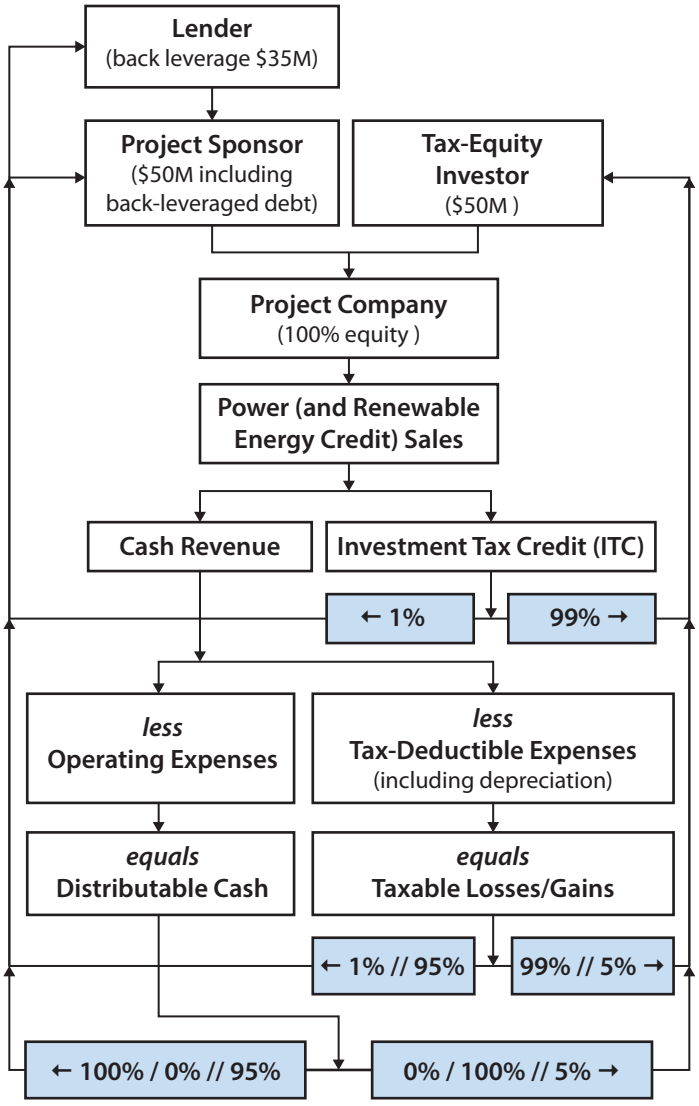

Figure 1. Partnership flip structure example. / = first flip point in transaction where distributions ratios are initially altered. // = second flip point in transaction where distribution ratios are again altered.

Insights on Tax Equity

As mentioned above, there is considerable variability in the solar project finance marketplace today. Deal size is one area that seems to exhibit little consistency. While interviewees considered $25–$30 million in total costs to be the lower bound for distributed portfolios and utility-scale projects, they said that the larger, more "sophisticated" tax equity investors tend to take greater interest when the deals approach $50 million and up (with deals often exceeding $200 million). Some outlying investors[2] will finance smaller distributed portfolios or commercial and industrial (C&I) or utility-scale installations that have not been aggregated into portfolios; however, these investors typically demand a higher yield on their capital because of the small project size, and also because projects at this scale often have offtakers with low-rated or unrated credit (in addition to other factors). Project sponsors on these smaller deals may have less ability to negotiate financing costs and deal terms than well-capitalized sponsors on bigger deals.

Interviewees also indicated that many experienced tax equity investors may 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 straightforward. Partnership flip structures can vary based on whether the project allocations flip according to a predetermined date ("fixed-date" flip), or based on the tax equity's target yield ("yield-based" flip). Fixed-date flips, which are less common than yield-based flips, generally

[1] This is not true for the percentage of debt in the project, which is inversely correlated to project cost; i.e., 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.

[2] "Outlying" investors can include newer entrants into the tax equity market, as well as some corporate entities (as opposed to large banks, which comprise the "sophisticated" investors). It is becoming common for these corporations to go through tax equity syndicators that place their investment with projects seeking capital in exchange for a fee.

Table 1. Ranges for Solar Finance Terms and Project-Level WACC

	Distributed PV				Utility-scale PV				Small Deals			
	Mid-Cost	High Cost	Low Cost	# of Data Points	Mid-Cost	High Cost	Low Cost	# of Data Points	Mid-Cost	High Cost	Low Cost	# of Data Points
Tax equity												
% of project	43.8%	47.5%	50.0%	6	43.8%	43.8%	50.0%	5	43.8%	47.5%	50.0%	3
After-tax return at flip	8.8%	10.0%	8.0%	9	8.0%	9.5%	7.4%	9	12.0%	13.0%	11.0%	3
After-tax return after flip	1.0%	2.3%	0.5%	3	1.0%	1.8%	0.5%	3	1.0%	1.8%	0.5%	3
Total after-tax return	9.8%	12.3%	8.5%	N/A	9.0%	11.3%	7.9%	N/A	13.0%	14.8%	11.5%	N/A
Sponsor equity												
% of project	16.3%	20.0%	6.3%	7	16.3%	20.0%	6.3%	6	16.3%	20.0%	6.3%	6
After-tax return	9.0%	9.5%	8.0%	5	9.0%	9.5%	8.0%	5	9.0%	9.5%	8.0%	5
Debt												
% of project	40.0%	32.5%	43.8%	7	40.0%	36.3%	43.8%	6	40.0%	32.5%	43.8%	6
Interest rate	4.8%	5.0%	4.0%	7	4.3%	4.5%	3.9%	4	7.0%	8.0%	6.0%	3
Taxes												
Federal	35.0%	35.0%	35.0%	N/A	35.0%	35.0%	35.0%	N/A	35.0%	35.0%	35.0%	N/A
State	6.0%	6.0%	6.0%	N/A	6.0%	6.0%	6.0%	N/A	6.0%	6.0%	6.0%	N/A
Combined	38.9%	38.9%	38.9%	N/A	38.9%	38.9%	38.9%	N/A	38.9%	38.9%	38.9%	N/A
WACC	**6.9%**	**8.7%**	**5.8%**	**N/A**	**6.4%**	**7.8%**	**5.5%**	N/A	**8.9%**	**10.5%**	**7.9%**	**N/A**

Note: Rounding errors may result in totals not equaling 100%.

allow tax equity investors to invest less cash in the deal because their exit comes immediately after the investment tax credit fully vests (in year six of project operation). Additionally, in fixed-date flips, tax equity investors typically transfer some of the accelerated depreciation losses to the developer in years 2–5.[3]

Insights on Debt

Foreign banks make up a considerable portion of the lenders in the U.S. solar market, though some U.S. regions stand out as particularly active. The lending market also includes some non-bank entities such as insurance funds and private equity (both of which may charge higher interest rates).

According to our interviews, the majority of debt issued in the distributed and utility-scale solar space is back-leveraged, meaning that the loan is collateralized by the sponsor's equity in the portfolio/project. In contrast, project-level debt is collateralized by the assets in the project's special purpose vehicle and allows the bank to step into control of the project if there is a breach of the loan contract. One interviewee indicated that project sponsors are currently seeking more than one back-leverage lender so as to monetize their project interests to the fullest extent possible. One interviewee noted that the proliferation of back-leverage within project finance has also occurred because (1) back-leveraging a portfolio of projects can increase deal size and (arguably) diversify some of the underlying risk on the loan, and (2) from the lenders perspective, back-leveraging can be more efficient in terms of the amount of time it takes to execute the transaction.

Interviewees largely agreed that back-leverage—which historically has come at a slight interest premium to project-level debt—is now being offered to solar developers/sponsors at virtually the same cost as project-level debt. Both debt products are being offered at historic lows (4%–5% for high-quality portfolios/projects, with a generally higher cost for small projects) owing to abundant supply, a globally low interest rate environment, and other factors.

Though back-leverage comprises a large portion of new solar project finance debt issues, one interviewee noted it is not necessarily an ideal arrangement from the lender's

[3] Both yield-based and fixed-date flips require careful planning to ensure that they demonstrate enough "economic substance" (i.e., risk in the deal) to be viewed favorably by the IRS. If tax equity is not able to overcome this requirement, it may be viewed as a purchaser of tax credits (and not a true investor) and will thus be ineligible to claim ITC. See Internal Revenue Code 7701(o).

Table 2. Additional Debt Terms

	Distributed PV				Utility-scale PV			
	Mid	High	Low	# of data points	Mid	High	Low	# of data points
Debt Service Coverage Ratio	1.34	1.35	1.25	6	1.33	1.35	1.2	4
Term Debt Maturity	5 yr mini-perm[4]	6 yr mini-perm	5 yr mini-perm	5	7 yr mini-perm	12.5	4	3

perspective. Having recourse not to the project assets, but to the developer's controlling interest in those assets, places the lender in a quasi-subordinate position to the tax equity. Some lenders have even gone on to characterize tax equity as "super-senior debt." Additionally, lenders are apparently reluctant to charge additional interest points for this subordination, owing to robust competition in the solar lending marketplace. Tax equity, on the other hand, was reported to generally increase its required yield on a project if debt is issued at the project level (which places the tax equity in a position of quasi-subordination and requires a forbearance agreement).[5] One interviewee indicated that the increase could be as much as 300–700 basis points, and that many tax equity investors will not transact a deal at any price with debt at the project level.

Despite the current dominance of back-leverage portrayed by interviewees, we did hear from some industry representatives that project-level debt is still common in the small utility-scale and C&I solar markets. The sponsors of these smaller projects may not be able to achieve such favorable terms as are found in the market for larger portfolios/projects. This can prevent sponsors from back-leveraging their debt and borrowing at interest rates offered to the larger, more active sponsors.

Additional data on debt/financial terms—including maturities and debt service coverage ratios—derived from our research are listed in Table 2. The additional debt terms were fairly consistent across the cost categories likely due to robust competition in the solar lending market mentioned previously.

Insights on Developer/Sponsor Equity

The developer/sponsor equity is the highest risk capital in the stack and therefore commonly requires the highest return.

In addition to the return they earn over the lifetime of the project (assuming that they do not sell it upon completion), developers usually collect a "developer fee" upon completion. Developers that are vertically integrated can also capture some margin on their engineering, procurement, and construction (EPC) contracts, from operations and maintenance (O&M) and asset management fees over the life of the project, and from other sources. Interviewees disclosed that developer fees can range from 10%–15% of project costs, depending on how they are calculated (e.g., if it is based on the appraisal or capital cost; if it includes margin from other development services such as EPC and O&M).

In addition to sponsor fees and margins, interviewees indicated that project finance transactions have considerable deal set-up costs, averaging $1.1 million for most projects (regardless of size), but potentially ranging from $0.9 million to $1.7 million. Deal setup costs can include legal fees for both the sponsor and tax equity investor (which the sponsor may pay), any fees and closing costs on debt, fees paid to consultants (such as tax accountants and independent engineers), and, in some cases, payments to appraisers and tax equity syndicators. These sizable upfront costs partially contribute to the need for large transactions so as not to greatly diminish project economics. For smaller deals the WACC may not be nearly as impactful to the LCOE as a high developer fee and deal setup costs.

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[4] A "mini-perm" is a term debt product with a long-term amortization schedule but a short-dated maturity (typically 5–7 years), such that a large "balloon" payment is due when the maturity is up. This balloon payment may be refinanced into another 5–7 year mini-perm. For example, in a solar project with a 20-year power purchase agreement, the sponsor may take out a loan that has a 20-year principal and interest payment schedule, though the balance of principal and interest will be due in year six of the project. Lenders will typically not extend any debt to a sponsor or project up to the entire length of its contract.

[5] A forbearance agreement is a legal document signed by the lender and the tax equity investor that, essentially, stipulates that the lender will not foreclose on a significant portion of the project assets during the time that the project receives tax benefits. Were a lender to do so, it could jeopardize the tax equity's disposition as the "owner for tax purposes" in the eyes of the Internal Revenue Service, thus disqualifying it as a recipient for the investment tax credit and accelerated depreciation benefits.

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