



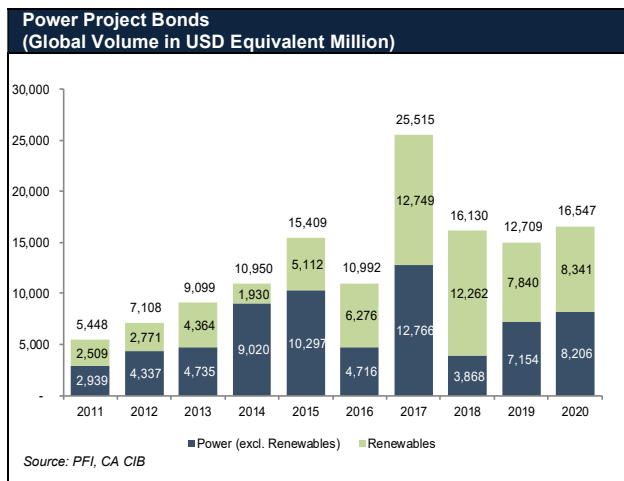
Project Bonds: Solar

Renewable Energy

The Capital Markets opened their doors to renewable energy projects with a wind Project Bond in 2003, followed by solar Project Bonds a few years later in 2010.

These trail-blazing transactions allowed investors to gain familiarity with the technologies, risks, and contractual arrangements related to renewable assets. They also paved the way for future issuances, as rating agencies started publishing specific methodologies dedicated to this newly accessible asset class.

Since the first Wind Project Bond in 2003, more than \$70.4BN has been issued on the back of renewables projects globally. Over the past decade, Renewable Project Bonds have grown to represent 49% of power Project Bonds and 14% of total Project Bonds across all asset types. In 2020 alone, renewable energy Project Bonds accounted for 50% of power Project Bonds, with \$8.3BN issued.

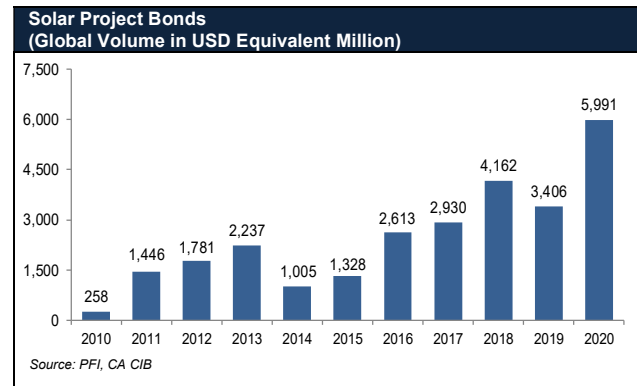


Renewable Project Bonds first gained traction in North America, followed by projects in Europe and Latin America, demonstrating the increasing comfort and global appetite among investors for renewable assets.

While renewables offerings have gained wider acceptance over time, there are challenges that need to be considered prior to approaching the Capital Markets. Lessons learned from past renewable financings can help ensure future successful executions.

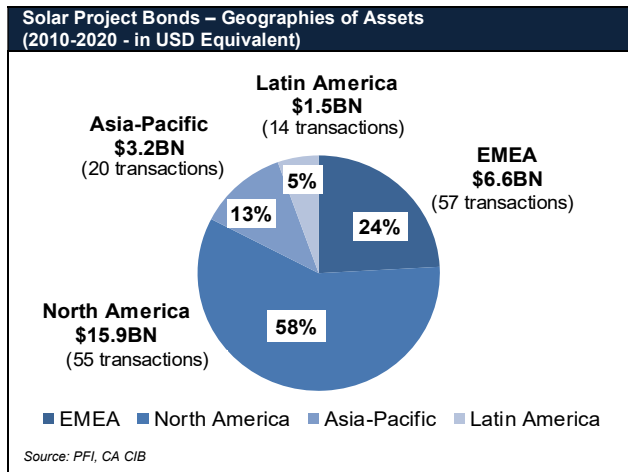
This article provides a historical review of the Project Bond market for solar assets globally, from utility-scale projects to commercial & industrial portfolios.

Solar Project Bonds



The first solar Project Bond issuance was the €196MM Andromeda Finance offering for a 51MW utility-scale PV Italian solar project in December 2010. In 2011, the \$702MM Project Bond for NextEra Genesis Solar, a single-site Concentrating Solar Power (CSP) project with a capacity of 250MW in California, marked the opening of the US Debt Capital Markets for solar projects. Since then, over \$27.2BN has been raised in 23 countries backing over 17.2GW of solar assets, with individual issuances ranging from €17MM to more than \$1,000MM. Solar Project Bonds have successfully been executed in 13 different currencies, out of which 60% have been issued in USD. Solar Project Bond issuance volume accounts for 19% of the power Project Bond market since 2010. In spite of the COVID-19 pandemic, 2020 was a record year for Solar Project Bonds with close to \$6.0BN issued in 28 transactions, a 76% increase from 2019.

North America is a highly active region for solar issuances, accounting for 58% of the total Solar Project Bond volume since 2010, with 55 out of the 146 transactions to-date taking place in the region. \$12.8BN has been issued for solar projects located in the United States, the global leader in Solar Project Bonds, while Canada is the third largest issuer with close to \$3.1BN.

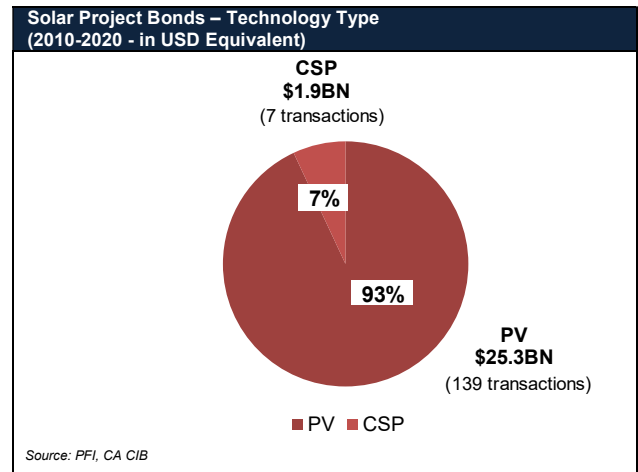


EMEA is the second largest region for Solar Project Bonds, with \$6.6BN in 57 offerings to-date. Spain is the main contributor to the region with \$3.9BN in 26 transactions and is the second largest issuer globally. The United Kingdom and Italy are also recurring issuers of Solar Project Bonds and hold the 5th and 6th global rank, respectively.

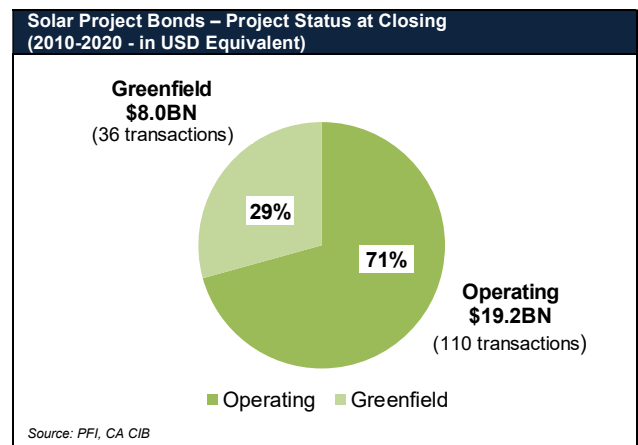
Outside North America and Europe, solar Project Bonds have been less common, but these financings are becoming increasingly frequent in Asia and Latin America.

In 2016, the ¥3,000MM offering for Aomori-Misawa, a 10MW operating solar farm, was the first Capital Markets transaction for an Asian solar project. Since then, \$3.2BN in 20 additional transactions have closed in Asia. India, is a key driver for the region with close to \$1.7BN in Solar Project Bonds, and the 4th largest issuer globally. Japan is also a recurring issuer with 10 offering to-date.

Latin America saw its first solar Project Bond placed in the international Capital Markets in 2018 with the issuance of \$65MM green Project Bonds to refinance construction bank debt for Invenergy’s 50MW La Jacinta solar PV farm in Uruguay. This inaugural issuance was followed shortly that same year with a \$110MM dual-tranche Project Bond to refinance the 76MW Naranjal and Del Litoral solar assets owned by Atlas Renewables, also in Uruguay. \$1.5BN have been recorded for Solar Project Bonds in Latin America until now, with issuances backing assets located in Brazil, Uruguay, Chile, Panama and Peru.



Solar projects rely on different technologies to convert sunlight into electricity. While Photovoltaic (“PV”), Concentrating Solar Power (“CSP”) and Concentrating Photovoltaic (“CPV”) technologies are the three main technologies available for utility-scale solar plants, projects relying on PV technology account for the overwhelming majority of the transactions to-date (94% of total issuance volume). Capital Markets participants have also financed parabolic trough systems, the most common form of CSP technology.



Many Project Bonds have financed greenfield projects, as both rating agencies and investors are comfortable with the low construction risk involved for solar projects. Also, the construction period is generally short, thus negative carry can be more easily mitigated. Project Bonds issued to refinance operating solar projects have also been successfully placed.

Project Bonds have allowed issuers to fully monetize solar projects’ offtake agreements and to partially monetize merchant cash flows with amortizing structures over the full tenor of their underlying contracts, e.g. without any tail versus their power purchase agreements (“PPAs”). Maturities of 20 years or more are the norm for this type of transaction, with average weighted lives above 10 years.

Trends and Highlights

A wide variety of utility-scale solar assets has been financed through the Project Bond market. Depending on the characteristics of the project, different structures have been successfully placed. The following section discusses some of these transactions, as well as current trends.

Financing Solar Technologies

The vast majority of utility-scale projects financed in the Capital Markets has used PV technology. PV technology directly converts sunlight into electricity through the acceleration of electrons in the PV cells. PV plants using crystalline silicon (c-Si) panels, including monocrystalline and polycrystalline, have been used for many years and are the most common technologies financed with Project Bonds.

CSP technology, while carrying a slightly higher complexity and operating risk, has also been financed through Project Bonds. A CSP project collects and concentrates the heat from the sun with highly reflective mirror panels and focuses the heat onto a receiver filled with a highly conductive fluid, such as synthetic oil. This fluid is then used to create steam and power a conventional steam turbine to generate electricity.

Another technology used for utility-scale solar projects is CPV technology. CPV directly converts sunlight into electricity, as PV does, but uses a lens system to concentrate the sunlight similar to CSP. To our knowledge, no projects relying on this technology have yet been financed in the Capital Markets.

Key technology risks include complexity of installation, degradation, commercial track record, and applicability of the solar technology in relation to the geography of the project. The technology and proposed design in solar assets financed with Project Bonds are typically reviewed by an independent engineer before launching the offering.

Approaching Technology Risk: Case Study

The first offering for a CSP project was the \$702MM issuance for NextEra Genesis Solar, a 250MW parabolic trough solar project in California. Issued in 2011, this transaction was also the first Capital Markets financing for a utility-scale solar project in the US.

The project consists of two 125MW parabolic trough solar fields and corresponding power blocks. The project is based on a Rankine power cycle with a reheat steam turbine generator designed to use solar radiation from parabolic trough technology. Two independently operated 140MW power blocks are fed thermal energy from solar collection systems. The solar panels capture and concentrate sunlight to heat synthetic oil, which then heats water to create steam. Steam is then pumped to an onsite turbine generator to produce electricity.

While the offering was rated AAA on the back of guarantees provided by the Department of Energy, Fitch considered the parabolic trough technology as proven and one of the oldest operating CSP technologies. Fitch also noted the sponsor's familiarity with this technology as a credit positive.

Construction Financing for Solar Assets

Capital Markets offerings have been successfully placed for greenfield projects. Construction of utility-scale solar project primarily includes permitting, procuring panels, installation and interconnection. The complexity of the overall design of a solar project tends to be relatively low compared to other power projects and the construction period is short, usually less than a year. For these reasons, investors and rating agencies are comfortable with construction risk and an investment-grade rating is achievable for greenfield projects.

Furthermore, sponsors typically secure comprehensive EPC contracts with experienced contractors. Fixed price, date certain contracts with adequate performance and delay liquidated damages (LD) clauses are standard in this industry, and are consistent with investment grade ratings.

Approaching Construction Risk: Case Study

In June 2013, Solar Star Funding issued \$1,000MM in series A senior secured notes to finance the construction of a 579MW PV project in California. Two locations were constructed in parallel over a two-year period. With \$2,740MM of construction budget, this project remains one of the largest ever financed in the Capital Markets.

The issuance was rated Baa3 / BBB- / BBB- by Moody's, Standard and Poor's and Fitch. The rating agencies noted the date-certain, fixed-price contract executed with SunPower, an experienced party, as a credit positive. The contract included milestone payments and a substantial early completion bonus payment if the project was completed ahead of schedule.

In March 2015, as the project was reaching completion ahead of schedule, Solar Star Funding issued \$325MM in series B senior secured notes (pari-passu with the series A) to repay part of the construction costs to the sponsor. Moody's and Fitch reaffirmed their initial ratings while S&P upgraded its rating by one notch to BBB.

Solar Project Bonds in New Geographies

While the vast majority of Solar Project Bonds have historically been issued for assets in North America and Europe, recent transactions in Asia and Latin America have demonstrated their applicability in new geographies.

New geographies: Case Study #1 (Asia)

Canadian Solar tapped the Japanese Capital Markets in 2016 to finance the 10MW PV Aomori-Misawa project with a ¥3,000MM issuance. The Project Bond had a two-year

grace period, a 20-year tenor, and was rated by a local rating agency. Incorporated in Canada, with the bulk of its operations in China, Canadian Solar had limited relationships with local banks and decided to rely on institutional investors instead. This transaction was the first asset-backed security arranged by a foreign sponsor in the Japanese solar market.

In 2016, following its initial successful transaction, Canadian Solar issued a ¥6,200MM private placement to finance a 21MW portfolio of solar projects in Japan. The issuance was bought by one institutional investor.

New geographies: Case Study #2 (LatAm)

In January 2018, La Jacinta SRL (a special purpose vehicle under the laws of Uruguay) issued \$64.75MM investment-grade Green Project Bonds, placed in the US private placement market, in order to refinance existing construction loans related to a fully-contracted 50MW solar PV farm in Uruguay.

The bonds were placed in the context of IDB Invest's A/B bond program. IDB Invest is the Inter-American Development Bank Group's private sector arm. The A/B bond structure entails a financing sequencing where an A/B loan is provided by a development bank to finance a project's construction with the participation of a commercial bank in the "B portion" of the facility, and a bond refinancing follows after project completion to take-out the commercial bank's commitment and reduce the development bank's long-term hold. This results in a "B bond" benefitting from the development bank's umbrella, as the B bond and the development bank loan tranche are pari-passu, senior secured debt obligations of the project company.

The Jacinta solar project benefits from a USD-denominated, 25-year, fixed-price, take-or-pay PPA with Uruguayan government-owned Administración Nacional de Usinas y Trasmisiones Eléctricas ("UTE").

The issue was the first "true" solar PV Project Bond issuance in Latin America (i.e. non-recourse, single-asset, utility scale) placed in the international capital markets and marked the third-ever A/B bond. Since then, over \$1.1BN Solar Project Bonds have been issued across 10 offerings in Latin America – from Brazil, Chile, Uruguay and Peru.

Private Offtaker Bonds

Utility-scale solar assets financed with Project Bonds are typically contracted through long-term Power Purchase Agreements ("PPAs") with an offtaker such as a utility or a public entity (State, municipality, etc.), thus providing cash flow visibility over the tenor of the offerings. Typically, Solar Project Bonds are structured as fully-amortizing offerings with legal maturities matching their underlying PPAs, without the need for a financing tail.

Issuers have also recently tapped the Capital Markets with Project Bonds related to solar assets benefitting from PPAs with private offtakers. Typically, these offtakers are creditworthy entities for whom the project has high strategic value, given the energy cost visibility they afford and increasingly-common carbon emission reduction targets for corporates. Project Bonds have allowed solar issuers to fully monetize private offtake agreements through amortizing structures over the full tenor of the underlying PPA, i.e. without any tail.

Private Offtakers: Case Study

In March 2020 (in spite of the COVID-19 pandemic), Atlas Renewable Energy issued \$253MM in 17-year, privately placed, green-labeled Project Bonds related to two projects in Chile: the 70MW operating solar PV asset Javiera Solar and the 230MW greenfield solar PV asset Sol del Desierto, which benefit from PPAs with one of Chile's largest copper mines (Minera Los Pelambres) and Engie Energia Chile S.A., respectively. This offering has been the largest Solar Project Bond from Latin America to-date.

The transaction evidenced investor appetite for private offtake risk, and demonstrated that having an unrated PPA counterparty (such as the Minera los Pelambres mine in Chile) is not a limiting factor to achieve an investment grade rating – the transaction was rated BBB- by Fitch.

Solar Project Bonds from Repeat Sponsors

Select sponsors who successfully executed solar financings in the Capital Markets, such as NextEra, Consolidated Edison, Canadian Solar and MidAmerican, have relied on Project Bonds for more than one of their projects.

This trend underlines the success of solar offerings since 2010 and the increased ease in executing such transactions, as market participants become more familiar with risks associated with solar projects.

Repeat Sponsor: Case Study #1

NextEra was one of the first issuers of Solar Project Bonds, in 2011, with the \$702MM senior secured notes for the NextEra Genesis Solar project, a 250MW parabolic trough project. The same year, NextEra tapped the Capital Markets for Desert Sunlight, a 550MW PV project in California, with a \$744MM senior secured offering. This private placement was closed alongside a syndicated loan to finance the construction of the solar project.

In 2014, NextEra relied on a HoldCo offering on the back of the Genesis Solar project with the \$280MM HoldCo Project Bond issued by Genesis Solar Funding LLC, the owner of the project.

Repeat Sponsor: Case Study #2

Consolidated Edison sponsored its first project bond issuance in March 2013 with \$219MM in senior secured notes for a greenfield 1,100MW PV solar plant in the US. Since this inaugural issuance, Consolidated Edison has acted as project sponsor on three additional Project Bond issuances in December 2015, April 2016, and May 2016 for operating PV solar plant assets across the US. For each issuance, Consolidated Edison has relied on the 4(a)(2) US Private Placement market for its solar projects and each issuance has been well-received by investors.

Back Leveraged Solar Project Bonds

Renewable projects in the US are sometimes partially financed by Tax Equity. Structures can be fairly complex and take the form of partnership flips or sale and leasebacks. Tax Equity investors are usually entitled to priority returns and most of the renewable tax benefits of the project, such as the Investment Tax Credit (ITC), and receive a larger share of cash flows in early years. The Managing Member, or sponsor, receives most of the cash flows in later years.

Project Bonds can be issued in this context, with distributions to the Managing Member used to repay investors. Project Bonds' due diligence tend to focus on priority returns to the Tax Equity investors and recapture risk, in case the tax benefits are not realized as anticipated.

Project Bond investors are getting increasingly comfortable with complex transactions involving solar assets in such back leverage structures.

Back leverage: Case Study

In November 2017, sPower issued its inaugural Project Bond on the back of Tax Equity funds, demonstrating investors' expertise in analyzing complex back leveraged transactions. sPower Finance I, LLC, the Holdco receiving Managing Member distributions issued \$421MM in senior secured notes backed by a diversified portfolio of 41 utility-scale renewable power projects in the US with aggregate capacity of 565MW. Of the 41 operating projects, 39 were PV solar projects (425MW) and two were wind power projects (140MW). Most assets were financed through partnership flip funds. The 4(a)(2) / Reg D offering achieved a BBB- rating and the proceeds were mainly used to refinance existing debt at the project levels.

Following a similar capital structure, sPower issued a \$499MM Project Bond in 2018 on the back of a solar portfolio.

Distributed Generation

Historically, solar Project Bonds have been issued for utility-scale projects, on the back of one or a small number of

assets. However, as solar developers invest and acquire smaller Commercial and Industrial ("C&I") assets or community solar assets, it creates an opportunity for solar Project Bonds secured by more granular portfolios.

Market participants usually refer to the C&I segment of the solar market for small to mid-size systems. These projects are typically developed for the benefit of municipalities, universities or small businesses, and can benefit from PPAs with unrated or non-investment grade offtakers. Systems installed on larger structures such as retail stores, malls, or factories, also fall into this segment.

C&I projects should not be confused with rooftop solar systems for residential homeowners. Such portfolios can also be financed in the Capital Markets, but usually in the ABS market. Please refer to our article titled "Solar ABS 101" for a review of these transactions.

C&I Portfolio: Case Study

In January 2020, Goldman Sachs Renewable Power ("GSRP"), an entity sponsored by Goldman Sachs Asset Management, successfully issued a \$500MM private placement on the back of a portfolio of C&I assets in the United States.

The approximately 500MW portfolio was composed of about 200 projects with capacity ranging from 1MW to 75MW. The projects were largely contracted through PPAs with a diverse group of offtakers, including investment-grade companies but also non-rated entities. The portfolio benefited from contracted revenues, Solar Renewable Energy Credits ("SREC") and merchant cash flows.

The Project Bond had a 25-year tenor and a 12-year average life. It was rated BBB by Fitch and placed in the 4(a)(2) / Reg D market. This issuance provides a relevant precedent for future Capital Markets transactions for C&I portfolios.

Community Solar and C&I Portfolio: Case Study

In October 2020, DG-CS Master Borrower Solar LLC, an entity sponsored by Clearway Energy Inc., successfully issued a \$467MM private placement secured by a portfolio of 172 solar projects in 14 states in the United States. The underlying portfolio included 90 community projects, 80 C&I projects, as well as 2 utility scale solar projects. This transaction is believed to be the first Solar Project Bond including community solar assets.

The senior secured notes, which were viewed as an NAIC-2 (BBB-), had a 19.5-year maturity and a 11.3-year weighted average life and priced at a spread of 275 bps on top of U.S. Treasuries, resulting in a 3.59% coupon.

Rating Agencies

Rating agencies approach solar financing by applying their generic project finance criteria complemented by solar-focused methodologies and commentary articles.

Rating agencies regularly update their methodologies as they rate new asset types and structures. For example, the development of various solar technologies has led to refined criteria by certain agencies to specifically address the risks associated with different technologies. Their criteria also evolved based on the performance of rated transactions.

The majority of rated solar projects achieved a “low” investment-grade rating. Investment grade offerings usually share the following main characteristics: PPA with investment grade counterparties, fully amortizing profile over the PPA tenor, proven technology, exposure to construction risk, experienced participants, 6 to 12-month Debt Service Reserve Accounts and Operation & Maintenance reserves. Items that may constrain the rating to below-investment grade include inadequate performance of solar technology/design, exposure to merchant risk, sub-investment-grade counterparties, and country risk. These particular aspects of the transaction do not necessarily prevent successful offerings but may require additional liquidity and credit enhancement.

The conclusions of the independent engineer and resource consultant are of paramount importance to rating agencies in their assessment of projects.

Of note, Fitch published updated criteria in March 2017 and lowered the DSCR guidance for PV solar. Indicative ratio guidance for such technology was lowered to 1.20x (from 1.30x previously) for contracted cash flows to support an investment-grade rating. DSCR guidance for merchant cash flows was also lowered. These adjustments were justified by observed performance of rated PV transactions, reflecting better generation performance with low volatility. Fitch, however, did not reduce its DSCR guidance for CSP projects, which remains at 1.40x on contracted cash flows.

For most projects, Fitch, like other rating agencies will continue to rely on P90 (1-year) generation for its rating case.

Standard & Poor’s has also indicated that PV solar project with solid on-site measurements to assess the solar resource can achieve an investment-grade rating with minimum and average DSCRs of 1.20x on P90 (1-year) on adjusted contracted cash flows. Other agencies maintain a view that DSCRs of 1.20x to 1.40x on P90 (1-year) on adjusted contracted cash flows are consistent with investment-grade ratings.

The table on the following page presents the main sizing criteria and structural features consistent with investment-

grade ratings for Fitch, Standard and Poor’s, Moody’s, DBRS, and Kroll.

Conclusion

Since 2010, the Capital Markets have welcomed solar Project Bonds for different technologies and geographies. An increasing number of sponsors, eager to expand their sources of liquidity for the development of utility-scale solar projects, continue to tap the Capital Markets. In particular, growth in the distributed solar market, and recent successful issuances backed by such assets, should provide a solid driver for solar Project Bonds volume in the years to come.

Investor appetite remains strong in North America and Europe, and recent successful transactions in Asia and Latin America suggest that the horizon for solar Project Bond will continue to expand.

Rating Criteria for Investment-Grade Solar Offerings

	Fitch	Standard & Poor's	Moody's	DBRS	Kroll
Applicable Methodologies and Select Research	<ul style="list-style-type: none"> "Infrastructure and Project Finance Rating Criteria" (Mar 2020) "Renewable Energy Project Rating Criteria" (Jan 2021) 	<ul style="list-style-type: none"> "Project Finance Framework Methodology" (Sep 2014) "Key Rating Factors for Power Project Financings" (Sep 2014) "Approach to Rating Renewable Energy Project Finance Transactions" (Apr 2015) 	<ul style="list-style-type: none"> "Generic Project Finance Methodology" (Nov 2019) "Power Generation Projects" (Jul 2020) 	<ul style="list-style-type: none"> "Rating Project Finance" (Sep 2020) "Rating Solar Power Projects" (Sep 2020) 	<ul style="list-style-type: none"> "Global Project Finance Rating Methodology" (Jan 2021)
DSCR Indication for Investment Grade Rating	<ul style="list-style-type: none"> P90 (1-year) generation Additional specific adjustments to cash flows Min DSCR \geq 1.20x for adjusted contracted cash flows (PV) Min DSCR \geq 1.60x for adjusted merchant cash flows (PV) Min DSCR \geq 1.40x for adjusted contracted cash flows (CSP) Min DSCR \geq 1.80x for adjusted merchant cash flows (CSP) 	<ul style="list-style-type: none"> P90 (1-year) generation Min DSCR \geq 1.20x for contracted cash flows (PV) Min DSCR \geq 1.40x for contracted cash flows for other technologies Min DSCR \geq 1.75x for merchant cash flows 	<ul style="list-style-type: none"> P90 (1-year) or P95 (1-year) generation Min DSCR \geq 1.40x for contracted cash flows Min DSCR \geq 2.00x for merchant cash flows 	<ul style="list-style-type: none"> P90 (1-year) generation Min DSCR \geq 1.25x for solar contracted cash flows Limited exposure to merchant revenues considered, subject to commensurably higher DSCR Conservative or worst-case electricity price forecasts in calculating the DSCR if revenues include merchant component 	<ul style="list-style-type: none"> Generation assumption not specified Min DSCR \geq 1.20x for contracted cash flows
Base Case Assumptions and Adjustments	<ul style="list-style-type: none"> Energy production haircut: 0% to 10% Annual panel degradation 0.3% to 2.5% Grid curtailment adjustment (as informed by a third-party assessment) Availability: informed by third-party assessment and peer analysis O&M costs: increase of up to 20% over base case expenses Other adjustments may be applied on a case by case basis 	<ul style="list-style-type: none"> Inflation rate: 2% Degradation (PV): 0.50% to 1.3% Availability (PV): 94% to 98.5% O&M cost: increase of 5% to 12% over pro forma costs Other adjustments may be applied on a case by case basis 	<ul style="list-style-type: none"> No specific adjustments / assumptions specified for Base Case scenario Adjustments may be applied on a case by case basis 	<ul style="list-style-type: none"> No specific adjustments / assumptions specified for Base Case scenario Adjustments may be applied on a case by case basis 	<ul style="list-style-type: none"> No specific adjustments / assumptions specified for Base Case scenario Adjustments may be applied on a case by case basis
Other Structural Considerations	<ul style="list-style-type: none"> 6-month Debt Service Reserve Account Operation & Maintenance Account as informed by third-party Distribution Test 	<ul style="list-style-type: none"> 6-month Debt Service Reserve Account 6-month Operation & Maintenance Account Distribution Test 	<ul style="list-style-type: none"> 6-month Debt Service Reserve Account 6-month Operation & Maintenance Account Distribution Test 	<ul style="list-style-type: none"> 6 to 12-month Debt Service Reserve Account 6 to 12-month Operation & Maintenance Account Distribution Test 	<ul style="list-style-type: none"> 6 to 12-month Debt Service Reserve Account 6 to 12-month Operation & Maintenance Account Distribution Test

Source: Rating Agencies, CA CIB

Solar Project Bond - Global Issuances To-Date

Issuer	Sponsor(s)	Capacity (MW)	Type	Project Status	Country	Geographic Region	Currency	Size (MM)	Tenor (Years)	WAL (Years)	Coupon	Credit Ratings (Moody's / S&P / Fitch)	Closing Date
Citizen Energy Solar DG Portfolio	Citizen Energy	--	PV	Operating	United States	North America	USD	58	--	--	--	--	Dec-20
Hudson Uruguayan Solar Portfolio	Hudson Sustainable Group	84	PV	Operating	Uruguay	Latin America	USD	97	22.0	15.0	4.650%	NAIC-2 (BBB-)	Dec-20
Alternus' PV Portfolio	Alternus Energy Group	153	PV	Greenfield	Germany, Italy, the Netherlands and Romania	EMEA	EUR	110	--	--	--	--	Dec-20
UEP Penonome II *	InterEnergy Group	255	PV	Operating	Panama	Latin America	USD	263	18.0	--	6.500%	Ba3 / -- / --	Dec-20
Clean Energy Infrastructure	Capital Dynamics	316	PV	Operating	United States	North America	USD	408	24.0	9.2	3.300%	NAIC-2 (BBB-)	Nov-20
Solaria Energia y Medio Ambiente	Solaria	23	PV	Operating	Uruguay	Latin America	USD	30	20.0	--	--	-- / BBB / --	Nov-20
DG-CS Master Borrower Solar LLC	Clearway Energy Inc	--	PV	Operating	United States	North America	USD	467	19.5	11.3	3.590%	NAIC-2 (BBB-)	Oct-20
Western Vista Solar	Duke Energy Renewables	360	PV	Operating	United States	North America	USD	135	19.5	13.1	3.460%	BBB (Kroll)	Oct-20
Utah Solar Holdings	Clearway Energy	585	PV	Operating	United States	North America	USD	296	16.0	10.0	3.950%	BBB- (Kroll)	Sep-20
TerraForm Phoenix I LLC	Brookfield Renewable Partners	250	PV	Operating	United States	North America	USD	296	23.3	9.6	3.300%	NAIC-2 (BBB-)	Sep-20
MKM European Solar Portfolio Mezzanine	MKM Invest Group	579	PV	Greenfield	Germany, Spain, France	EMEA	EUR	106	--	--	--	--	Sep-20
Bulgarian Solar Project	Energy	--	PV	Operating	Bulgaria	EMEA	EUR	95	11.0	--	2.750%	--	Sep-20
Atlantica CSP Helienergy I & II	Atlantica Yield	100	CSP	Operating	Spain	EMEA	EUR	326	17.0	10.0	1.900%	-- / AA / --	Aug-20
Kuala Muda Solar PV Portfolio	Leader Energy	49	PV	Operating	Malaysia	Asia-Pacific	MYR	260	--	--	--	--	Aug-20
Atlantica CSP Helienergy I & II	Atlantica Yield	100	CSP	Operating	Spain	EMEA	EUR	326	17	10	1.900%	-- / AA / --	Au-20
Malpartida PV	Grupo Cyopsa	12	PV	Operating	Spain	EMEA	EUR	30	--	--	--	--	Jun-20
FSL Issuer S.A.U.	Q-Energy (Qualitas Equity)	65	PV	Operating	Spain	EMEA	EUR	304	21.0	--	--	-- / AA / --	Jun-20
Risen Yarranlea Solar PV Project	Risen Energy	134	PV	Greenfield	Australia	Asia-Pacific	AUD	90	20.0	--	--	IG	May-20
Guaimbe and Ouroeste Solar	AES Tiete	241	PV	Operating	Brazil	Latin America	BRL	820	10.0	--	--	--	May-20
Q-Energy Silver Solar Portfolio	Q-Energy (Qualitas Equity)	7	PV	Operating	Spain	EMEA	EUR	10	--	--	--	--	Mar-20
Q-Energy Iron Solar Portfolio	Q-Energy (Qualitas Equity)	24	PV	Operating	Spain	EMEA	EUR	22	--	--	--	--	Mar-20
Hancock HoldCo US Renewable Portfolio *	John Hancock Infrastructure Funds and Exelon Generation Co LLC	--	PV	Greenfield	United States	North America	USD	130	--	5.0	3.000%	BBB- (Kroll)	Mar-20
Alton Road Solar PV Plant	Reivity Energy	18	PV	Operating	United States	North America	USD	32	--	--	--	--	Mar-20
Dracena Solar PV Plants	Total Eren	90	PV	Greenfield	Brazil	Latin America	BRL	350	17.0	--	--	--	Mar-20
Atlas Chilean Solar Portfolio	Atlas Renewable Energy (Actis)	300	PV	Greenfield	Chile	Latin America	USD	253	17.0	10.0	--	-- / -- / BBB-	Mar-20
Pride Investments SA	Q-Energy (Qualitas Equity)	--	PV	Operating	Spain	EMEA	EUR	342	21.0	--	1.541%	-- / AA / --	Feb-20
GSRP Portfolio I	Goldman Sachs Asset Management	--	PV	Operating	United States	North America	USD	500	25.0	12.1	3.770%	-- / -- / BBB	Feb-20
SFO RuSol 1 LLC	Solar Systems	--	PV	Greenfield	Russia	EMEA	RUB	5,700	--	--	--	--	Feb-20

* Includes Wind Assets

Solar Project Bond - Global Issuances To-Date

Issuer	Sponsor(s)	Capacity (MW)	Type	Project Status	Country	Geographic Region	Currency	Size (MM)	Tenor (Years)	WAL (Years)	Coupon	Credit Ratings (Moody's / S&P / Fitch)	Closing Date
ReNew Power Renewable Portfolio *	Consortium	--	PV	Operating	India	Asia-Pacific	USD	450	7.1	5.5	5.875%	-- / BB- / BB-	Jan-20
Hong Phong 1A Solar	Vietracimex	195	PV	Operating	Vietnam	Asia-Pacific	VND	12,500,000	15.0	--	7.500%	-- / AA / --	Jan-20
Hong Phong 1A Solar	Vietracimex	195	PV	Operating	Vietnam	Asia-Pacific	VND	400,000	5.0	--	--	-- / AA / --	Jan-20
Adani Green Energy Portfolio	Adani Green Energy	570	PV	Operating	India	Asia-Pacific	USD	363	20.0	13.5	4.625%	IG	Dec-19
Bothwell Spain SA	T-solar, Meag, KKR	127	PV	Operating	Spain	EMEA	EUR	268	19.0	--	--	--	Dec-19
Tajimi Solar PV Plant	Renewable Japan	23	PV	Greenfield	Japan	Asia-Pacific	JPY	11,000	21.5	--	--	--	Dec-19
Rosales Solar Holding Inc	--	--	PV	Greenfield	United States	North America	USD	209	30.0	21.0	4.090%	-- / BBB- / --	Dec-19
Q-Energy 26MW Solar PV Portfolio	Q-Energy (Qualitas Equity)	26	PV	Operating	Spain	EMEA	EUR	130	19.0	--	2.300%	--	Oct-19
CED California Holdings IV LLC	Con Edison	247	PV	Operating	United States	North America	USD	303	19.2	11.4	3.820%	NAIC-2	Oct-19
Cypark Ref Sdn Bhd	Cypark Resources Berhad	30	PV	Greenfield	Malaysia	Asia-Pacific	RM	550	3.0-21.0	--	4.600%-5.990%	AA3 (RAM)	Oct-19
Edra Solar	Edra Power Holdings (China General Nuclear Power)	50	PV	Operating	Malaysia	Asia-Pacific	RM	245	3.0-18.0	--	3.950% - 5.050%	AA2 (RAM)	Oct-19
Adani Indian Solar Portfolio	Adani Green Energy	570	PV	Operating	India	Asia-Pacific	USD	363	20.0	13.5	4.625%	Baa3 / BBB- / BBB-	Oct-19
Q-Energy Spanish Solar Portfolio	Q-Energy (Qualitas Equity)	14	PV	Operating	Spain	EMEA	EUR	38	21.0	Amortizing	--	--	Sep-19
Hermes Infrastructure Solar Portfolio	Hermes Infrastructure	35	PV	Operating	United Kingdom	EMEA	GBP	58	--	--	--	--	Aug-19
Ergon Peru S.A.C.	Tozzi Green and Gardini	28	PV	Greenfield	Peru	Latin America	USD	222	15.0	--	4.870%	--	Jul-19
Niigata Solar	Etrion	45	PV	Greenfield	Japan	Asia-Pacific	JPY	16,000	20.0	--	1.200%	BBB (R&I)	Jul-19
Izcalli Investments Spanish Solar Portfolio	Q-Energy (Qualitas Equity)	46	PV	Operating	Spain	EMEA	EUR	207	19.0	--	2.200%	-- / AA / --	Jun-19
JSC's Polish Solar Portfolio	Lords LB Asset Management	66	PV	Greenfield	Poland	EMEA	EUR	30	--	--	--	--	Jun-19
Adani Green Energy	Adani Green Energy	--	PV	Operating	India	Asia-Pacific	USD	500	5.5	--	6.250%	Baa3 / BBB- / BBB-	Jun-19
CAAB Energia Italian Solar Portfolio	Filizola and Pagano & Ascolillo	6	PV	Operating	Italy	EMEA	EUR	8	14.0	--	4.970%	--	Jun-19
Archimede Sicily CSP Plant	Archimede	1	CSP	Greenfield	Italy	EMEA	EUR	5	23.0	--	6.070%	--	May-19
Citizens Energy Solar PV Portfolio	Citizens Energy	27	PV	Greenfield	United States	North America	USD	44	--	--	--	--	May-19
JSC's Polish Solar Portfolio	Lords LB Asset Management	--	PV	Greenfield	Poland	EMEA	EUR	30	--	--	--	--	May-19
Springbok 3	Capital Dynamics	121	PV	Greenfield	United States	North America	USD	--	--	--	--	--	Apr-19
Noboribetsu Solar Project	Renewable Japan	22	PV	Greenfield	Japan	Asia-Pacific	YEN	8,900	22.0	--	+150bps	BBB (Japan's rating)	Feb-19
Arlington Valley PV Solar	LS Power	127	PV	Operating	United States	North America	USD	171	19.9	--	--	A (Kroll)	Dec-18

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Centinela Solar Energy	LS Power	170	PV	Operating	United States	North America	USD	180	15.6	--	--	Baa1 / -- / --	Dec-18
Cordelio AmalCo LP I *	Canada Pension Plan Investment Board	246	PV	Operating	Canada	North America	CAD	425	15.7	--	--	--	Nov-18
Cordelio AmalCo LP I *	Canada Pension Plan Investment Board	246	PV	Operating	Canada	North America	CAD	433	15.5	--	--	--	Nov-18
Eliantus Energy's PVs	JZI and Elliott Advisors	43	PV	Operating	Spain	EMEA	EUR	67	23.0	--	3.723%	--	Nov-18
TerraForm Power DG + Utility Solar Portfolio	TerraForm Power	--	PV	Operating	United States	North America	USD	79	14.0	--	4.460%	--	Sep-18
Aurora Solar	Osaka Gas USA and Diamond Generating Corp	74	PV	Operating	Canada	North America	CAD	309	15.0	8.0	4.113%	-- / -- / BBB-	Sep-18
Cerberus' Spanish Solar Portfolio	Cerberus Capital Management	42	PV	Operating	Spain	EMEA	EUR	167	19.0	--	3.290%	BBB-	Sep-18
Sobral I Solar	Global Power Generation	36	PV	Operating	Brazil	Latin America	BRL	135	15.0	--	NTN-B + 195bps	brAAA (Fitch)	Sep-18
Sertão I Solar	Global Power Generation	32	PV	Operating	Brazil	Latin America	BRL	130	14.3	--	NTN- B + 120bps	brAAA (Fitch)	Sep-18
Pirapora I PV Solar Plant	EDF Energies Nouvelles and Canadian Solar	192	PV	Operating	Brazil	Latin America	BRL	220	16.0	--	IPCA + 5,766%	brA+ (Fitch)	Aug-18
sPower Finance 2, LLC	sPower	652	PV	Operating	United States	North America	USD	499	23.5	13.8	4.960%	Ba2 / -- / --	Jul-18
NE Antares HoldCo	--	--	PV	Operating	United States	North America	USD	23	18.8	11.5	4.826%	Baa3 / -- / --	Jul-18
Naranjal/Litoral	Atlas Renewable Energy	76	PV	Operating	Uruguay	Latin America	USD	11	15.0	9.4	6.750%	--	Jun-18
Naranjal/Litoral	Atlas Renewable Energy	76	PV	Operating	Uruguay	Latin America	USD	98	24.0	15.3	5.750%	--	Jun-18
8point3 YieldCo	8point3 Energy	718	PV	Operating	United States	North America	USD	760	26.0	--	T+185bps	--	Jun-18
8point3 YieldCo	8point3 Energy	718	PV	Operating	United States	North America	USD	411	17.5	--	T+175bps	--	Jun-18
Sonnedix Portfolio	Sonnedix and Q-Energy	30	PV	Operating	Spain	EMEA	EUR	140	19.0	--	--	Private	Jun-18
Toba PV Solar Plant	Renewable Japan Co.	17	PV	Operating	Japan	Asia-Pacific	JPY	6,900	22.0	--	--	Private	Apr-18
Ontario Solar Holdings LP	SkyPower Operations Limited	30	PV	Operating	Canada	North America	CAD	105	14.0	--	4.220%	-- / -- / BBB-	Apr-18
Northland Solar Finance One	Northland Power	60	PV	Operating	Canada	North America	--	--	--	--	4.397%	Baa3 / -- / --	Mar-18
Q-Energy	Q-Energy	7	PV	Operating	Spain	EMEA	EUR	38	19.0	--	3.496%	Private	Jan-18
La Jacinta Solar Farm Finance	Invenergy	50	PV	Operating	Uruguay	Latin America	USD	65	24.5	14.5	T+300bps	Baa3 / -- / --	Jan-18
T-Solar Group Spanish Solar PV Portfolio	T-Solar Group	34	PV	Operating	Spain	EMEA	EUR	118	19.5	--	3.152%	BBB-	Jan-18
Canadian Solar Portfolio	Canadian Solar	52	PV	Operating	United Kingdom	EMEA	GBP	42	17.0	--	--	--	Jan-18
Solaria Project	Solaria	--	PV	Operating	Spain	EMEA	EUR	9	22.0	--	4.150%	BBB-	Jan-18

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Solar Project Bond - Global Issuances To-Date (Continued)

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Sungem Holding	Amplio Energy	--	PV	Operating	Italy	EMEA	EUR	70	12.0	--	--	Unrated	Dec-17
Southgate Solar	Connor, Clark and Lunn Infrastructure	50	PV	Operating	Canada	North America	USD	171	18.0	--	4.159%	Unrated	Dec-17
Windsor Solar	Connor, Clark and Lunn Infrastructure	50	PV	Operating	Canada	North America	USD	188	18.0	--	4.159%	Unrated	Dec-17
sPower Portfolio *	sPower	565	PV	Operating	United States	North America	USD	421	--	--	4.550%	BBB-	Nov-17
Tottori	Canadian Solar	27	PV	Operating	Japan	Asia-Pacific	JPY	7,400	1.5	Bullet	1.273%	A (JCR)	Nov-17
Azure Sun	Pensions Infrastructure Platform	29	PV	Operating	United Kingdom	EMEA	GBP	20	18.5	--	0.427% to 3.145%	Private	Oct-17
Australia's New Energy Solar	Consortium	--	PV	Operating	United States	North America	USD	63	24.0	13.2	--	Private	Oct-17
X-Elio Spanish portfolio	X-Elio	33	PV	Operating	Spain	EMEA	EUR	93	23.0	--	3.840%	Private	Sep-17
Sonnedix Spanish portfolio	Sonnedix	18	PV	Operating	Spain	EMEA	EUR	74	19.5	--	3.429%	Private	Sep-17
Renewable Japan	Renewable Japan Co.	15	PV	Greenfield	Japan	Asia-Pacific	JPY	4,670	23.0	--	--	Private	Aug-17
CSolar West's project in Imperial County	CSolar West	150	PV	Operating	United States	North America	USD	401	23.0	12.2	3.850%	BBB (Kroll)	Aug-17
Magacela Solar 1 SL	Solaria	10	PV	Operating	Spain	EMEA	EUR	47	20.0	--	3.769%	Private	Aug-17
High Noon Solar	Duke Energy	--	PV	Operating	United States	North America	USD	233	19.0	12.5	4.100%	BBB- (Kroll)	Jul-17
Moapa Southern Paiute Solar InvestCo	AllianzGI	250	PV	Operating	United States	North America	USD	208	24.0	--	5.230%	Private	Jun-17
Alamo 6 Holdings LLC	OCI Solar Power	110	PV	Operating	United States	North America	USD	225	24.9	13.5	4.170%	NAIC-2	Apr-17
Parque Solar Cuz Cuz	Solek	3	PV	Operating	Chile	Latin America	USD	20	5.0	--	6.200%	Private	Apr-17
Mibu Solar Way	JAG Energy	17	PV	Greenfield	Japan	Asia-Pacific	JPY	5,400	9.0	--	--	A	Mar-17
Econergy Solar Plants	Econergy	35	PV	Operating	Italy	EMEA	EUR	12	--	--	--	Private	Mar-17
Planta Solar Puertollano 6	Solaria	10	PV	Operating	Spain	EMEA	EUR	45	20.5	--	3.750%	BBB- (Axesor)	Mar-17
NextEnergy Solar Fund	Guernsey	241	PV	Operating	United Kingdom	EMEA	GBP	63	18.5	--	--	Private	Feb-17
Ahana Operations	ATN International	--	PV	Operating	United States	North America	USD	66	12.0 & 14.0	--	--	Private	Feb-17
CED Upton County Solar	Consolidated Edison	150	PV	Greenfield	United States	North America	USD	97	--	--	--	Private	Jan-17
Azienda Solare Italiana	Quercus	84	PV	Operating	Italy	EMEA	EUR	125	13.5	--	3.054% and Euribor +250bps	Private	Jan-17
Brainwave Solar Portfolio	Consortium	--	PV	Operating	France	EMEA	EUR	121	--	--	--	Private	Dec-16
Globasol Villanueva	Solaria	10	PV	Operating	Spain	EMEA	EUR	45	21.0	--	4.200%	Private	Dec-16
Celeo Fotovoltaico SA	Celeo Redes	15	PV	Operating	Spain	EMEA	EUR	42	21.5	--	3.948%	Private	Dec-16
Sonnedix	JP Morgan (Sonnedix)	68	PV	Operating	Italy	EMEA	EUR	95	14.0	--	Euribor + 230bps	Private	Dec-16

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Solar Project Bond - Global Issuances To-Date (Continued)

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Spex Solar	Consortium	20	PV	Operating	Spain	EMEA	EUR	107	20.0	--	--	Private	Oct-16
Kingston Solar	Samsung C&T	--	PV	Operating	Canada	North America	CAD	633	19.0	10.0	3.570%	Private	Oct-16
Canadian Solar Portfolio	Canadian Solar	--	PV	Greenfield	Japan	Asia-Pacific	JPY	6,200	--	--	--	Private	Aug-16
TS Energy	Zhongli Talesun Solar	--	PV	Operating	Italy	EMEA	EUR	40	16.0	--	4.200%	Private	Aug-16
Finsterwalde II/III Solar	Talanx	40	PV	Operating	Germany	EMEA	EUR	51	13.0	--	--	Private	Jul-16
Fonroche Energie	--	82	PV	Operating	France	EMEA	EUR	25	5.0	--	--	Private	Jul-16
Andasol 1 & 2	Antin Solar, DBAM and ACS	100	CSP	Operating	Spain	EMEA	EUR	90	15.0	--	--	Private	Jun-16
Grand Renewable Solar LP	CCLI, Samsung, and Six Nations	100	PV	Operating	Canada	North America	CAD	613	19.0	9.6	3.926%	Private	Jun-16
Vela Energy	Centerbridge Partners	100	PV	Operating	Spain	EMEA	EUR	404	20.0	--	3.195%	-- / BBB / --	Jun-16
Solaria Project	Solaria	10	PV	Operating	Spain	EMEA	EUR	45	21.0	--	4.200%	-- / BBB- / --	May-16
Foresight Solar Fund	Foresight	--	PV	Operating	United Kingdom	EMEA	GBP	63	18.0	--	--	Private	Apr-16
ConEd California Holdings 3	Consolidated Edison	--	PV	Operating	United States	North America	USD	95	20.0	12.0	4.070%	NAIC-2	Apr-16
ConEdison Development	Consolidated Edison	106	PV	Operating	United States	North America	USD	218	25.0	--	--	Private	Mar-16
Aomori-Misawa	Canadian Solar	--	PV	Operating	Japan	Asia-Pacific	YEN	3,000	20.0	--	1.400%	A (Japan CRA)	Mar-16
ConEdison Development	Consolidated Edison	--	PV	Operating	United States	North America	USD	159	25.0	14.3	4.530%	NAIC-2	Dec-15
Etrion Solar PV Portfolio	Etrion	54	PV	Operating	Italy	EMEA	EUR	35	14.0	--	Euribor + 225bps	Private	Dec-15
Lightsource	Lightsource	101	PV	Operating	United Kingdom	EMEA	GBP	284	8.0 & 22.0	--	--	Private	Nov-15
Solaben 1 & 6	Abengoa	250	CSP	Operating	Spain	EMEA	EUR	285	19.0	10.0	3.758%	-- / BBB / --	Sep-15
Solar Star Funding	MidAmerican	579	PV	Greenfield	United States	North America	USD	325	20.0	12.5	3.950%	Baa3 / BBB / BBB-	Mar-15
Primrose Solar Portfolio	Primrose Solar	39	PV	Operating	United Kingdom	EMEA	GBP	29	18.5	--	--	Private	Jan-15
Antin Solar Investments	Antin Solar	66	PV	Operating	Italy	EMEA	EUR	85	14.0	--	3.371%	Private	Nov-14
Northland Power Solar Finance One LP	Northland Power	60	PV	Operating	Canada	North America	CAD	232	18.0	9.3	4.397%	BBB (high)	Oct-14
Enerparc	Enerparc	52	PV	Operating	Germany	EMEA	EUR	17	10.0	Bullet	4.750%	Private	Jul-14
Genesis Solar Funding LLC	NextEra	250	CSP	Operating	United States	North America	USD	280	24.0	13.0	5.600%	NAIC-2 (BBB- Fitch)	Jun-14
Borealis Canada Solar Portfolio	Recurrent	108	PV	Greenfield	Canada	North America	USD	390	C + 19.0	--	--	Private	Jan-14
Csolar South	Tenaska	130	PV	Operating	United States	North America	USD	316	25.0	12.0	5.370%	NAIC-2 (BBB-)	Nov-13
Solar Star Funding	MidAmerican	579	PV	Greenfield	United States	North America	USD	1,000	22.0	14.7	5.375%	Baa3 / BBB- / BBB-	Jun-13

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Foresight Solar Fund	Foresight	--	PV	Operating	United Kingdom	EMEA	GBP	60	21.0	--	--	Private	May-13
Moapa Solar Project	K Road Power Holdings	350	PV	Greenfield	United States	North America	USD	250	12.0	10.0	5.500%	NAIC-2 (BBB- Kroll)	Apr-13
Touwsrivier	Soitec	44	CSP	Greenfield	South Africa	EMEA	ZAR	1,000	16.0	0.0	11.000%	Baa2.za (Moody's)	Apr-13
Topaz Solar Farms LLC	MidAmerican	550	PV	Greenfield	United States	North America	USD	250	26.0	14.0	4.875%	Baa2 / BBB / BBB	Apr-13
Consolidated Edison	Consolidated Edison	1,100	PV	Greenfield	United States	North America	USD	219	24.0	15.0	4.780%	NAIC-2 (BBB+)	Mar-13
Solar Power Generation	Solar Power Generation Ltd.	10	PV	Operating	United Kingdom	EMEA	GBP	40	24.0	--	3.610%	Private	Nov-12
Imperial Valley Solar	AES	266	PV	Greenfield	United States	North America	USD	416	25.7	14.6	6.000%	NAIC-2 (Baa3/BBB-equivalent)	Nov-12
Centinela Solar Energy Project	LS Power	170	PV	Greenfield	United States	North America	USD	275	22.0	--	5.600% (fixed) / 5.800% (delayed)	Private	Oct-12
St. Clair Holding	NextEra	40	PV	Operating	Canada	North America	CAD	172	19.0	10.0	4.880%	Private	Sep-12
Topaz Solar Farms LLC	MidAmerican	550	PV	Greenfield	United States	North America	USD	850	28.0	15.5	5.750%	Baa3 / BBB- / BBB-	Feb-12
Desert Sunlight	NextEra and GE	550	PV	Greenfield	United States	North America	USD	744	25.0	--	5.506%	-- / -- / AA+	Aug-11
NextEra Genesis Solar	NextEra	250	CSP	Greenfield	United States	North America	USD	702	26.5	--	3.875% to 5.125%	AAA (DOE Backed) / A- (Uncovered)	Aug-11
Andromeda Finance	SunPower	44	PV	Greenfield	Italy	EMEA	EUR	196	18.0	--	4.839% to 5.715%	Baa3 / -- / -- Aa2 / -- / --	Dec-10

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