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US SOLAR – WHITE PAPER

Contents

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Re-imagining US solar financing

US solar projects have historically been bankrolled by some combination of energy sector players, banks, and the federal government, but the landscape is rapidly changing. New business models are emerging with an emphasis on third-party financing. New investors, including institutional players, are entering. And new financing vehicles such as project bonds and other securities are being assembled to tap the broader capital markets. This report, commissioned by Reznick Group and undertaken by Bloomberg New Energy Finance, describes the ongoing evolution of US solar financing: where the market is today, where it is heading, and what's behind this important transition.

- *Maintaining US solar deployment growth will require substantially more investment.* Asset financing for US photovoltaic (PV) projects has grown by a compound annual growth rate of 58% since 2004 and surged to a record $21.1bn in 2011, fuelled by the one-year extension of the Department of Treasury cash grant programme. But funding the next nine years of growth (2012-20) for US PV deployment will require about $6.9bn annually on average.

- *Traditional players are taking a smaller role.* Regulations, primarily in the EU, are curtailing banks from providing long-term debt as easily as previously. In the US, the Department of Energy loan guarantee programme's expiry has meant less direct federal government support.

- *New models are emerging.* Distributed generation is driving innovation and creating new models for solar deployment. Few homeowners can afford the upfront cost of a solar system, giving rise to third-party financing models, which allow them to 'go solar' with little or no money down. These models also give investors a diversified opportunity to back solar.

- *New investors are taking interest.* Institutional players such as insurance companies and pension funds seek stable, long-lived assets to match long-term liabilities; some utilities may seek solar portfolios to offset revenue loss from distributed generation. On the development side, infrastructure funds could achieve targeted returns by bringing these projects to fruition.

- *New vehicles are taking shape.* Such structures aim to make solar project investments more liquid by allowing developers to tap the capital markets. Options include project bonds, solar real estate investment trusts (S-REITs), public solar ownership funds ('yieldcos'), and others.

- *The cost of capital will fall*. Solar equipment prices have dropped by more than half since the start of 2011 but financing costs matter too. New financing vehicles and new investors across the solar project lifecycle – development, construction, commissioning, and then long-term operation of assets – will cause the costs of equity, debt, and even tax equity to migrate down.

- *This is happening now*. Institutional investors have bought solar bonds; publicly listed renewable asset funds exist; solar portfolios are poised for securitisation; and pension funds have shown willingness to buy and own renewable assets.

- *Policy could accelerate change.* Surveyed investors seek stronger SREC programmes, new standards, more flexible tax credits, and sanctioned high-liquidity vehicles such as S-REITs.

1. INTRODUCTION

Energy industry players, banks, and the federal government have met the majority of the solar sector's project finance needs to date. But the landscape today is changing.[1]

This evolution is being driven by two factors. First, traditional players are scaling back their participation. Constrained by regulatory requirements and by the continent's financial crisis, eurozone banks are offering loans of shorter duration and with slightly wider spreads over LIBOR. In the US, a key Department of Energy loan guarantee programme lapsed in 2011 making less low-priced capital available for large-scale projects.

Second, thanks to the continuing low-interest rate environment, non-traditional investors are becoming more interested, lured by the risk/return profiles of solar projects that employ well proven PV technology. Motivated by attractive yields and the examples set by Chevron and Google, US corporations are eyeing forays into tax equity. Pension funds and insurance companies are willing to give solar projects a serious look in the wake of the successful bond issuance for a solar project owned by a Warren Buffett-backed utility. The past year has seen a crescendo of conversations around financing vehicles that draw on the capital markets, such as solar-backed securitisation, master limited partnerships, and structures resembling real estate investment trusts.

In parallel, new business models for deployment of solar have flourished, including variations of third-party financing structures which enable customers to enjoy the benefit of local systems at little or no upfront cost. These models have the potential to broaden substantially the universe of solar investors.

This report assesses the current landscape for US solar financing, examines some of the more intriguing new structures, and explores where things are likely to go from here. It was undertaken by Bloomberg New Energy Finance and commissioned by Reznick Group – a national accounting, tax, and business advisory firm.

2. US SOLAR FINANCING: HISTORY AND OUTLOOK

2.1. Historical financing trends

Asset financing for US PV projects has grown at a 58% annual growth rate since 2004, with a record year in 2011

Asset financing for US PV projects has grown at a 58% compound annual growth rate since Bloomberg New Energy Finance began tracking this data in 2004. Activity surged to a record $21.1bn in 2011 (Figure 1), fuelled by the one-year extension of the US Department of Treasury's 1603 'cash grant' programme, an incentive that entitled project developers to receive 30% of a project's capital cost in the form of cash, and the Department of Energy's (DOE) 1705 loan guarantee programme, which provides partial risk-sharing with lenders by guaranteeing up to 80% loans to qualified projects. The cash grant programme expired at the end of 2011, and the loan guarantee programme made its final commitments in September 2011.

Historically, most of the financing, particularly for debt and tax equity, has come from a relatively small number of players, via three types of capital:

- *Sponsor equity*: equity from large independent power producers (IPPs), smaller developers, utilities, and private equity players
- *Debt*: construction financing and term debt, primarily from banks and the US Department of Treasury (via its lending arm, the Federal Financing Bank) (Figure 2)

1 References to solar throughout this Note generally apply to photovoltaic (PV) technology, especially when describing distributed solar applications. However, many of the investment strategies and financing structures described here could also be applicable for solar thermal and even other renewables.

- *Tax equity*: upfront equity, in exchange for tax credits and other benefits, primarily from US banks and insurance companies (Figure 3)

Figure 1: Asset financing for US PV projects ($bn)

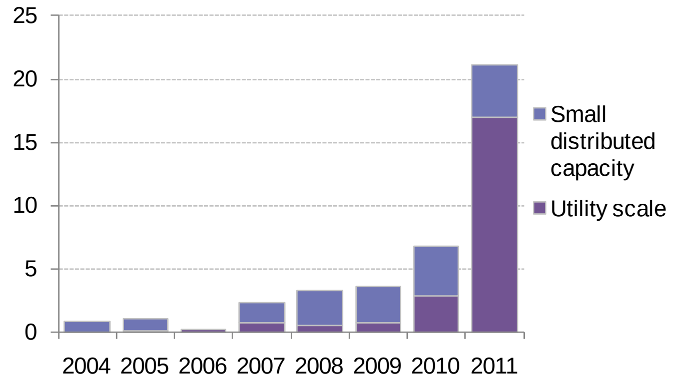
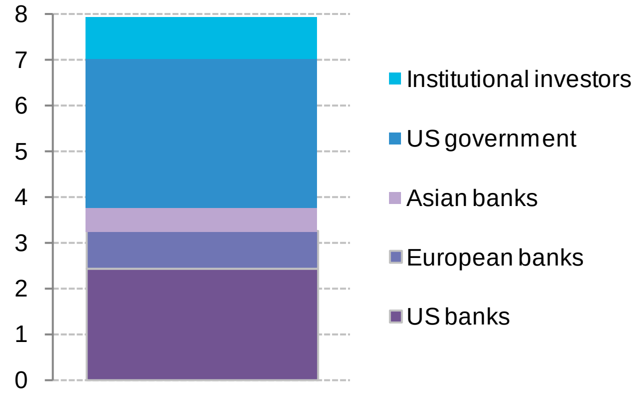
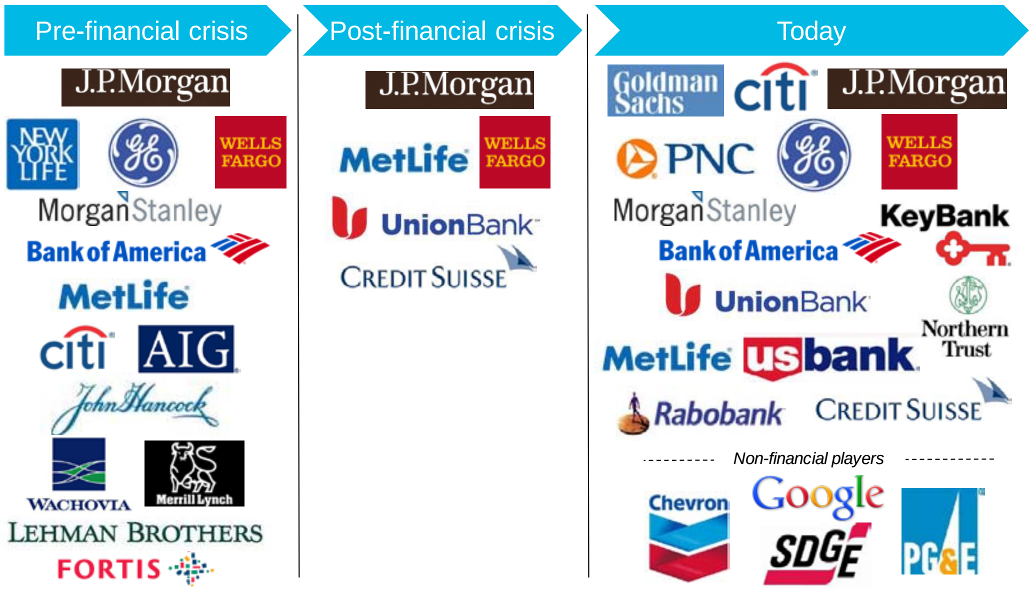


Figure 2: Debt financing providers for US PV projects with *disclosed* deal terms, 2008-12 ($bn)



Source: Bloomberg New Energy Finance Notes: Small distributed capacity is <1MW. Asset financing for small distributed capacity is estimated based on total capacity known to be installed, from subsidy programmes and grid operators; asset financing for utility-scale projects where the deal values are not publicly disclosed is estimated based on average values for disclosed deals. If percentage breakdown per investor of total deal was not disclosed, we assumed financing was evenly divided among debt providers. Institutional investors are Macquarie Energy (10MW Oak Solar Plant), Prudential Capital Group (127MW Arlington Valley Plant Phase II), and buyers of bonds in the February 2012 $850m Topaz bond offering (actual buyers were not disclosed but are assumed to be primarily institutional investors). Analysis draws on all US PV projects which had disclosed deal terms (29 projects in total).

Figure 3: Third-party tax equity providers for US renewables



Source: Bloomberg New Energy Finance, US PREF

2.2. Outlook for sector growth

The US installed 1.80–1.86GW of PV in 2011. Q4 2011 saw a particularly high number of ground breakings as developers rushed to qualify for Treasury grants before the programme expired at the end of the year. Under the programme's 'safe harbour' provision, 5% of a project's capital had to be deployed by year end for a project to get the grant. The last-minute rush will bolster installation figures for 2012 as a large number of projects come online in coming months.

Additionally, utility-scale projects awarded loan guarantees by DOE totalling over 3GW are likely to get built in 2013-15.

The revival of the ITC may give third-party financing companies with the ability to raise tax equity a leg up over competitors

While the grant is now officially gone, developers and installers can still exploit the Investment Tax Credit (ITC), which covers 30% of total costs as well. For developers of large projects or sizeable portfolios, the ITC offers an adequate, albeit more costly replacement for the grant. But for small-scale installers that lack the capacity to arrange tax equity financing, the grant's demise will likely hinder growth. The revival of the ITC may give third-party financing companies with the ability to raise tax equity, such as SolarCity or Sunrun, a leg up over competitors. It will also depress small-scale PV demand as a share of overall annual demand in 2012. Bloomberg New Energy Finance forecasts the residential segment to comprise 13-14% of overall PV installations, with commercial systems accounting for 37-42% and utility-scale projects making up the balance. In all, we expect 2.4-3.0GW of new-build US PV in 2012.

US PV demand (annual capacity installed) forecast, 2009-14 (GW)

Figure 4: Conservative scenario

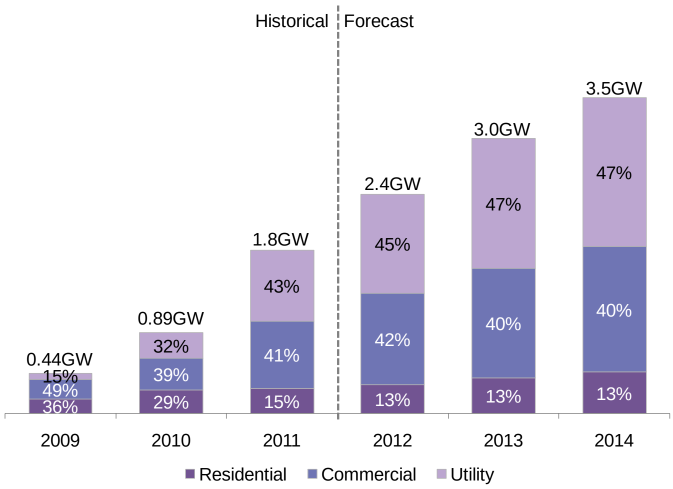
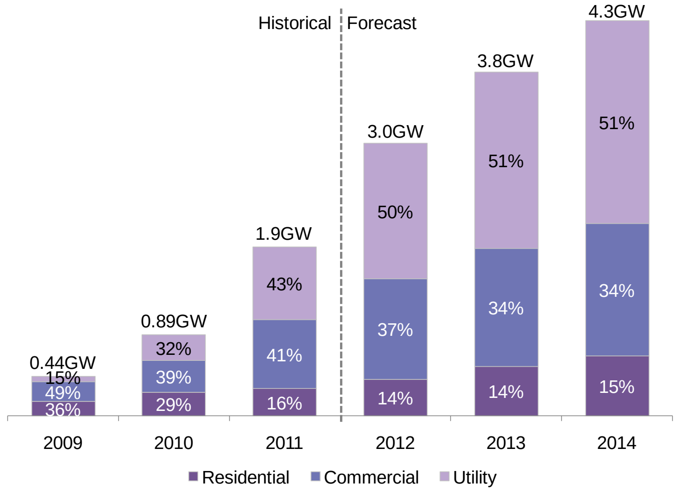


Figure 5: Optimistic scenario



Source: Bloomberg New Energy Finance, Interstate Renewable Energy Council

Figure 6 shows Bloomberg New Energy Finance's long-term forecast for US PV. We anticipate commercial activity to rise faster than residential as the economics for these systems improve in the later years, due primarily to lower system costs. Together, residential and commercial PV capacity will grow at a 22% compounded annual rate from 2010–20, resulting in 15.9GW of cumulative capacity by the end of the decade.

State renewable portfolio standards (RPS), which mandate that state utilities source a certain percentage of electricity from renewables, will be a primary driver for US renewable build. These standards will drive solar build in two ways.

- RPS often feature solar 'carve-outs', dictating that a specific amount of the RPS be met through solar. States throughout the PJM (Mid-Atlantic) region of the country are already major solar markets as a result of these carve-outs. New Jersey, for example, will require 2.2GW by 2020; Maryland will require 1.3GW.

Solar will be an increasingly competitive option for satisfying RPS, even beyond solar carve-outs

- Solar will be an increasingly competitive option for satisfying RPS, even beyond the carve-outs. This will occur both because solar economics are improving faster than for other technologies, and because the high-quality, low-cost resource sites for other technologies will become saturated. This is already happening in California, where utilities actively sign utility-scale solar PPAs to meet a part of their RPS (California does not have solar carve-out).

We project 13.9GW of new large-scale US PV build by 2020, 46% of the total PV market. Together, across all segments, PV capacity will total nearly 30GW by 2020. The Energy

Information Administration forecasts US energy consumption of 4,172TWh by the end of the decade, of which we expect PV generation to supply 1%.

Figure 7 projects US PV annual demand for third-party tax equity financing. The sudden spike in 2012 results from the expiration of the cash grant and the revival of the ITC. The 2017 drop-off in required tax equity results from the 30% ITC reducing to a 10% credit, as per current policy. A change in policy, extending the 30% ITC beyond 2016, would result in a strong uptick both in project cumulative PV installations and tax equity requirements for 2017–20.

Figure 6: Historical and projected cumulative US PV capacity installed (GW)

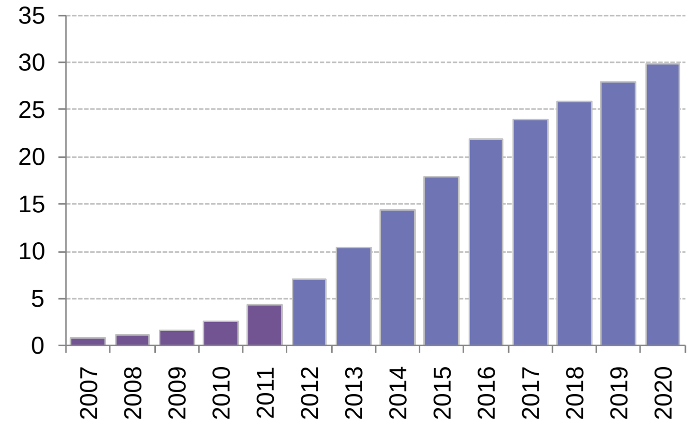
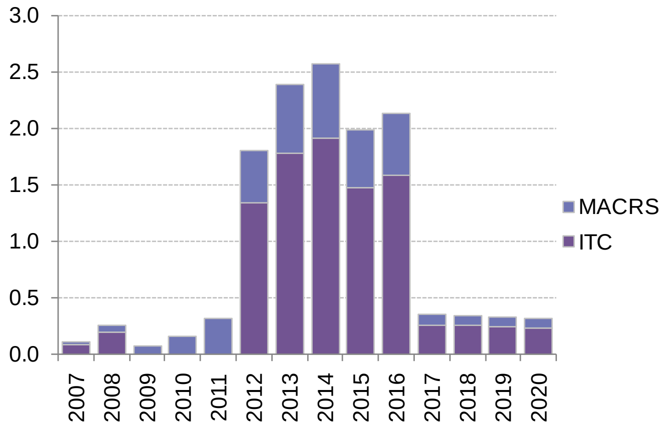


Figure 7: Historical and projected need for third-party tax equity financing for US PV ($bn)



Source: Bloomberg New Energy Finance Notes: Solar growth projections based on Bloomberg New Energy Finance analysis. ITC analysis assumes 100% of projects financed in 2009-2011 took advantage of cash grant; 30% ITC through 2016, 10% ITC after 2016. MACRS historical and projections are based on average ratio between MACRS value and ITC for a typical project – or, in the case of 2009-2011, based on MACRS value per MW for a typical project. Value of MACRS calculated as increase in NPV relative to straight-line.

PV capital requirements for 2012–20 total $62bn, of which $12bn is required third-party tax equity

PV capital requirements for 2012–20 total $62bn, of which $12bn is required third-party tax equity. New business models, new investors, and new vehicles to harness that investment will help meet that need.

3. BUSINESS MODELS

3.1. Types of models for solar deployment

The rise of distributed solar has led to the creation of new and diverse business models

Utilities and IPPs are accustomed to building and integrating power plants that operate at large scale. The rise of distributed solar has led to the creation of new and diverse business models, popularised by third-party financiers such as SolarCity and Sunrun and intermediaries such as Clean Power Finance. This section describes the various models used across the solar industry. Table 1 provides descriptions and examples of the various solar business model participants and is colour-coded to correspond with Figures 8-11.

Utility-scale PPA model

Project developers and financiers have traditionally operated under a common and relatively simple project finance model in which a developer invests sponsor equity into a project and a lender provides non-recourse project debt (Figure 8). In the renewable energy sector, a tax equity investor can also provide financing if a developer cannot monetise the renewable tax benefits, including the ITC. With this capital, a developer can build a project and sell electricity into the merchant market, or directly to a utility via a power purchase agreement (PPA).

Table 1: Solar business model participants

Participant	Role	Examples
Lender	• Provides debt to a project • Repaid via interest payments over the loan's tenor	JPMorgan Banco Santander
Tax equity investor	• Provides tax equity to finance a project under various structures • Repaid via tax benefits and cash	US Bank Wells Fargo
Developer	• Originates and develops project through commissioning • Sources financing from investors • Can provide sponsor equity • Most relevant in the utility-scale model	NRG Borrego Solar
Third-party financier	• Originates solar customers and provides small-scale financing services via a lease or PPA • Sources financing for project portfolios from large investors • Provides monitoring and customer services • Can also act as an installer	SolarCity Sunrun
Third-party intermediary	• Offers a platform to connect financiers with installers	Clean Power Finance
Special purpose vehicle	• Created by developers and third-party financiers to hold ownership of assets	Blue Chip Energy LLC Sun City Project LLC
Installer	• Installs projects on its own or via a partnership with a third-party financier • Can provide financing to a customer via a third-party intermediary	Galkos Construction REC Solar
Project	• The physical solar asset • A 'project portfolio' is a bundled group of usually small-scale solar assets	Webberville Solar Plant SunEdison Kohl Department Store Solar Portfolio
Utility	• Distributes energy from producers to consumers • Purchases solar energy via PPAs with large projects • Under net metering, credits hosts for project generation in excess of use	Southern California Edison Duke Energy
Host	• Provides rooftop or land for solar projects • Consumes electricity produced by hosted project	Homeowners Commercial building owners

Source: Bloomberg New Energy Finance

Host-owned model

Host-owned projects differ from utility-scale projects under PPAs in several notable ways:

- They tend to be small-scale.
- Rather than primarily serving the utility's grid, these projects produce electricity primarily for the host – that is, the owner of the property on which the project sits (eg, rooftop or adjoining land). Assuming 'net metering' is in place, the system owner receives credit for any excess generation the solar system sends into the grid. Depending on state and utility regulations governing net metering policy, system owners may roll the excess generation over months or years, with the value of excess electricity paid to the homeowner at year end at prevailing wholesale or retail rates.
- These projects are too small to attract tax equity investors such as banks or insurance companies, which tend to want to deploy at least $15-30m at a time. One alternative is for the

host to exploit the tax benefits directly. This is possible for some corporates such as big box retailers or even individual homeowners; either may face sufficiently high income tax obligations to effectively monetise the benefits.

Figure 8: Utility-scale PPA model

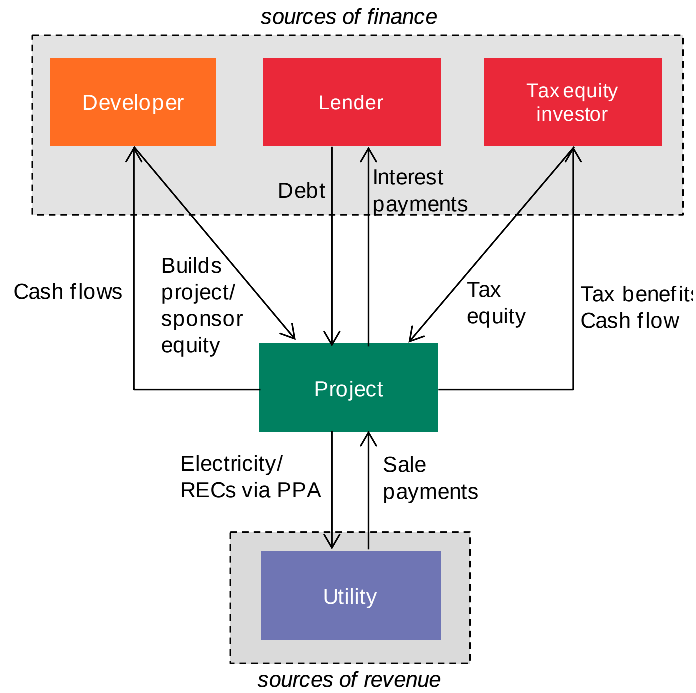
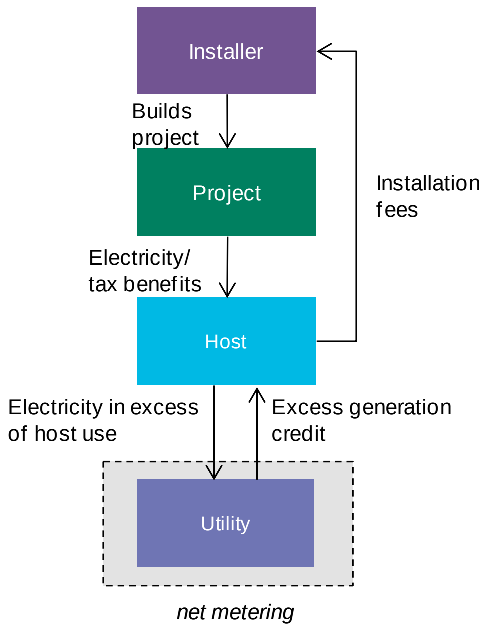


Figure 9: Host-owned



Source: Bloomberg New Energy Finance Note: RECs are "renewable energy credits". A PPA is a "power purchase agreement". For consistency, Figure 9 characterises the solar asset as a 'project', though in residential applications the industry commonly labels it a 'system'. For a more extensive explanation of the allocation of tax benefits and cash flows under tax equity structures, see Bloomberg New Energy Finance whitepaper (commissioned by Reznick Group), The return – and returns – of tax equity for US renewable projects*, 21 November 2011.*

Third-party financing models offer customers the benefit of a solar system without the upfront cost

However, many residential and commercial users cannot afford the upfront cost of a solar system, or are unwilling to use their own equity and arrange project debt. This has led to the development of third-party financing models, which offer customers the benefits of a solar system without the upfront cost. A host pays to the third-party financier either a series of payments via a lease ($/month) or PPA payments linked to the system's performance ($/kWh), usually based on a 10–25 year contract. Effectively, the lease/PPA is a loan agreement between the customer and the third-party financier. Various third-party financiers have developed several different 'flavours' of this business model: the vertical, semi-vertical and financial market structures.

Vertical model

Under the vertical model (Figure 10), an integrated player handles customer origination, installation, engineering, maintenance and financing services via a lease or a PPA tailored to a customer's location and system size. Such firms essentially serve as *both* installer and third-party financier to the home or business owner that receives generation from the PV system. SolarCity is today among the largest and best-known firms serving this dual role of installer and third-party financier. Others serve only the third-party role.

Third-party financiers pool multiple leases and PPAs from multiple systems to attract larger project finance lenders and tax equity providers

Third-party financiers pool multiple leases and PPAs from multiple systems into investment portfolios to attract larger outside project finance lenders and tax equity providers, which invest in the portfolio rather than directly in the third party. The third party and the investor create a fund – which may or may not be leveraged by a lender – to support these projects and build additional ones. As the third party installs more systems, the fund is drawn down. A host's lease/PPA payments, though written to the third party, are typically assigned to the fund.

SolarCity's model: peeking under the hood

SolarCity's model is actually more complex than what has been outlined above. The company is tight-lipped about its strategy – and these days more than ever, as it is in a 'quiet period' in anticipation of its initial public offering (IPO). On 26 April, SolarCity filed a draft registration statement, and it expected to commence the offering following a review by the US Securities and Exchange Commission. In February 2012, a person familiar with the matter told Bloomberg News the IPO may value the company at more than $1.5bn.

Bloomberg New Energy Finance assumes that the project financing for SolarCity's portfolios primarily takes the form of a tax equity structure known as an 'inverted lease.' Under this structure, the third party leases the project portfolio (ie, leases a portfolio of leases) and 'passes through' the ITC to the tax equity investor. The customer lease payments technically go to the investor, and the investor pays the lease payments to the third party. This allows the third party to maintain steady cash yield from the start of the project (as opposed to the 'partnership flip' which delays cash return for developers by five or more years). This is useful for a vertically integrated third party requiring capital roll-over to fund construction services.

There is one more wrinkle: when submitting claims for the ITC, SolarCity, which manages the funds, cites the appraised net present value of the system to a customer, rather than the lower capex cost or market value. The IRS sanctioned this practice in a 6 April private letter ruling.[2]

The characterisations above are our best approximation of SolarCity's model. The extent to which this is accurate will be determined when the company files its S-1 IPO prospectus.

Figure 10: Vertical model

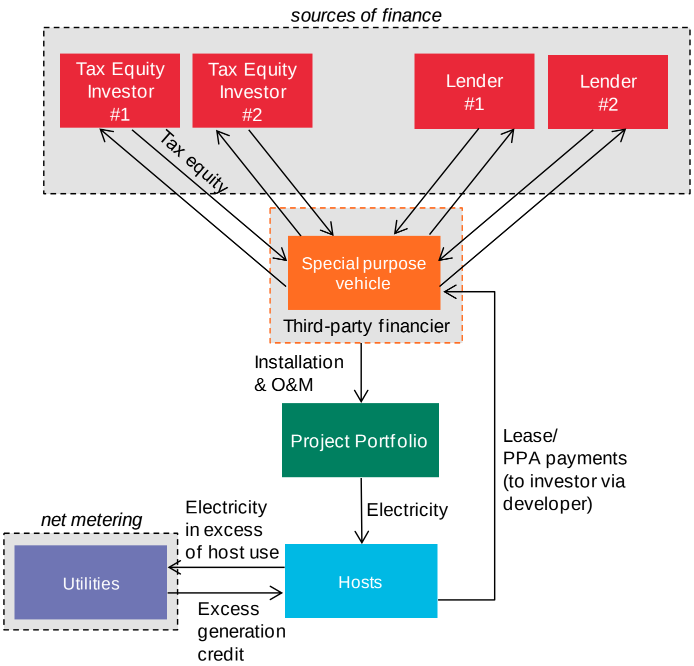
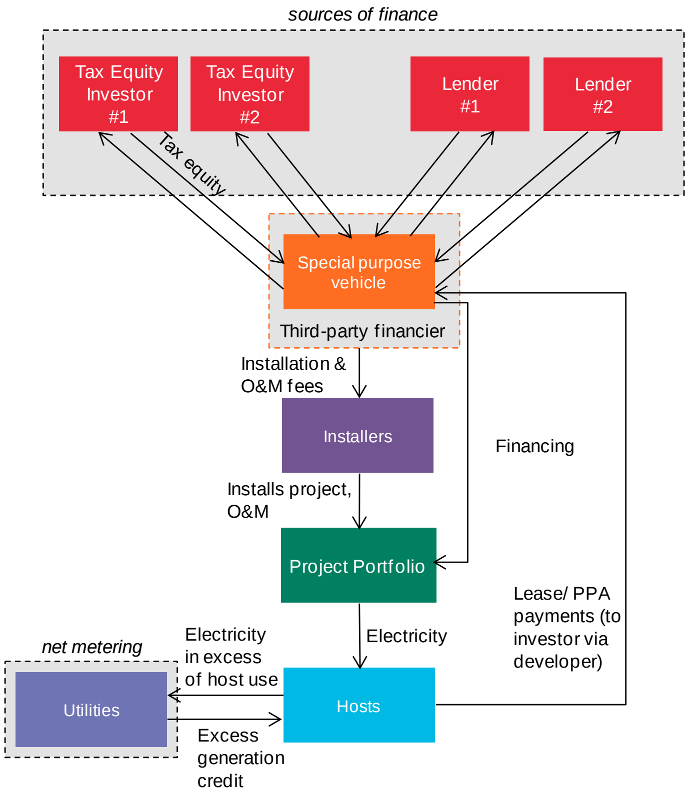


Figure 11: Semi-vertical model



Source: Bloomberg New Energy Finance

2 IRS Private Letter Ruling 201214007: http://www.irs.gov/pub/irs-wd/1214007.pdf

Semi-vertical model

This model (Figure 11), popularised by Sunrun and Sungevity, is similar to the vertical model. However, rather than having installation and maintenance services in-house, a third-party financier partners with selected installers. The third-party financier pays the installer a fee, while the host's lease/PPA payments go to the financier.

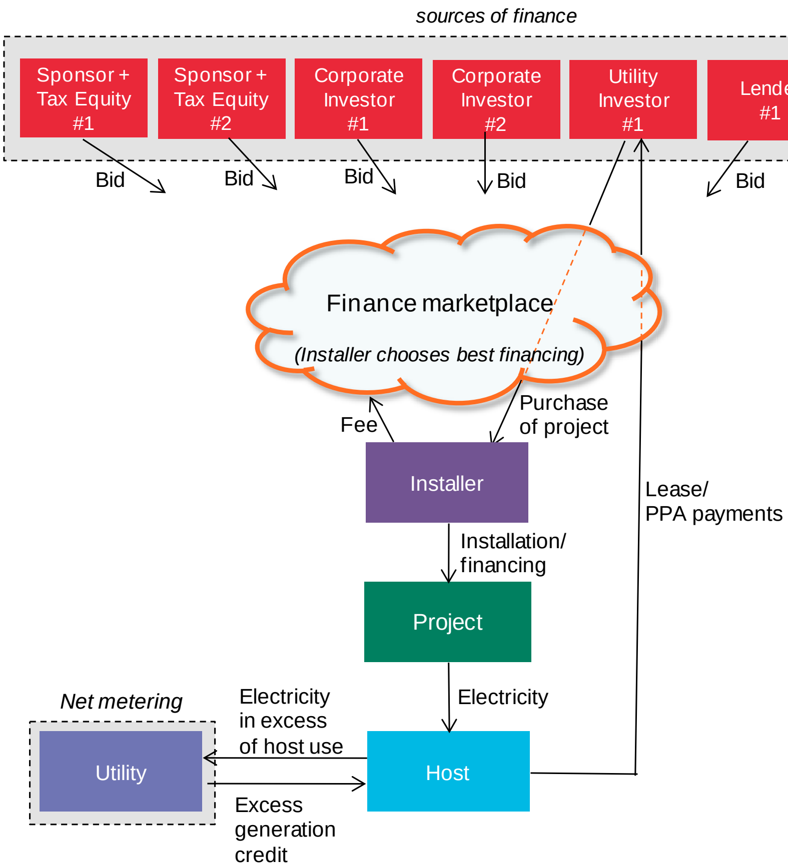
Financial market model

Developed by Clean Power Finance, this model brings in various investors of different types to compete with each other on the basis of yield or other characteristics. The concept is somewhat similar to lending exchanges, in which an intermediary provides an interface to match large lenders with small borrowers.

Under the financial market model, an intermediary provides an interface to match large lenders with small borrowers

For example, a tax equity investor could create a financing product for the marketplace, stipulating that the fund requires a certain minimum unlevered yield, a minimum credit score for the host, or other criteria. Installers with a project meeting those specifications might choose to sell a project to an investor if it provides a 'best fit' and competitive economics. The intermediary (such as Clean Power Finance) underwrites the installers and manages the operational work (eg, billing, administration) on the behalf of the investor. The intermediary collects a fixed fee on each transaction from the installer, and receives a monthly 'risk and asset management fee' from the investor.

Figure 12: Finance market model



Source: Bloomberg New Energy Finance

3.2. Investors' roles in these business models

The various solar business models present different opportunities for investor participation. Table 2 outlines the advantages and disadvantages of each for prospective investors.

Table 2: Investors' roles in range of solar business models

Business model	Potential role for investors	Advantages for investors	Disadvantages for investors
Host-owned	• Host, own, and receive electricity from the asset, capture the ITC	• Protects investor from retail electricity costs (since investor is the solar power consumer) • Maximises project value as there are no 'frictional' costs paid to other parties	• Limited to hosts able to afford upfront cost and monetise the ITC • Exposes investor to project-specific risk without the benefit of diversification
Independent power producer (IPP) power purchase agreement (PPA)	• Provide cash equity, tax equity, or debt to the project • Provide cash equity or debt (back leverage) to the developer • Purchase securities (eg, bonds) backed by the project	• Allows investor to enter project development at desired stage to obtain preferred risk/return • Risk evaluation for individual projects is easier than for project portfolios	• Exposes investor to project-specific risks (eg, plant performance, offtaker creditworthiness, manufacturer warranties) • Nascent project bond market currently makes investment via capital markets difficult
Vertical and semi-vertical	• Provide tax equity to the portfolio (most common) • Provide cash equity or debt to the portfolio (uncommon) • Purchase securities (eg, collateralised loan obligations) backed by the portfolio	• Risk evaluation is easier due to standardised PPAs/leases and contracts arranged by single third-party financier • Contract standardisation can open market up to solar-backed securitisation	• Opacity between the investor and the third-party financier can allow the latter to realise higher returns on the margin between PPA/lease revenue and financing costs
Semi-vertical only		• Competition among installers drives down installation costs and reduces upfront cost per lease/PPA, all else equal	• Business model relies on relationships with installers, opening up risk that installers cannot deliver on commitments • Use of different contracted parties for installation and O&M creates uncertainty
Semi-vertical and finance market			• Use of different contracted parties for installation and O&M creates uncertainty
Finance market		• Investors can specify project criteria (eg, minimum host credit score, geography) • Intermediary is an independent third party and will not negotiate down tax equity investor's yield (whereas a project sponsor or third-party financier might)	• Inherent competition brings down overall yields

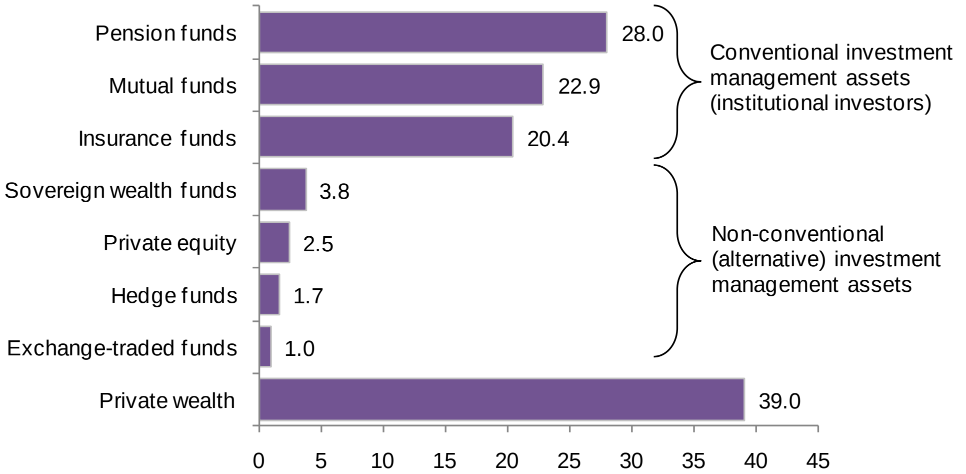
Source: Bloomberg New Energy Finance

4. INVESTORS, VEHICLES, AND THE EVOLUTION OF SOLAR FINANCING

Five major drivers suggest that there may be an expanded role for new types of investors behind US solar projects:

1. Diminished appetite from the historically most active investors, such as banks and the government (Section 2.1 above)
2. The success of emerging business models for solar deployment (Section 3 above)
3. The basic characteristics of solar assets (potential for high returns for early-stage equity investors; likelihood of steady, high single-digit returns for owners and creditors of operating projects)
4. Momentum behind development of new types of high-liquidity financing vehicles (Section 4.4 below)
5. Recognition that the clean energy sector overall, which has surpassed $1 trillion in cumulative investment since 2004 and grew by $260bn last year, will need to increasingly draw from the massive reserves of wealth managed by institutional and other investors in order to continue to fund this tremendous growth (Figure 13)

Figure 13: Assets under management for global fund management industry, 2009 ($trn)



Source: TheCityUK estimates, www.thecityuk.com/assets/Uploads/Fund-management-2010.pdf Notes: as per TheCityUK, "around one-third of 'private wealth' is incorporated in conventional investment management."

Bloomberg New Energy Finance conducted interviews with 20 investors across 11 investor types, to understand what might be the potential appetite for solar project investment among these 'new' potential players. The key questions asked in the interviews are summarised below[3]:

- *Involvement in solar to date*: what types of investments have you made, or have you considered making, in solar?
- *Interest and involvement in comparable asset classes*: what is your level of participation in asset classes that bear some resemblance to solar project investment?
- *Investment profile*: what metrics guide your investment selection? What is your investment horizon (or your fund's lifetime), what are your target returns, and what level of liquidity do you require? Were you to invest in solar projects, what stage in the project lifecycle would be your ideal entry point? Do you have a preference for debt vs. equity?
- *Assessment of solar investment overall*: what is your perception of the riskiness of solar investments? What barriers have you encountered in pursuing solar investments? Do you anticipate expanding your investments into solar?
- *Policy commentary and recommendations*: are there specific regulatory measures which could make solar project investment more attractive to you?

4.1. Investor descriptions

The responses from these interviews are summarised in Table 3. The characterisation of the investors in the table is simplified and is not exhaustive. It is also not mutually exclusive: the list includes, for example, both pension funds and venture capital, but it is not uncommon for pension funds to invest in venture capital funds. Similarly, the list does not include high net worth individuals, who could participate as backers behind almost all of these investor types.[4]

3 These interviews were conducted under 'Chatham House' rules: we encouraged interviewees to speak candidly about their investment decision-making with the understanding that there would be no remarks cited with attribution. Instead, the intention was to solicit responses that captured the 'flavour' of how different types of investors may approach solar project opportunities.

4 In a recent innovative financing deal, wealthy foreign individuals backed the financing of a Nevada geothermal plant. Their motivation?: in exchange for the investments, which must be at least $500,000 and create 10 permanent jobs for US workers, investors receive US green cards two years later. A similar transaction has happened in solar: according to its S-1 filing, solar thermal developer BrightSource received a similar $90 million loan for its Ivanpah project.

Table 3: Characteristics of potential investors

	Investor type	Examples	Preferred asset classes	Investment horizon	Targeted returns[(a)]
← Low returns / low risk – High returns / high risk →	Venture capital	• Accel Partners • Sequoia Capital	• Early-stage companies and platforms	• ~10 years (fund life) • ~3-5 years (exits for individual investments)	• >30%
	'Development' private equity	• KKR • Starwood Energy	• Infrastructure projects • Portfolios of projects	• ~7-10 years (fund life)	• ~10-20%
	Infrastructure debt funds	• Hadrian's Wall • Macquarie Group	• Direct infrastructure loans • Infrastructure debt securities	• ~20 years	• ~8-11% (low risk/operational projects) • ~11-15% (low/medium risk primary deals)
	Hedge funds	• Bridgewater • Soros Fund Mgmt	• Liquid securities	• ~1 year	• ~7-10% for absolute return funds • Maximise returns (~20%+) for aggressive funds
	Banks	• JP Morgan • US Bank	• Currently: project finance (construction and term debt), tax equity • Future: construction finance, tax equity	• Debt: – Historically: >10 years – Currently: 5-10 year semi-perms • Tax equity: 5-10 years	• >7% (overall company earnings) • ~2.5-3% debt spreads over three month LIBOR[(b)] • ~7-8% tax equity after-tax yield for utility-scale PV, ~9% for distributed portfolios (unlevered), 14-18% (levered) • >14% for tax equity structures favouring IRR over NPV
	Large corporations	• Apple • Chevron	• Cash • Short-term commercial paper and notes • Liquid, low-risk tax credits	• <1 year for >50% of fixed income on balance sheet • ~1-5 years for most other fixed income holdings • Corporate minority equity holdings	• >7% (overall company earnings) • >LIBOR for fixed income holdings • >8% for tax equity (eg, low-income housing)
	Mutual funds / Retail investors	• Fidelity • T Rowe Price	• Liquid securities	• Quarterly, for some • ~1-2 years, for others • ~10+ for retirement portfolios	• ~6-8%
	Pension funds / Endowments	• National Pension Service of Korea • New York State Teachers • Yale Endowment	• Various: willing to invest in managers (sometimes directly) across broad range of asset classes – eg, venture capital, equities, real estate	• Annual (liability matching framework: ensure yearly liabilities are met) • 'Perpetuity' for overall fund lifetime	• ~7-8%
	Utilities	• Constellation • Tri-State G&T Coop	• Power plants	• Quarterly (overall company earnings) • >20 years (asset lifetimes)	• ~11% required return on equity • ~5–6% WACC • ~4% dividend yield
	Insurance companies	• AIG • Prudential	• Fixed income to cover claims • Riskier assets to grow asset base	• >20 years (long-term assets)	• ~6% (long-term) • Maximise return
Other stakeholders	Vendors / EPC installers	• Bechtel • Trina Solar	• Pipelines / channels for their products	• ~3-5 years (companies looking to ensure future sales of their products)	• ~2.5-3% debt spreads over three-month LIBOR[(b)]
	Landowners / Real estate developers	• Ted Turner • Vornado	• Land, buildings	• ~10 years (fund lifetime) • >20 years (for individual holdings)	• ~20-25% (development) • ~5% REIT dividend yield
	Government	• California PUC • US Treasury • US Army	• Projects	• Long term	• n.a.

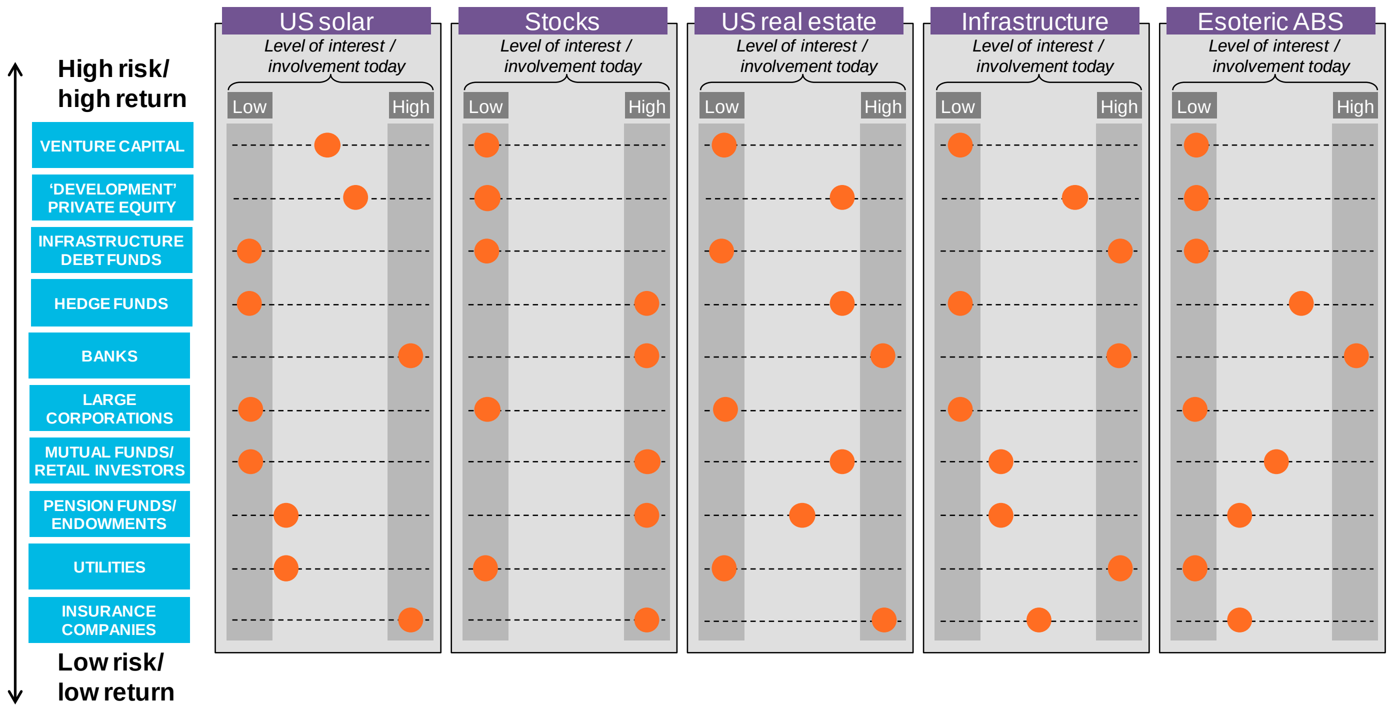
Source: Bloomberg New Energy Finance, interviews with each of these investor types. Note: The examples in the fourth column do not *include any companies interviewed for this report; the examples are chosen because they are high-profile names within each investor type. Risk/return profiles are not representative of each financier in the above classes. Targeted return can vary considerably outside above range depending on investment type, risk, project stage, tenor, etc. (a) Targeted returns are net of fees, where applicable. (b) Total loan cost to developer is typically ~325 basis point (bps) spread over three-month LIBOR (~50bps) plus a 12-year swap (~230bps) to change loan from floating rate to fixed rate*

The emphasis of the analysis is on ten types of investors, with their inclination for solar project investment further depicted in Figure 14 and Figure 15. Table 3 also includes several other 'stakeholders' which are not examined in detail, which could also represent potential solar project investors. These include equipment and service vendors (by financing purchases, the vendor is effectively loaning customers the money to purchase their products); landowners and real estate holders (they are natural hosts and customers of the systems and may be willing partial investors or full owners); and government bodies (they may be procurers of the energy with an option to acquire the asset, or they may be debt financiers, as in the case of the Federal Financing Bank).

Figure 14 sorts the investors based on their risk/return profile and assesses their level of interest in US solar project investment relative to other asset classes that share some 'adjacency' with solar:

- *Stocks*: High level of interest in stocks could indicate interest in shares of publicly listed entities consisting of solar projects, were that option to materialise. In addition, some funds satisfy their 'green' inclinations by purchasing cleantech stocks (though these have little to do with project investment as they are often stocks of *manufacturing* companies that have diversified downstream by buying project developers).
- *US real estate and project infrastructure*: As with solar projects, real estate and infrastructure projects call for significant upfront capital with some level of risk in the development process, followed by a long asset duration delivering relatively steady income
- *Esoteric asset-backed securities*: Solar portfolios could be securitised in the near future. Investors' willingness to consider a wide range of securitisations – not just mortgage-backed securities, but also credit card receivables, car loans, and other products – could signal a willingness to embrace solar-backed securities. However, some investors are still cautious towards securitised products following the 2008 financial crisis.

Figure 14: Investor appetite in solar project investment compared to other asset classes (qualitative assessment)



Source: Bloomberg New Energy Finance

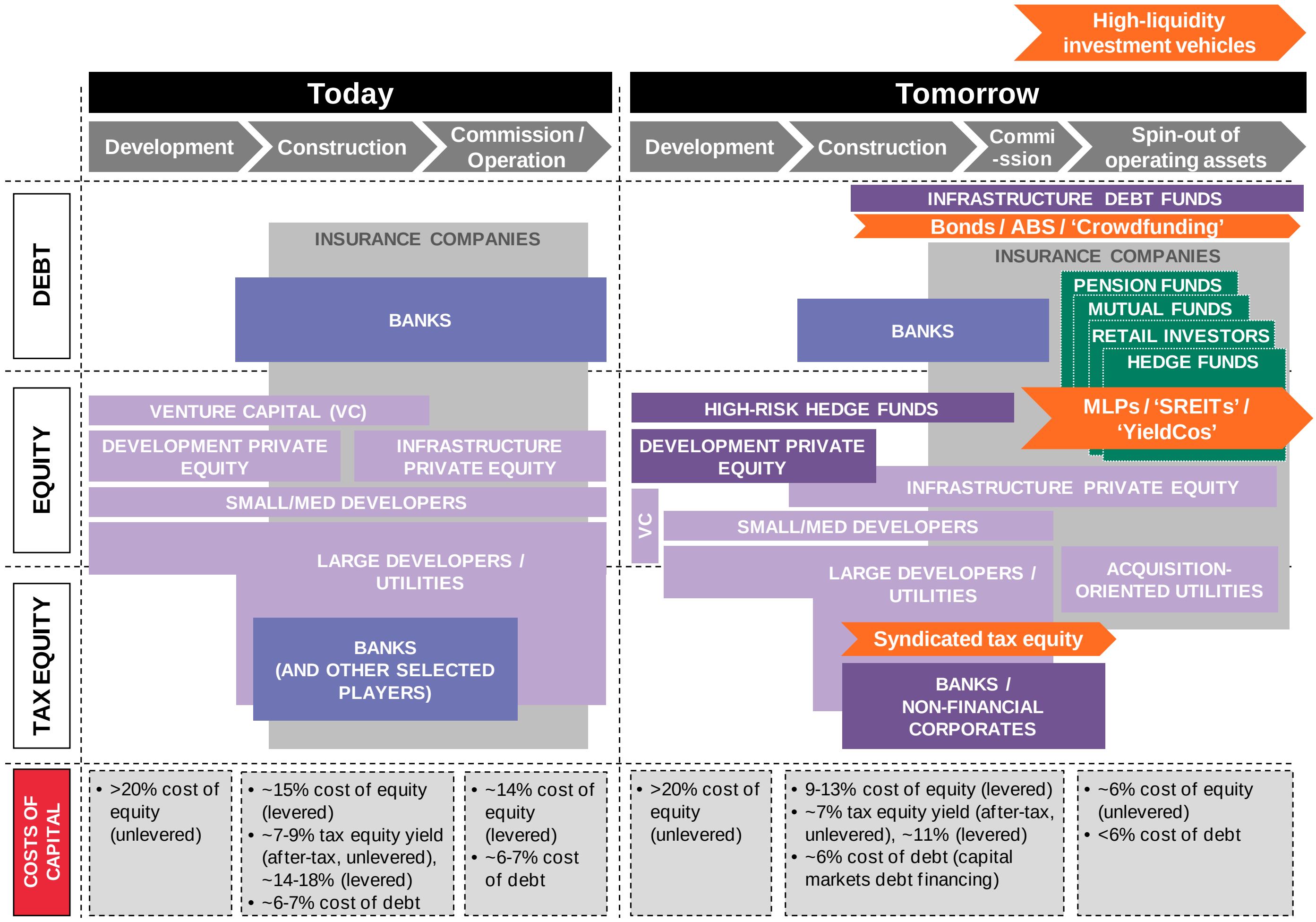
There could be meaningful appetite to invest in solar projects if investments are structured to look like other asset classes

The most telling statement about this analysis is the *absence* of a compelling pattern linking solar project investment to other asset classes. Investors across a broad spectrum of risk/return profiles, who are otherwise active in investments that could bear resemblance to solar projects, have largely not dipped a toe in the water, likely because the asset has not yet been 'configured' to match a familiar asset class. The findings suggest that there could be meaningful appetite if solar project investments are structured to look like other classes.

4.2. Evolution of US solar financing

The US solar project finance landscape is shifting. Figure 15 illustrates one plausible scenario of how US solar financing could evolve.

Figure 15: Potential evolution of US solar financing



Source: Bloomberg New Energy Finance

Several fundamental changes appear likely:

- *Participation from investors who have been historically active (banks and federal government) will likely diminish.* European banks, which have for years provided construction debt to US clean energy projects, are grappling with the continent's ongoing credit crisis. At the same time, the set of financial regulations known as Basel III is further causing banks to reconsider their exposure to project finance. The regulations require that any loans longer than one year be backed by funding of at least one year (eg, a 20-year project loan must be matched by an asset with a maturity greater than one year, such as a long-term bond). This will result in higher capital requirements and will likely raise the cost and decrease the length of project finance debt. Though the European banks will feel the squeeze first, Basel III will reduce the ability of many banks throughout the world to provide long-term debt finance. Beyond the banks' diminishing appetite for long-term lending, the US federal government's role as a direct renewable project investor is also decreasing due to the expiration last year of a key loan guarantee programme (though the federal government is poised to play a major role as a project host via military projects).

- *With many banks scaling back their long-term lending, others will gain market share.* While borrowers with well-established lender relationships and solid project development track records may still be able to access long-tenor commercial loans, many borrowers will transition to 5-10 year 'semi-perms' (ie, shorter tenor loans, which are refinanced in the middle or end term). Banks will continue to be the dominant source of *construction debt*, as other institutions are not comfortable with the associated risks. Asian banks, which are better capitalised and therefore less affected by Basel III, will also do more term finance in the absence of active European lenders.
- *New investors will become comfortable with solar assets' risks/rewards*. While PV is a fairly mature technology within clean energy, compared with infrastructure projects such as natural gas pipelines or toll roads, it is new and therefore can be viewed as riskier. As the sector matures, increasing investor interest and decreasing perceived risk will lead to a lower cost of equity, debt and tax equity.

Solar projects are good potential fit for insurance companies and pension funds, which seek stable and low-risk assets to match their long-term liabilities

- *Institutional investors in particular may become more active.* Solar projects are a good potential fit for insurance companies and pension funds, which seek stable and low-risk assets to match the duration of their long-term liabilities. While these investors prefer not to take construction risk, they may become involved in refinancing construction debt, perhaps by 'taking out' short-term lenders. They may also play significant roles on the equity side: some insurance companies have an inclination for buying operating solar assets under all-equity deals and then holding the assets for the remainder of the project lifetime: the reliable cash flows for projects with PPAs nicely match the funds' regular annual obligations.
- *High-liquidity vehicles will pave the way for the expanded role of new investors.* While some large insurers (eg, MetLife, John Hancock) have experience investing directly in US solar projects, many institutional investors do not have project finance teams capable of doing the same, or simply prefer investments that are more liquid and more closely resemble other asset classes to which they are accustomed, such as bonds. Other examples of investors who have been on the sidelines to date but who could enthusiastically pursue public markets securities include hedge funds and mutual funds. (These high-liquidity vehicles are described in Sections 4.4-4.5.)
- *New non-financial corporates will enter the tax equity market.* In March 2012, the White House hosted a session to educate new potential corporate investors on tax equity, and earlier this year, Chevron announced its intention to invest in solar projects in the 3-20MW range. Other companies may follow: the yields are attractive, the market is relatively uncompetitive, and some have experience with tax credits via the low-income housing sector. In the long-term, increased supply of tax equity may drive down yields from the current 7-9% range. But in the short-term, one tax equity investor mentioned that yields may trend upwards as the increased demand – due to the expiration of the cash grant – is met with inelastic supply. Additionally, large utilities with development arms such as Duke, NRG, enXco (affiliate of the European utility, EDF) and others – which typically internalised tax benefits – may not have much tax capacity remaining. Demand for tax equity will further increase as these companies go to the market for financing. However, as will be explained below, the list of new tax equity providers to meet that demand will be short.

Utilities may purchase portfolios of solar PPAs and leases to compensate for lost revenue

- *Utilities may become active purchasers of distributed solar portfolios.* Residential solar installations reduce their customers' power demand, as system hosts which generate electricity therefore buy less from their local utility. As solar becomes more prevalent, utilities may purchase portfolios of solar PPAs and leases to compensate for revenue lost as a result of those very installations. Two avenues are available. The first is via tax equity, such as PG&E's combined $160m in tax equity funding to Sunrun and SolarCity. The second is via the acquisition of portfolios on the tail end of existing tax equity deals, with the utility taking advantage of the cash revenue from leases or PPAs for the remainder of the project lifetime.

Across the solar project lifecycle, the cost of financing will fall

- *The cost of capital will fall*. Sector maturation and the entrance of new investors will lower the cost of financing. In particular, the widespread adoption of high-liquidity vehicles could open up solar to an investable base with a lower required return on capital. Widespread adoption of mortgage-based asset-backed securities drove significant decreases in the cost of capital for the homeowners, and a similar effect could happen in solar.

4.3. Barriers to investor participation

Our interviews revealed five major barriers to further participation from the broader investment community.

- *Complexity:* Tax equity, necessary in the solar industry through 2016, is not for the faint of heart. The mechanisms necessary to pass tax and depreciation benefits to investors involves complicated accounting and legal structuring. This has limited participation to a select number of institutions with specialised financial expertise, a strong understanding of the energy industry, or both.

  Theoretically, tax equity should be attracting more investors. As one tax equity provider interviewed for this study put it, "For the measure of risk we are taking, the yields have been exceptional."[5] Thus far, few corporations have been persuaded. Many consider the opportunity, then deem it too complex or far afield strategically from their core business, and too risky. Additionally, the significant time and effort in deal structuring requires either the creation of an internal team or the outsourcing of service providers at significant expense. Finally, it is impossible to start small; investors usually do not consider deals smaller than $15-30m or more because of the 'overhead' involved.

- *Immaturity:* solar projects – and manufacturers – are not viewed as having a track record of long-term operating success. Investors like certainty. While many active financiers assume that solar panels will operate within a manufacturer's expectations, more risk-averse investors such as pension funds prefer to see evidence first. Panels from newer manufacturers have yet to operate over the 25-year expected lifetime, although the oldest panels, based on the same technology, have been in service for over 35 years now. Another turn-off for potential investors centres on the current wave of consolidations and bankruptcies in the manufacturing sector. To paraphrase one interviewee, "It's difficult to invest in a solar project when you don't know if the manufacturer giving the warranty is going to be in business next year."

- *Illiquidity:* Solar investments are not easily transferrable*.* Liquid investment vehicles have developed in other capital-intensive industries such as real estate (REITs) or natural gas infrastructure (MLPs), but none have been popularised in the solar industry. Many investors have little interest in assets that cannot be sold at short notice for net asset value. Tax credits are particularly vexing for liquidity-seekers: if a tax equity investor sells a project within five years, the IRS recaptures a portion of the ITC.

5 This is a milder version of other utterances from interviewees who have invested in tax equity deals in the past. While acknowledging the complexity, one investor said, "If I could invest my entire life savings and 401(k) in solar tax equity deals, I would."

- *Lack of standards:* In the residential and commercial-scale market, there is a lack of standards for payments and services. The numerous third-party financiers have different PPA and lease contracts, and credit quality and maintenance standards. Without standard PPA and lease agreements throughout the sector, it is difficult to rate and issue solar securities. Geographical diversity reduces weather-related risk, but it also brings unique regulatory and market risks, making portfolio evaluation even more difficult. Challenges in bundling assets together may create a shortage of capacity and cash flow required to arrange and issue a solar bond and access capital markets.
- *Availability of opportunities:* Some investors have expressed considerable interest but have been unable to find suitable investment targets. US solar presents a vast potential market – from utility-scale plants in the Southwest desert, to greenfield developments in New Jersey to portfolios of rooftop projects on big-box retail stores across the nation. Yet solar development options inevitably come with assorted challenges: Southwestern utility-scale markets are extremely competitive; Northeast US markets are often beset by SREC pricing volatility; many regions simply do not offer sufficient incentives to make the economics viable; and assembling meaningful-sized portfolios of projects often comes at steep customer acquisition costs. Opportunities abound but identifying and executing on them is rarely easy.

4.4. High-liquidity vehicles

The most striking changes in the move from the 'Today' to 'Tomorrow' sides of Figure 15 will only be possible with the emergence of vehicles that make solar project investments a more liquid option and that allow these projects to tap a broader pool of investors via the capital markets. The vehicles identified in the chart are described below.

Bonds can be an at attractive alternative to bank loans as they offer higher liquidity, less-restrictive covenants and lower costs

Project bonds

For debt financing, bonds can be an attractive alternative to bank loans as they offer higher liquidity (for large issuances with a good rating), less restrictive covenants and lower costs. To date in the renewables sector, bonds have been used primarily by manufacturing companies seeking capital for new lines. There have also been a limited number of bonds attached directly to projects issued by financial institutions or developers.

Bloomberg New Energy Finance estimates the clean energy project bond market at $9.6bn globally with the most conspicuous recent offering being MidAmerican's 550MW Topaz solar project in February 2012 (see Case Study 5.1 below). Bond issuance for renewable projects has historically lagged that of the wider infrastructure market, partly due to the sector's relative immaturity, but also because of the lack of projects large enough to actually issue bonds. Another traditional barrier to bond floats has been a lack of standards, though there are recent signs of progress in this area. Rating agencies have grown more adept at assessing solar project risk in order to grade bonds, and the Climate Bonds Initiative, a non-governmental organisation that promotes renewable project bonds, is developing standards to determine which project bonds meet the 'green' criteria.

Asset-backed securities

Securitisation is the process of pooling together contractual debt and selling the resulting asset-backed securities as notes to institutional investors. Common securitised assets include payments from mortgage loans, car loans and credit cards (more esoteric examples include contracts for home burglar alarms, taxi medallions and music royalties).

Securitisation of lease and PPA payments may offer cheaper financing than commercial loans

Applied to solar, securitisation of the lease and PPA payments of third-party-financed solar projects may offer cheaper alternatives to financing than commercial loans. Sale proceeds from the securitised assets can be reinvested to build more solar systems. Credit rating agencies grade solar-backed securities on the ability of customers to make timely payments and on expected generation performance of the projects.

US small-scale third-party-owned solar could demand up to $5.2bn in financing in 2014. If all of 2011's installed residential capacity were securitised, the proceeds from the securitised assets would contribute 32-47% of capital requirements for residential solar build in 2012 and 31-42% of commercial build.

As with project bonds, the lack of standardised payment and servicing contracts make securitisation harder to arrange. Market fragmentation outside the leading solar companies prevents smaller companies from securitising their assets as their portfolios are not large enough. In the short run, the companies with the largest market share, such as Sunrun and SolarCity, are likely to be the first to securitise their assets. Longer term, solar-backed securitisation could flourish but this will depend largely on standardisation.

MLPs

Master limited partnerships (MLPs) combine the access to capital of public stocks with the tax advantages of partnerships. Traditionally limited to sectors such as oil and gas, MLPs enable individual investors to avoid 'double taxation' while raising equity to invest in large, capital-intensive projects. Benefits associated with MLPs would lift the economics of renewable projects, as they would drive down the cost of capital and reduce tax obligations.[6] Currently, though, renewable generation projects are not eligible for MLP status.

If renewables were allowed to qualify, using MLPs in combination with tax equity would be challenging under current rules, particularly the rule associated with 'passive losses' for individual investors. This rule stipulates that losses from an MLP can only be used to offset 'passive income' (or active income from that same MLP). But only a small pool of investors are sitting on significant amounts of passive income (salaries and gains from stocks and bonds do not qualify – these are considered active income). For investors without passive income, the loss-related tax equity benefits would need to be deferred to later years, when the MLP begins to generate positive income, thus decreasing their value. There exist potential workarounds – such as creating 'exit MLPs' to acquire assets once the tax benefits have been absorbed – but none are straightforward.

MLPs and S-REITs combine the access to capital of public stocks with tax advantages of partnerships and trusts

'S-REITs'

The real estate investment trust (REIT) structure has served the real estate sector with a funding mechanism that is liquid, accessible to individual and institutional investors, and tax-efficient. As with MLPs, REITs are 'pass-through' entities – there is no tax at the corporate level, and shareholders are taxed on dividend income. REITs can be publicly listed or privately held. To qualify, REITs must meet three principal criteria:

- at least 75% of assets must be qualifying assets, such as real estate (certain components of solar systems *may* be considered qualifying)
- at least 75% of income must come from rent or mortgages
- at least 90% of taxable income must be distributed to shareholders

6 Bloomberg New Energy Finance has conducted analysis of applying MLPs to wind. For a hypothetical 100MW wind project financed through a typical tax equity structure, incorporation of the developer and the tax equity investor as MLPs would result in an IRR increase of roughly 1.5% (percentage points) and an NPV increase of $4.0–4.3m, from the perspective of the unit-holders of these MLPs. For the tax equity investor, however, realisation of these benefits hinges on relaxation of the 'passive loss' rule.

This type of structure is an appealing one for solar project financing, but the second criterion presents the main obstacle. Rules for REIT eligibility do not allow (or at least do not *explicitly* allow) revenues associated with solar PPAs or leases to qualify as 'rental income', though the rules do provide for other exceptions under the 'rental income' definition (eg, services provided by hotels are considered REIT-eligible revenue).

The momentum behind a 'solar REIT' concept is strong. The fit between real estate development and ownership and solar is a natural one, both because the physical assets are inevitably intertwined, and because the economics of both asset types have similar profiles (upfront costs, long-term payment streams). Bloomberg New Energy Finance has spoken to several parties which are exploring this concept as a business venture and others who are testing its viability in political circles – and even investigating whether it would be possible to gain S-REIT eligibility without legislative action.[7]

'YieldCos'

Tax advantages aside, MLPs and REITs both offer an attraction that is at present non-existent in the US solar sector: the opportunity for any investor to access and own shares of productive dividend-yielding assets without illiquidity risk, and without exposure to other unrelated market segments at the same time.

If, say, a retail investor seeks exposure to US solar development, the options are limited and 'impure.' A typical retail investor would not have access to the types of private equity and private debt plays that typically fund projects today.[8] As an alternative, the investor could buy shares of publicly quoted companies such as First Solar or NRG, which develop solar projects. Yet, neither of these prominent examples are pure plays. First Solar is primarily a module manufacturer that develops projects. NRG is primarily a developer but owns many non-solar assets as well.

Developers could 'spin out' ownership of their generation assets to the public markets

The future of US solar project investment may include the emergence of pure-play operating companies. This could involve a developer 'spinning out' ownership of its generation assets to the public markets via an IPO to represent a 'pure' solar asset income fund. These entities have been referred to as 'yieldcos' by advocates of the scheme such as KeyBanc Capital Markets, with reference to the steady yields such companies could provide to investors. Yieldcos present an investment profile similar to REITs as they are non-cyclical, are based off of fixed assets, and can provide stable dividend yields. An interviewee championed the structure as being "better than REITs" because revenue is based off of long-term escalating PPAs with generally high-credit offtakers (whereas the real estate assets in REITs tend to have shorter term leases and potentially lower credit tenants).

The concept is not new in the energy industry, and there are a handful of operating yieldcos in the market today, though most are internationally focused. The most relevant example may be Brookfield Asset Management's spin-out of a public market fund that owns renewable assets (see Case Study 5.2). A yieldco could undertake development itself (though this would dilute a fund focused purely on asset ownership), acquire projects from third-party developers, or acquire companies directly from the original 'development arm' of the company, effectively bifurcating development from ownership.

There are two chief obstacles to the yieldco concept. The first is scale. Bankers familiar with these structures suggest a minimum IPO size for a new yieldco would need to be roughly $150–200m,

7 A useful introduction to the solar REIT concept, and the source for much of the S-REIT characterisation above, is a two-page whitepaper, 'The Case for Solar REITs' by Kenneth Kramer of Rushton Atlantic LLC.

8 An investor could of course acquire his own solar system – eg, for his own rooftop. But if the investment is simply a matter of quenching the investor's desire to gain exposure to the solar development sector, this approach has a 'killing an ant with a Sherman tank' quality: the upfront cost is several orders of magnitude higher than what a typical investor may allocate to a single stock, the investment leaves the investor vulnerable to single-project risk without diversification, and the asset would be far from liquid.

with a total equity valuation for the company of at least $500m. The second obstacle is that tax equity does not reconcile well with the yieldco concept. Yieldcos generally trade on the basis of cash flows, and under tax equity structures, much of these cash flows in the early years are captured by the tax equity investor (rather than flowing to the sponsor, or to the yieldco's potential shareholders). An ideal scenario, then, might feature the *spin-out of the yieldco after the tax equity investor relinquishes ownership*, once the tax benefits have been realised (eg, after the 'flip' event under a partnership flip structure).

A new yieldco might attain a 7% yield but with growth and maturity this could fall to around 5%.

Syndicated tax equity

Today, there is no readily available secondary market for renewable energy tax credits. This lack of liquidity presents risk and diminishes the appeal of tax equity investments for potential new entrants into the market, such as large corporations.[9] Syndication of tax equity, or participation in secondary market transactions in which tax credits are transferred from one investor to another, is not strictly impermissible – but it is difficult. Much of the challenge has to do with the requirement of demonstrating some level of economic ownership of the renewable project when taking advantage of tax credits (ie, the credits cannot be 'unbundled' from the project). This means that investors who participate in tax equity deals today are binding themselves to the risks posed by that single project. It also means that doing anything other than large deals is uneconomical: the substantial administrative and due diligence costs of undertaking a tax equity investment are essentially the same in absolute terms for a small project as for a large one.

If the obstacle of 'tax credit transferability' can be surmounted, it is possible to envision the development of a secondary market for renewable energy tax credits. Liquidity could attract new types of investors who could outsource much of the administrative and due diligence process to an 'issuing party'; these investors would be less concerned about the risks of performance of any individual project (as they could perhaps diversify their tax credit holdings across multiple projects) and would have some reassurance that, should a short-term cash need arise, a viable 'exit strategy' exists for those tax credits.

'Crowdfunding'

'Crowdfunding' has emerged as a plausible source of capital

With the April 2012 package of the Jumpstart Our Business Startups Act (JOBS) signed into law, 'crowdfunding' has emerged as another possible source of capital for solar energy investments. The bill legalised small equity investments in startups and projects by non-accredited investors. Through crowdfunding, a developer or financial intermediary would act as agent for placing retail investors' capital as construction or term debt into an asset under development or already generating. Such projects are likely to be small at first, as the JOBS Act company investment threshold is $1m, and individual investments must remain under $10,000. Crowdfunded projects should be relatively low-risk as well, as they would fit the established model of third-party-owned projects supplying energy to offset retail consumption. Returns should be commensurately low as well, with the CEO of the most visible crowdfunder, Solar Mosaic, saying that once his company has structured its first positive-return projects, it expects to make yearly payments of 6-9% to investors.

Crowdfunding would not allow investors to participate in tax equity finance. However, with competitive rates it could displace traditional term debt in some project structures. Several issues remain to be settled before crowdfunding is considered an established funding vector for solar energy projects. In particular, it is unclear if there can be a secondary market for crowdfunded

9 Suppose, for example, that a corporation commits to a tax equity investment but then unexpectedly experiences losses (ie, negative income) in the fiscal year when it had planned to monetise the investment tax credit (ITC); or suppose the company becomes abruptly cash-constrained. In either case, the company would likely be interested in selling its ITC to another party.

investments – allowing an investor to exit from his or her position prior to the agreed project finance schedule.

The pools of capital potentially available to fund new solar structures are massive

4.5. Assessing the vehicles

The pools of capital potentially available to fund these new solar structures are massive. Figure 16 shows the 'market capitalisation' of vehicles that are in some way aligned with options outlined above. Even if a capital markets-oriented vehicle were to gain traction, it will be some time before the US solar project investment begins to approach the scale of some of these other asset types. Nevertheless, this analysis demonstrates the considerable appetite that exists for high-liquidity approaches to investment – far more appetite than banks and the US government would be willing to stomach – and the considerable valuation that the markets are willing to recognise for long-term, dividend-yielding assets.

The vehicles in Figure 16 are shown in descending order of viability were they to be applied to solar. Publicly quoted equities, including 'yieldcos', already exist as do solar project bonds (Figure 17 and Case Study 5.1); solar securitisation activity is expected to happen this year; implementation of solar REITs will be challenging but, according to some experts, *may* be legally feasible even with current rules; while implementation of MLPs is more of a long shot and will require legislative change.

Figure 16: Market capitalisation of relevant high-liquidity vehicles ($bn)

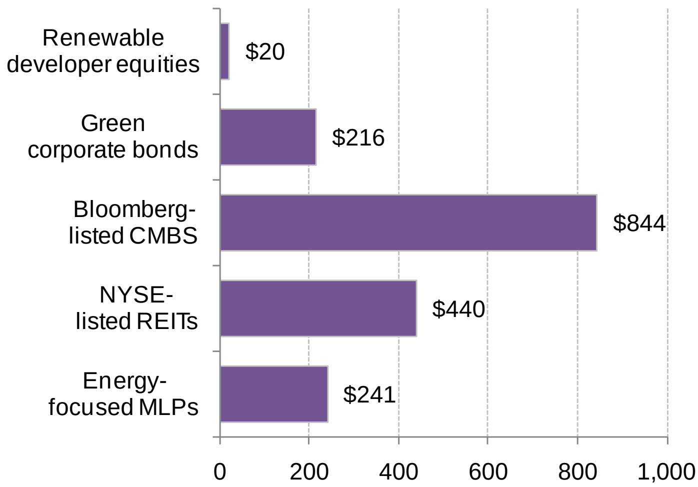
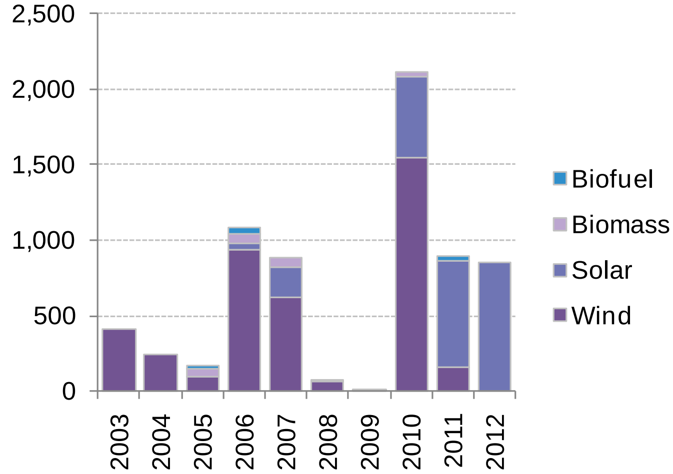


Figure 17: Global clean energy project bond issuance since 2003 ($m)



Sources: Bloomberg New Energy Finance, Bloomberg LP National Association of Publicly Traded Partnerships, NYSE, Rushton Atlantic Notes: Values for 'Green corporate bonds' and 'CMBS' reflect total value of outstanding fixed-interest securities. 'Green corporate bonds' are corporate bonds issued by companies globally with over 25% exposure to clean energy value chain according to Bloomberg New Energy Finance. 'Bloomberg-listed CMBS' are commercial mortgage-backed securities globally that are tracked by the Bloomberg terminal; we estimate that the terminal-listed securities represent roughly a fourth of total CMBS outstanding. 'Renewable developer equities' corresponds to market capitalisation of six selected companies globally that are publicly listed renewable development 'pure plays': EDP Renovaveis, Enel Green Power, Innergex Renewable, Ormat Technologies, Energy Development Corporation, Brookfield Renewable Energy.

5. INNOVATIVE RENEWABLE FINANCINGS: CASE STUDIES

This report discusses various 'prospective' financing options for the years to come. The case studies below, however, demonstrate that innovative renewable financing strategies are already coming to the fore.

5.1. Insurance companies and project bonds: Topaz

In December 2011 Warren Buffett's MidAmerican Energy acquired the $2.4bn, 550MW Topaz solar project. Two months later the utility raised $850m via the first of a two-part, $1.3bn project bond offering. The landmark deal was the first US solar bond financing without a government guarantee. Due to particularly appealing characteristics (among them the support of MidAmerican, credit quality of the offtaker PG&E, and an exceptionally attractive PPA price), the rating agencies rated the bonds investment grade.

The Topaz deal highlights the growing interest of institutional investors

MidAmerican's acquisition and the bond issuance point to two significant, potential trends: expanding appetite among utilities for renewable investments and the growing interest of institutional investors. The original $700m offering received strong demand of $1.2bn, leading the syndicate to increase the issuance size by $150m.

The largest perceived risks among investors in the market were the credit worthiness of the equipment supplier First Solar, and more generally, the perceived long-term operating risk of the technology itself. Insurance companies – which have historically been comfortable with solar and have provided both project debt and tax equity in the past – were likely some of the largest bond purchasers.

5.2. Public market vehicles: Brookfield Renewable Energy Partners

Brookfield Asset Management invests in infrastructure, property ownership and private equity. In 1999 it spun out one its flagship funds, Brookfield Renewable Energy Partners, into a publicly-listed income trust traded on the Toronto Stock Exchange. In September 2011 Brookfield merged its wholly owned renewable energy assets with those in the publicly traded fund to create one of the world's largest listed renewable pure-plays. Its portfolio totals about 4.5GW of primarily hydroelectric assets, which it expands upon via acquisitions and internally-developed projects.

Brookfield is an example of a 'yieldco' as its revenue mostly comes from its generating assets, via the sale of electricity under long-term PPAs. For shareholders, it targets a distribution payout ratio of about 60–70% of funds from operations, and the fund has provided a 12-month dividend yield of 4.88% on its common equity, and 5.25% on preferred stock. One interviewee said these yields are fairly typical of a 'mature' yieldco. However, one caveat is that Brookfield is not necessarily a 'pure' yieldco, as the company is also involved in project development, with 20 projects in various stages of development.

The public market spin-out of Brookfield's renewable assets presents a compelling precedent for solar portfolio owners

The spin-out of the original fund represents an interesting precedent for solar portfolio owners. At least one solar developer is now speaking with bankers about doing this. Speculatively, solar project owners could spin out a portfolio into a publicly owned operating company, in which a share of stock would entitle the owner to income (dividends) from the lease or PPA payments, net of the contribution to project financiers.

5.3. Asset-backed securitisation: SolarCity and Walmart?

Last September, SolarCity and Walmart announced a deal to install solar systems on 60 Walmart stores in California with a goal of generating up to 70GWh/year. At an assumed PPA rate of $130/MWh with 3% escalation, these projects could deliver revenues of $9.1m/year (or a present value of $117m over a 20-year term at a 6% discount rate). The offtaker (Walmart) has a low default risk (it has a Moody's rating of Aa2), and SolarCity standardised its PPA contracts and servicing arrangements across all the Walmart stores. Given this, SolarCity could possibly be able to leverage this portfolio by bringing commercial-scale solar-backed debt securities to investors.

A Danish pension fund has $1.5bn in equity invested or committed to solar and offshore wind projects...

5.4. Pension funds and long-term equity stake: PensionDanmark

Among institutional investors, PensionDanmark is among the most ambitious in terms of renewable project investment. The fund is a veteran renewable energy investor, with $1.5bn in equity either invested or committed to solar and offshore wind projects in Europe. It plans to invest 10% of its assets directly into renewable energy projects. For comparison, many pension funds will only place around 1% of assets across *all* infrastructure projects.

In 2010, PensionDanmark bought a 50% stake in Dong's Nysted wind farm for DKK 700m ($130m). In April 2011, PensionDanmark and fellow large Danish pension fund PKA acquired a 50% stake in the Anholt offshore wind park in the north-east coast of Denmark for a total joint investment of DKK 6bn ($1.1bn). The 400MW project, run by Danish utility Dong Energy, will be the biggest offshore wind farm in Denmark and one of the biggest in the world when completed in 2013. PensionDanmark will own 30% of the asset, and PKA 20%.

...with returns of 6.5–9% on its existing investments

PensionDanmark has explained that this direct form of project investment is preferable to investing in an infrastructure fund because it bypasses high management fees and allows for greater control. On the other hand, a high level of expertise and a lengthy preparation is required for such transactions. According to management, the fund has realised returns of 6.5–9% on its existing investments.

6. POLICY OPTIONS

Under the status quo, US solar will experience significant growth in the coming decade, enabled by rapidly falling costs and by the drivers identified in this report: new business models for deployment, new investors, and new vehicles for investment. With adjustments to policy, however, this growth could potentially be accelerated, and these drivers could be reinforced.

Table 5 in the Appendix sweeps across a range of policies, both existing and proposed, aimed at promoting US solar. The taxonomy for these is based on Bloomberg New Energy Finance's New Energy Policy Library, which tracks implementation of 68 different policy types around the world. For each that could be relevant to US solar, the table describes the specific application of the policy that has been enacted or proposed, along with an assessment of its current status or future viability.[10]

Solar investors, developers, and industry advocates have articulated five major themes as high priority. These cover policies which (a) have either been proposed or are already in place and could be further strengthened, (b) could be folded relatively easily into existing market structures or existing policies, and (c) have been cited by investors as examples of policies which could pave the way for significant increases to investment and solar penetration.

The scarcity of long-term SREC contracts makes project investment a highly risky merchant bet

- **Strengthen existing Solar Renewable Energy Credit (SREC) programmes**: Solar REC markets, pervasive in the Northeast US, are often touted by observers with only a superficial understanding of those markets. Experienced players operating there know the challenges of those markets: the scarcity of long-term SREC contracts, which makes project investments a highly risky merchant bet; and the boom-bust cycles, whereby build rates hurry ahead of regulators' expectations, creating cases of massive SREC oversupply.

  Investment in these markets could be supported by strengthening existing standards, which can be achieved through various means, the most straightforward being lifting or accelerating the targets for solar carve-outs. New Jersey and Pennsylvania are examples of markets that are currently flooded with oversupply and whose legislatures are evaluating proposals to accelerate SREC targets.

  A further policy push could focus on mandating availability of long-term contracts. These are sometimes not easily compatible with load-serving arrangements in deregulated markets but in some cases have been implemented through creative workarounds; Connecticut, for example, has recently introduced a carve-out, expected to be filled mostly through solar, which requires electric distribution companies to allocate funds towards the procurement of SRECs, which will be procured in standard, 15-year contracts.

10 The list is neither exhaustive nor granular – there may be specific policies being aggressively promoted at state or even municipal or utility-specific levels, which are not captured here.

Standards around solar leases and PPAs would spark the growth of solar-backed securitisation

- **Introduce standards**: Adoption of standardised programmes propels investments – the California Solar Initiative and the state's Renewable Auction Mechanism allow developers to efficiently submit and process projects. Standards around solar leases and PPAs, furthermore, would spark the growth of solar-backed securitisation.
- **Enable incorporation of solar into the grid**: Relatively slight changes to regulation could facilitate deeper penetration of distributed solar. Two prominent examples are wider adoption of net metering rules and adjustments to 'PURPA' rules.

  Under net metering, system owners are compensated for electricity the system feeds back into grid (ie, the portion of generation not consumed by the owner). Most US states allow net metering up to a certain percent of peak load (typically 1-5%); advocacy efforts could focus on promoting net metering rules at the federal level or lifting those limits.

  The 1978 Public Utility Regulatory Policies Act (PURPA) mandates that an electric utility buy power from a qualified generator at the utility's 'avoided cost' rate. The law was the first major step toward unbundling of electricity service, prompted the emergence of IPPs and opened the door to competitive renewable projects. Yet, for the time being, with solar still pricier than fossil fuels, the technology does not usually meet the 'avoided cost' metric. Introduction of a solar-specific but still competitive avoided cost rate could ensure the uptake of solar generation by utilities that would otherwise purchase fossil-based generation.[11]
- **Make ITC use more flexible and amenable to new parties**: Previous Bloomberg New Energy Finance analysis has shown that the ITC 'works' for investors: tax equity investors in a typical solar project could achieve IRRs of 14-48%, depending on the structure.[12] Yet many potential investors are discouraged from undertaking investments, often due to the illiquidity of the renewable energy tax credits, especially compared with tax credits in other sectors. Solar financing professionals have identified three adjustments to the ITC rules for solar which could make them more aligned with other sectors and increase their appeal to new investors, summarised in Table 4 below.

Table 4: Potential adjustments to solar ITC rules to increase appeal for new investors

	Description	Type of change required
CRA / public welfare qualification	Community Reinvestment Act (CRA) and the public welfare investment (PWI) authority motivate banks to provide equal access of their products to underserved (eg, low-income) populations and to undertake investments that benefit the public. Low-income housing tax credits (LIHTC) can be used to meet CRA obligations; renewable ITCs cannot. Expanding the qualification to include renewables would incentivise banks looking to lift their CRA scoring (particularly local and regional banks who have not yet been prominent players in the market) and make the tax equity market more competitive, lowering yields.	Regulatory change through Office of the Comptroller and Office of Thrift Supervision
ITC recapture and transferability	'Recapture' risk presents headaches for solar project investors. Change in ownership, sale of the project, foreclosure on the property, and other scenarios can trigger the ITC to be recaptured before its benefits are realised. The Treasury cash grant programme offered more flexible treatment: the project could change hands without the ITC being recaptured, as long as certain conditions were met. A return to cash grant programme rules would mitigate this risk.	Legislative change
Effective yield accounting	LIHTC investments benefit from favourable treatment of losses under GAAP accounting – specifically, the favourable rules mitigate the earnings volatility caused by tax credit investments by allowing the investor to recognise the benefits of the tax credits in conjunction with the costs of the investments, so that the financial statements reflect a steady 'effective yield' throughout the period. Broadening the accounting rule to also apply to solar would alleviate some corporate investors' concerns about the impact of the ITC's 'lumpiness' on earnings statements.	Accounting change

Source: Bloomberg New Energy Finance, conversations with solar investors, advisors to investors, and developers

11 This is different from a feed-in tariff (FiT). A FiT is set by law or regulation. A resource-specific avoided cost is set by a formula based on prices of generation by that particular resource. The former is an incentive rate; the latter is a market rate.

12 Bloomberg New Energy Finance whitepaper (commissioned by Reznick Group), The return – and returns – of tax equity for US renewable projects, 21 November 2011

- **Sanction liquid, tax-advantaged vehicles**: Whether they take the form of renewable MLPs or S-REITs, vehicles that allow investors to buy shares in public markets, offer tax-efficient financing to the sector, and are without an illiquidity premium have the potential to expand the base of investors and lower the cost of capital. Of the two, S-REITs seem more politically viable, as they can be implemented without legislative change and do not entail butting heads with deficit hawks.

  As an initial approach, usages of the S-REIT structure may simply feature the bundling solar systems as part of an existing REIT-eligible real estate property. The longer term play, though, is to enable the creation of pure play S-REITs: funds composed entirely of solar assets. Realising these kinds of structures would require that PPA revenues earn qualification as 'rental income' and likely also that solar equipment earn qualification as part of property.

  A final wrinkle to be smoothed to further pave the way for S-REITs, would be to allow for production-based tax credits (PTC) in lieu of ITCs for solar. According to advocates of this idea, the steady long-term drip of PTCs would more suitably fit the cash flow profile of a dividend-yielding REIT than would a large lump-sum payment of the ITC. However, this would also expose an investor to performance risk.

7. NEAR TERM: CONSOLIDATION ENABLES EVOLUTION

Sector consolidation will enable these innovations in solar financing

The evolution that has been described throughout this paper is one that we expect to unfold in the medium term, over the next several years. For this to happen, however, in the nearer term, the make-up of the US solar industry will itself need to evolve. Specifically, sector consolidation will enable these innovations in solar financing.

The industry will likely transition from one with many small players – particularly in the residential and commercial markets – to one that will have small number of large and well-capitalised players. The expiration of the cash grant will accelerate industry consolidation. Smaller developers who thrived on the grant will not be able to raise tax equity because providers have minimum investment thresholds of $15-30m or more. Additionally, smaller developers are typically unable to provide indemnification for tax equity providers who are looking to protect themselves against the risks of ITC recapture (recapture may be triggered by circumstances such as foreclosure on the property on which the solar project sits). Sponsor size matters, and smaller developers unable to raise tax equity may not be able to stay in business.

Consolidation will facilitate the emergence of investment options that require scale such as asset-backed securities or 'yieldco' issuances. It will lower risks for investors, and lead to a decrease in cost of capital. Consolidation may particularly benefit the commercial market. Large third-party financiers such as SolarCity are well-versed in obtaining tax equity finance for the residential market, and large developers such as NRG are similarly equipped for utility-scale projects. However, the commercial space has been largely neglected by tax equity investors, as project developers today are too small to provide standardised commercial PPA contracts that are more complex than residential PPAs and generally too small to offer indemnification to tax equity investors. In a consolidated industry, developers may have the scale to raise tax equity for commercial-scale projects.

Even with consolidation, it is unclear if the tax equity 'majors' will be willing to finance small distributed solar projects. Many providers only have experience with utility-scale projects and may be turned off by the due diligence involved with small projects or portfolios. In the near-term this may require new entrants to finance these deals as well as potentially tax equity guarantors to protect investors against the risk of ITC recapture.

Appendix

Table 5: Landscape of US solar policy options

Mechanism type	Policy type	Definition	Existing or potential US solar-specific applications (*potential in italics*)	Status of existing policies			Status of potential policies			Explanation
				No longer applicable	In force	In force and expanding	Unlikely to be viable	Viability uncertain	Likely to be viable	Cells highlighted in green indicate proposed policies (or existing policies that have the potential to be strengthened) which represent potential high-priority opportunities for solar industry advocates.
Carbon market mechanism	Domestic cap and trade	Creation of tradable emission permits, which place a price on greenhouse gas emissions and can be traded across borders	• California cap and trade • *Other carbon programmes*							California programme, due to launch in 2013, will incentivise low-carbon power generation, though projected carbon prices (average $31/t between 2013-20) will not be sufficient on their own to drive incremental solar. Cap and trade not viable elsewhere in US in the short term
Debt finance mechanism	Loan guarantee	A commitment on the part of the guaranteeing agency to assume responsibility for or flex the terms of a loan if the borrower defaults	• US DOE 1705 loan guarantee programme							Temporary programme authorised loan guarantees (up to 80% of loan) for renewable projects; programme ended Sept 2011
			• *'Guarantees' for tax equity investments*							For other, non-renewable sectors (eg, community investment tax credits), banks have extended guarantees to tax equity investors (eg, large corporates) – guaranteeing to make the investors whole up to a certain IRR. To support renewable tax equity, the government could consider similar forms of guarantees, though this is unlikely to gain support given the controversy around 1705 programme
Energy market mechanism	Feed-in tariff	Guarantee of power prices above the average market rate, depending on renewable technology used	• Local feed-in tariff (FiT) programmes • *Other FiT programmes*							Feed-in tariff programmes exist in some municipalities or states (Sacramento, Gainesville, Vermont, Hawaii) But mechanism has not gained support at broader regional or federal level
	Preferred status	Preferential treatment of specified technologies, equipment or methods promoting low carbon outcomes	• Segregation of federal land for solar development							Rule issued by the Bureau of Land Management (BLM) in April 2011 allowing for the temporary segregation of federal land for up to four years: during this period, solar projects under development are insulated from interference by competing interests (particularly mining-related claims). BLM manages 245m acres of land, of which 22m has high solar potential (especially in southwest US)
	Renewable portfolio standard	Requirement for utilities/distributors to source a specific % (or capacity) of power from renewable sources	• RPS programmes with solar carve-outs							17 states plus Washington DC have solar carve-out as part of their RPS; several have moved towards strengthening the carve-out in recent year (eg, MD, DC) or are considering strengthening it (eg, NJ, PA)
	Reverse auction / request for contract	Competitive tender for power purchase/installation deals targeted at a specific technology	• California RAM • *Federal reverse auction*							California Renewable Auction Mechanism (RAM) authorises utilities to procure system-side DG of <20MW; RAM streamlines process for developers and aims to achieve lowest cost for ratepayers – bidders set their own price for simple, standard contract Hudson Clean Energy Partners has proposed federal reverse auction for clean energy, funded by oil & gas lease sales and royalty payments (creating 'federal RECs' that could be fungible with state RECs) – the proposal advocates cash-based, rather than tax-based, incentives linked to production.
	Standards	Implementation of standardised processes and contracts	• *Standardised PPA contracts for offtakers*							Standard offtake contracts with utilities, buildings, and homeowners would enable high volume of small, diverse projects to be pooled together, facilitating economies of scale for investment and enabling securitisation

Cells highlighted in green indicate proposed policies (or existing policies that have the potential to be strengthened) which represent potential high-priority opportunities for solar industry advocates.

Mechanism type	Policy type	Definition	Existing or potential US solar-specific applications *(potential in italics)*	Status of existing policies: No longer applicable	Status of existing policies: In force	Status of existing policies: In force and expanding	Status of potential policies: Unlikely to be viable	Status of potential policies: Viability uncertain	Status of potential policies: Likely to be viable	Explanation
	Utility regulation	Restructuring regulation to support low carbon outcomes	• *Net metering*			■				Solar system owner receives compensation for portion of electricity fed back into grid (ie, portion not consumed by the owner). Currently several bills pending at the federal level would mandate that utilities provide net metering, while most US states allow net metering up to a certain % of peak load (typically 1-5%)
			• *'Low-cost' utility regulation measures*					■		Potential 'low hanging fruit' measures adopted at the PUC level that would facilitate solar adoption include: (i) apply 'silent assent' principle to new project approval (eg, if authorities do not respond within 30 days of announced intention to develop project, developer may proceed); (ii) institute resource (solar)-specific avoided cost rates to ensure the uptake of solar generation by utilities that otherwise are required to purchase lowest avoided cost (eg, natural gas) resources. (This is different from a feed-in tariff. An FiT is an incentive rate, whereas a resource-specific avoided cost is a market rate.)
Equity finance mechanism	Grants	Public financial aid to support low carbon outcomes	• 1603 Treasury cash grant programme	■						Cash grant for project owner corresponding to 30% of project cost . Expired Dec 2011
			• Local / regional upfront rebates		■					California (via California Solar Initiative) and Colorado among states that incentivise solar deployment by offering cash-based rebates based on system size and cost
	National laboratories	Creation of national centres for research	• DOE and other national lab initiatives		■					US DOE funds both technical and market research – eg, DOE SunShot Initiative to reduce total cost of energy systems (including 'soft costs') by 75% by 2020
	National / state / local infrastructure funds	Project investment in equity or debt funds invested in clean energy projects	• Public Benefit Funds				■			A number of US states established Public Benefit Funds (PBF) for renewable energy and energy efficiency in the process of deregulating their electric utilities in the 1990s. Most state PBFs expired after their initial terms, and there has been limited effort to reinstate them in the aftermath of the recession.
Tax-based mechanism	Accelerated depreciation	Granting the right to depreciate certain types of clean energy equipment over an accelerated time-frame to reduce tax liabilities	• MACRS • Bonus depreciation • 'Super bonus' depreciation	■	■					MACRS allows for depreciation of solar asset on accelerated (6-year) schedule, compared to ~25-year project life Bonus depreciation (allows 50% depreciation in first year) is available through 2012 Super bonus (100% in first year) was available in 2011
	Investment tax credit	Tax benefit based on upfront capital investment, to reduce tax paid in the early years of a project	• ITC		■					Investment tax credit for project owner corresponding to 30% of project cost. In force through 2016
			• *CRA / public welfare qualification*					■		Qualification of solar ITC to allow banks to count these credits for community-serving obligations
			• *ITC recapture and transferability*					■		Flexibility to allow change in ownership of solar projects without risking recapture of the ITC before it is fully monetised
			• *Effective yield accounting*					■		Adjustment of GAAP accounting rules to mitigate the volatility to earning statements caused by the ITC's 'lumpiness'

Mechanism type	Policy type	Definition	Existing or potential US solar-specific applications *(potential in italics)*	Status of existing policies: No longer applicable	Status of existing policies: In force	Status of existing policies: In force and expanding	Status of potential policies: Unlikely to be viable	Status of potential policies: Viability uncertain	Status of potential policies: Likely to be viable	Explanation (Cells highlighted in green indicate proposed policies (or existing policies that have the potential to be strengthened) which represent potential high-priority opportunities for solar industry advocates.)
	Production tax credit	Tax benefit based on project performance, to reduce tax paid over project lifetime	• *PTC for solar*							Tax credits based on MWh of generation is currently available for other technologies (eg, wind, geothermal, biomass) but not for solar – yet some investors argue that PTC-based incentives may be preferable to ITC as they are long term and not dispersed in lump sum: would be particularly suitable under S-REIT structure
	Tax waivers	Exemptions on taxes to encourage investment	• *MLP qualification for renewables*							Proposals aim to broaden MLP eligibility to include renewables. Lobbying efforts underway yet resistance will be significant, since there is push in Washington to reform tax regulations and 'close loopholes' rather than creating more exemptions.
			• *S-REIT qualification for renewables*							Proposals aim to allow solar systems to be part of REIT structures, or for portfolios of solar to constitute a unique type of REIT. Policy may gain hold as it may be possible to implement without significant legislative change.

Source: Bloomberg New Energy Finance, drawing on the company's New Energy Policy Handbook outlining 68 policy types

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