

Secondary Markets in Solar: Securitization

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Executive Summary

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This Project examines the nascent field of financial securitization in solar. Securitization aggregates a similar type of assets (i.e. mortgages or credit card debt) in order to sell the future cashflows to investors based on a set contract regarding principle and interest, thus making the performance of an illiquid asset similar to that of bonds. Securitization allows greater levels of public capital to invest in these products and lowers the cost of capital that asset class must pay. Solar has grown greatly in the last five years as an asset class and thus securitization has begun to develop. The paper will look at the recent development in securitization type investment vehicles for solar. This includes Solar City's Asset Backed Securitizations and six yieldcos now publically traded. The paper will then explore ways securitization can continue to grow and how it can benefit the solar industry. Key developments in Standardization for contracts and for investors will help securitization grow.

Introduction to Solar and Securitization

Solar in the United States has grown incredibly fast in the last five years. By 2009, the United States had 1,164 cumulative megawatts of solar PV.¹ By 2013, that total had skyrocketed to nearly 15,000 megawatts. Solar continues to grow: in the first half of 2014, more than half a million homeowners and commercial entities had installed solar systems. This growth in the solar market has piqued the interest of banks who are now looking to securitize solar assets.

The growth of solar does not derive from a technical breakthrough but rather from financial innovation: third party ownership, a simple yet elegant model, has in many states turned solar from a large and costly investment to a self-evident business decision by offering immediate savings. Instead of investing in a system with a long pay-back period, businesses can sign a contract for solar power that immediately reduces electricity expenses because the (\$/Kwh) rate they paid to the third parties involved costs less than the price of electricity from utilities. The model has turned solar investors into owners of contracts often set for as long as 20 years. However, as solar industry seeks to grow in the face of declining government support, the cost of solar must come down.² While the hard costs --the costs of manufacturing panels-- have fallen, softs costs, such as the cost of financing, have not fallen significantly. In addition, due to federal incentives, solar depends heavily on a limited number of tax equity financiers, whose paucity drives up the cost of capital. The securitization of solar assets, which would open up solar to the public market, represents a key step in the maturation and development in the industry.

This paper will first explore current growth opportunities in solar securitization and recent market developments from Yield Cos and Asset Backed Securities (ABS). Then I will explore ways in which securitization can develop and become more effective.

The Solar Industry

Before delving into the history of securitization. I will present the current development of the solar industry and nascent efforts in securitization. Federal tax incentives have played a key role in supporting solar.³ Solar developers often cannot fully recoup the full value of those tax incentives as they do not have a large enough corporate tax liability to use the credits to their fullest value. As a result, companies (banks and insurance companies), acting as “tax equity” investors, commit capital to solar projects in order to receive tax benefits. Many returns from solar investment come from tax benefits, which include an investment tax credit (ITC) and rapid scale depreciation in addition to any losses that serve as a tax write off. Currently, when an investor finances solar, it receives 30% tax back on the cost of the investment; in addition, solar assets which have a lifespan of 20-30 years depreciate in 5 years, allowing companies to deduct the high depreciation value from their income and to reduce taxes. Any losses from the early

¹ Lowder, T.; Mendelsohn, M. (2013). Potential of Securitization in Solar PV Finance. 37 pp.; NREL Report No. TP-6A20-60230.

² Horowitz, Yuri, and Will Graves. "Peering Over the 2017 Horizon for Solar, Part 2: Beyond the ITC." GreenTechMedia. GTM, 21 July 2014. Web. 09 Mar. 2015.

³ Lowder et al (2013).

years of a project's development also serve as tax benefits. These tax benefits require investors with large tax appetites, who in turn demand significant returns from their illiquid investment. However, fewer than twenty five institutions, insurance funds and corporations served as tax equity investors last year. Furthermore, tax equity is complex, illiquid and thus a high cost source of financing. Currently the ITC provides a 30% tax refund for a company's investment in a solar project. By January 2017, pending no federal action, the tax credit will fall to 10%, which will significantly change the industry.

To make solar investment appealing to tax equity investors the industry has developed three ownership structures: The sales-lease back, partnership flip and inverted flip.⁴ In the sales-lease-back model, the tax equity investor will buy the project from the developer in order to gain the tax benefits, but then will lease the project back to the developer, hence the name. The developer pays the lease but collects the PPA or payment from the energy off-taker and collects cash from the original sale to the equity investor. The developer may have the option to buy the project for a certain fee after the recapture period. By owning the project, the tax equity investor ensures that it accrues the tax benefits while the developer manages the project.

In the partnership flip model, the developer forms a Limited Liability Company (LLC) to develop the project and to contract with the off-taker. Before the project begins, the tax equity investor will purchase equity. This creates a tax partnership, allowing the tax equity investor to receive as high as 99% of the tax benefits. After five to seven years, the developer will receive the majority of the taxable income. The investor receives cash and tax benefits in order to meet its IRR target. After meeting the target, the developer can purchase the investors ownership stake for an agreed amount based on fair market value, that is the value of the cash flows minus costs. At this point, the developer could securitize the assets.

In the inverted lease model, the developer leases the project to the tax equity investor who then enters the PPA or sublease with the off-taker. The tax credit is "passed through" to the investor, but the developer will retain depreciation benefits. As the lessor, the developer retains tax ownership and associated depreciation deductions. The tax equity investor can usually make a pretax profit on the difference between the PPA payments and its rent payment to the developer. In these scenarios, the developer is the holder of the receivable, and creates an issuer known as a special purpose bankruptcy remote vehicle (SPV). The issuer then issues equity or debt securities to investors. The proceeds will then go from the issuer to the originator, in this case the developer.

Securitization provides leverage to the back end of the project, but the front end investor retains more of a security interest than in the case of a pure loan with the contracts as collateral. Securitization itself can either remove assets from the books, resulting in a tax deduction, or lead to the sale of the assets, resulting a new tax liability. It is also possible to securitize a project without tax equity. The securitization proceeds could pay off debt or construction loans, as with a take out loan, or achieve a book sale of the receivables.

⁴ Mull, Richard. "The Encyclopedia of Solar Securitization, Part 1." GreentechMedia.com. Greentech Media, 3 Sept. 2013. Web. 11 Jan. 2015. <<http://www.greentechmedia.com/articles/read/The-Encyclopedia-of-Solar-Securitization-Part-1>>.

In the solar sale lease back, the tax equity investor, as the owner, could securitize the receivable, causing a deemed disposition of the assets. In a securitization with solar sales leaseback, it is important both to capture the tax credit and to avoid a tax on sales of the asset. Normally, one can structure the securitization to avoid a deemed disposition. For example, by over-collateralizing the transfer the risk of default will be nullified. The developer cannot securitize the PPA or receivables, as the obligations to the lessor may be a full recourse loan, and the lessee would have to use the PPA as collateral. In an inverted lease, the developer should be able to securitize the rent receivable, as long as it is not prepaid. This would be similar to the securitization of a lease receivable from a non-tax equity investor, because neither require tax equity investor consent nor endanger tax credits. Tax equity investors can securitize a head lease receivable, and developers can securitize a lease receivable, an inverted lease, or the distribution after a partnership flip. However, securitization, in some situations, may not be supported by a tax equity investor if it is deemed a sale and results in recapturing benefits. Finally, in securitization, where size plays a crucial role, the cash flows have to greatly outweigh the transaction costs. Thus, commercial scale and residential developers must bundle deals.

Securitization can work with “take out” financing, by which the issuer purchases the projects or assets, usually after five years, from the tax equity investor. It is also possible for the developer to take out loans based on their percentage in the partnership, prior to the take out financing. If many project partners were to take out loans, then these loans could be pooled and securitized as a CLO. Due to limited liquidity and to the limited number of tax equity investors, the cost of capital based on the needed internal rate of return ranges from 7 to 18%. The cheaper cost of capital would place downward pressure on the break-even solar price that companies would need to charge per watt or per Kwh, making it more cost competitive with retail energy. In tandem with the ITC, securitization could reduce the weighted average cost of capital for a given solar project in a portfolio.

Securitization has many different forms. Currently the market has embraced asset backed securities (ABS) and yieldcos, discussed below. However, there is also a possibility that collateralized loan obligations will also serve as a vehicle for securitizations. ABS, the common structure securitization for real estate and mortgages, are based on receivables from consumers, such as payments on a loan for auto loans, credit card debt and student loans (the most common ABS). These products serve a key role in the economy and have low capital cost for consumers and originators, because they are viewed as secure investments.⁵ Less common ABS, known as esoteric assets, have limited trading activity and usually involve higher fees and a lower rating. These assets include the financing of Low Income Housing Tax Credit, cell phone towers, song royalties and tobacco legal claims. For now, solar exists as an esoteric ABS. Collateralized Loan Obligations are a pool of loans usually from businesses as opposed to consumers. The payments made on those loans serve to pay down the interest and principle on each of the CLO. Thus, the investors take on the risk of the businesses’ ability to pay the loans, and the rating for the underlying business is crucial.

Solar projects can also issue bonds by the developer or owner to fund development or to pay down existing debts. ⁶The principal and interests on the bonds are amortized by the sponsor

⁵ ibid

⁶ Mull, Richard.(2013)

using the payments from the PPA or the existing corporate fund. Project bonds have often been used by utility scale solar developers to finance large scale project such NextEra's St. Clair project in Ontario, Canada. As an asset class, solar must ensure the high quality operation and maintenance of their projects; if they do not produce energy as expected, their value will be severely lowered and the solar industry as a whole will suffer. Uniform O&M standards to ensure guaranteed permanent maintenance may serve well. With these standards and indicators of future performers, capital markets will accept longer loan tenors for the life of the solar panels 20-30 years. A floating interest rate in the capital market pegged to LIBOR or Treasuries will reduce inter rate risk.

Commercial solar developers could look into developer CLO, since the main risk will be the credit of the underlying companies and that risk can be tranching accordingly. CLO have had an average size of \$400 to \$500 million, much higher than ABS. Thus a single CLO will have 250 400 k systems with 25% of the capital stock, assuming an installation cost \$4/W. So a \$400 million CLO covers 100 MW of development. Over time CLO may well cover more. As CLO would correspond to the commercial solar development, the industry must develop standard PPA contracts, something that NREL hopes to address.

Yuri Horowitz, CEO of SolSystems, a financier of commercial and utility scale projects, emphasizes the importance of cost of capital and thus the potential of securitization when the ITC expires.⁷ The table below shows the necessary price per watt of installation. Intuitively, with a higher capital cost and a lower electricity price the developer must pay a lower cost per watt for a solar in order to make profits. If the price of electricity increases, then the installation cost that the developer pays can also increase -- Of course, if the price of electricity increases businesses and families have a stronger incentive to go solar to save money. According to Jigar Shah, founder of SunEdison, it is unlikely that the cost of electricity will decrease because flat energy demand will require utilities to raise prices to meet their return on investment. If the cost of capital increases, then the developers must reduce the price they pay for installation in order to break even. Thus, securitization offers an effective way to bring down the cost of capital. As solar modular prices have decreased significantly in the last five years, it is unlikely that they will decline further; thus gains must be made in the cost of capital.⁸

Horowitz highlights the value that the ITC currently plays in bringing down the cost of capital. Currently, the ITC at 30% will fall to 10% by 2016.⁹ Horowitz compares the 10% ITC (chart below) to a situation with no ITC. He estimates that the ITC provides 150 basis points in reducing the cost of capital. Assuming those numbers, Horowitz looks at the relationship between grid parity and cost per watt. He concludes: "commercial customers, average all-in prices for solar projects in 2017 will need to be between \$1.60 or as low as \$1.33, assuming a cost of capital between 6 percent and 8 percent. Residential installations in 2017 will need to be reduced to a cost range of \$1.98 to \$1.65 assuming a cost of capital between 6 percent and 8

⁷ Horowitz et al

⁸ "The table assumes a twenty-year PPA with a 1 percent annual escalator, a California tax rate, degradation of .5 percent annually, no ITC, no additional incentives, and a production capacity ratio of 1500 kilowatt-hours annually. Importantly, there is no consideration for potential solar renewable energy credits (SRECs) or feed-in tariff income, and we do not take into account a potential step-up in basis."

⁹ Ibid.

percent.” The discrepancy, which derives from the higher electricity prices that residential customers face, makes it easier for residential solar developers to offer a profitable product. For example, in 2013, commercial energy customers in Ohio paid \$0.09 per kilowatt-hour, while residential customers paid \$0.12 cents/kWh. Using a 7 percent cost of capital, commercial projects must have a \$1.19 per mwh, while a residential system will only need to lower cost per watt to \$1.72.

From a broad perspective, a decline of 100-basis-point in the cost of capital increases the base line price for a residential system with a \$0.125 PPA rate from \$1.98 to \$2.18. This additional 20 cents per watt can benefit the entire industry. The same 100-basis-point drop in the cost of capital from 6 percent to 5 percent for commercial projects that sell electricity at a lower \$0.10 per kilowatt-hour PPA rate, will provide a smaller increase in potential costs to \$0.16 per watt. Thus, residential and commercial solar (both with higher PPA rates than utility-scale) will benefit from cheaper cost of capital because of the benefits of scale and because the cheaper cost of capital will remove the need to lower total cost per watt. According to Horowitz, with no state incentives residential solar will become competitive with the price of energy by 2017 in 15-20 states, assuming an ITC of 10% and a 6.5% cost of capital, while commercial solar should be competitive in 13-17 states in 2017, assuming an ITC of 10 percent and cost of capital of 6.5 percent.¹⁰ Thus, securitization, which offers a crucial way to bring down the cost of capital in the face of the reduction in ITC, can open up more markets.

In order to meet investor needs, SAPC has been working to standardize power-purchase agreements, leases, data protocols, quality assurance protocols, and operations and maintenance (O&M) best practices.¹¹ SAPC is also walking through mock securitization ratings with real solar system portfolios to identify and to resolve industry gaps that need to be addressed. “The work being performed by SAPC will provide a valuable foundation for wide-scale investment through securitization and other capital market investment vehicles,” said Mike Mendelsohn, senior financial analyst at NREL. There is also a major effort to establish national quality assurance standards in order to create a consistent baseline throughout the solar industry. A high quality standard and third-party oversight will promote uniform investment across the industry to create confidence for investors, as well as a feedback loop on quality to help installers improve over time.

Starting in 2013, investments in solar contracts have been securitized according to two models: the Yieldco, in which investors have equity in a pool of projects, and the asset backed Security (ABS) in which investors provide debt financing securitized by a pool of projects.

Securitization Overview

Securitization pools illiquid assets into financial securities and then sells them to investors on a private market or an exchange.¹² Investors can respond favorably to a particular security by trading the asset and bringing down the asset’s yield. High levels of trading create a demand-pull, causing greater origination of the asset in order to satisfy investor demand. This

¹⁰ *ibid*

¹¹ Lowder at al.

¹² *ibid*

occurred in the case of mortgage backed securities in the late 1990's. Structured mortgage finance through securitization began with the securitization of the mortgage industry in the 1970s. Then, in the 1980's, banks moved on to securitize credit card debt, auto loans and commercial paper. Prior to the collective securitization of MBS in response to the financial crisis of 2008, collateralized loan obligations and collateralized debt obligations totaled more than 3.5 Trillion. The volume dropped precipitously following the financial crisis. At this time, however, the market has rebounded.

Assuming no default, securitization offers tangible benefits, and, used effectively, provides a triple-win opportunity for investors' issuers and end customers. Securitization takes a complex product and standardizes it to conform to investors' desires. It removes the corporate risk incurred when investing in a company directly and the complications involved in obtaining tax credits, and offers a pool of relatively secure cash flows. In summary, it mitigates risk, provides access to a broader pool of capital, improves financing terms and creates opportunities for market growth. The process begins by removing the asset from originators balance sheet, insulating them from the originator -- in the case of solar, the developer's corporate risk-- and making the assets "bankruptcy remote." Pooling assets diversifies credit risk and ideally geographic and other concentration risks. As the pool is quite large, securitization reduces the cost per kWh of asset assessment, and the cost per unit of performance management and reporting. Securitization also allows for various methods of credit enhancement, which can improve the credit risk of the assets and the resulting credit rating. Thus, securitization and the subsequent credit rating attracts more investors to finance solar, opening the door to capital markets and offering them liquidity. The terms of financing from the capital markets may involve lower cost and longer tenors. By monetizing existing assets on their balance sheets, originators will receive additional capital to invest in developing more assets, to expand operations and to grow, all at a lower cost. Moreover, once the secondary market for assets reaches a certain size, there could be demand pull as developers and even investors develop the upstream market. Ultimately, the declining cost of capital can allow developers to offer better prices and deals to attract investors and to bring solar products to and beyond price parity.

Securitization thus serves a powerful tool for developers who wish to grow their business and for investors, especially for institutional investors, such as pension and insurance funds, with strong yields to maintain and under pressure to grow their portfolios. Finally, businesses and consumers can also reap the benefits of securitization through lower costs. However, the dispersion of risk through the market could become systemic and lead to a financial crisis that affects the entire economy, as was the case in the financial crisis of 2008. Securitized subprime mortgages triggered wide scale losses for the financial markets. Credit default swaps, instead of the mortgages themselves, served as collateral and could not be redeemed without severely crippling the market. After the crisis, regulations were enacted in order to reform the system. In terms of securitization, these new regulations mandate transparent investment information; moreover, equity holders, originators and sponsors must retain more risk. Solar, itself, cannot reach a sufficient market size to cause systemic risk. However, in the post financial crisis market, solar must show transparency and standardization as a security.

Securitization, at its most basic, consists of cash flows tied to assets. The market of securitized contracts includes types of debt, installments on leases or contracts, and royalty

payments or other forms of receivables. The originator of the assets must meet certain criteria specified by the market, such as credit quality, size of asset pool or underwriting standardization and other aspects of the contract. Usually, both a legal team and an investment bank help issue the portfolio. The issuing team will create a SPV that pools the asset, is not liable for parent company debt and does not pay taxes. Transferring the assets, in this case solar contracts, to the SPV is deemed a “true sale”, thus removing the assets from the originator’s or owner’s books, reducing liability and giving the owners of the SPV ownership of the assets. The new owners of the equity must pay the fair market value for the assets, usually in cash. Investment banks work to structure the deal, to help sell equity to investors and to issue the first sale. The banks optimize the asset payments to create a security that appeals to investors in terms of maturity and to structure payments in terms of priority to each specific group of investors, creating waterfall payments. The banks may implement “credit enhancement”, such as overcollateralization (adding a higher principal or collateral to the SPV than necessary to meet the terms in order to negate any underperformance by the assets), tranching (the creation of different tranches within the asset class usually by credit rating), and choosing either a fixed interest rate or a floating rate and a subsequent option for credit swaps.

After a bank and lawyers hired by the developer have created the SPV, it must receive a credit rating by an independent agency in order to attract investors. Credit ratings determine the interest that the originator must pay to investors in the securitization transaction. The rating is based on the risk of the asset. For example, the market believes that US government debt has very little risk of default and thus usually receives an AAA rating. The lower the rating, the higher the interest rate payment that the owner must pay.¹³

The key participants in the securitization transaction thus include the obligor, originator or issuer, servicer, underwriter, trustee credit enhancement provider, credit rating agency and investor. The obligor makes payments on the assets to the originator; his payments form the basis for the assets in the pool. In the case of solar, the energy off-taker paying for loans, leases or a PPA contract for the solar equipment, serves as the obligor. The originator creates the contracts and owns the asset. The original investor in a solar project, either a tax equity investor or the developer, acts as originator depending on the equity structure. The servicer ensures that the assets are maintained and enforces compliance of the contract payments to the investors and from the obligor. The issuer, usually the developer or original owner, moves the assets into the SPV. However, as securitization develops, it is possible that originators will sell their assets to a larger developer, who will then include them in the asset pool in the SPV. The underwriter structures the securitization transaction, creates the securities and sells them in the marketplace. He receives a fee for those services and for holding the assets on the balance sheet prior to the sale. The trustee serves the investor, ensuring the compliance of all parties within the terms of the agreement, manages payments to the investors and the SPV, and monitors the portfolio’s performance.

¹³ Mull, Richard. "The Encyclopedia of Solar Securitization, Part 2." GreentechMedia.com. Greentech Media, 9 Sept. 2013. Web. 11 Jan. 2015. <<http://www.greentechmedia.com/articles/read/The-Encyclopedia-of-Solar-Securitization-Part-2>>.

Often third parties such as banks and insurance carriers provide credit enhancements, which can take the form of overcollateralization and can also include loss reserves.¹⁴ Investors purchase the rights to securitized cash flows as a fixed income security. This purchase functions as a loan, since the investor provides capital in exchange for repayment of the principal, plus a decided interest rate. Securitization can also serve as pass-through: the payments made to investors are tied directly to the underlying asset payments made by the obligors and the pooled obligors' payments go directly to the investor. Non pass through payments would involve a payment schedule with fixed payment to the investors; this schedule usually includes a revolving pool of assets to ensure obligations are met. After the financial crisis, third party guarantees are no longer common; however investors can enhance credit in other ways such as tranching and over collateralization. Tranching works to separate assets within the pool by risk, tenor and other characteristics. For residential solar, a pool could tranche based on customers' FICO scores or on the type of customer contract obtained by the customer (loan vs PPA.) Each tranche has its own credit rating and subsequent yield. The highest-rated tranche receives payment and then subsequent lower tranches receive payment consequently, creating a senior subordinate structure. Each investor purchases rights to a specific tranche and receives returns and takes on the risk of that tranche. In overcollateralization assets are placed within the SPV but not securitized so the issuer will only provide securitization for a portion of the pool, with the remaining portion serving as collateral in case the securitized assets underperform.

The investment bank creating the SPV can sell either in the public or the private markets. To sell publicly, the issuer must register with the Securities Exchange Commission, a significant cost of time, diligence and capital. By selling in the public market, the issuer can attract more investors and drive down the cost of capital; they can also attract more liquidity as investors purchase and trade the assets. Private offerings do not involve the SEC; however only select investors known as qualifying institutional buyers, can invest. The size of the securitization in a private market can be smaller, an advantage for solar developers with a limited pool of assets.¹⁵ However, private issuances have higher capital costs of capital, because the liquidity is limited, the market is smaller and the credit rating will probably be lower. As solar grows, public market financing will prove more valuable by establishing solar as a standard and non-esoteric asset class. Moreover, by entering the public markets the cost of capital and, with time, the transaction costs from issuing the asset will go down. Solar assets face a risk premium as the class is new, has a growing but still relatively small volume, and has a long contractual lifespan. Solar panels themselves are quite illiquid and expensive and only derive value from the contracts being obligated, and thus the yields required by investors will rise above many standard asset backed securities. Issued in the private markets, solar securities will lack liquidity and thus investors will demand additional premium. As solar securitization enters this nascent stage, credit ratings agencies will offer lower ratings due to lack of long term historical performance and credit data and to the novel complex structures solar presents. In turn this lower rating will raise the coupon rate and the cost of capital. As solar becomes more common, its rating and cost of capital should improve. Likewise, successful issuance will decrease the cost of capital and encourage developers to develop assets that can be securitized. Ideally, this would result in a virtuous cycle of solar development and smart innovation.

¹⁴ Lowder et all

¹⁵ ibid

Solar City

As the cost of securitization is fixed, only developers with a large amount of assets on their books had an opportunity to securitize. Unsurprisingly, the largest residential solar company, Solar City, has issued three ABS, the first in 2013. In November 2013, they issued \$54.4 million debt with a maturity of 2026.¹⁶ Usually, ABS consist of \$100 million in debt, so the smaller relative size may be explained by Solar City limiting itself to its best assets.¹⁷ The coupon and the maturity of the debt provide cheaper capital than the corporate debt Solar City had received. As the pool consisted only of assets, the risk was lower than that of corporate debt (which had a 7% coupon) especially the length of the maturity, thus the rate was lower than the rate for issuing corporate bonds. The bonds received a BBB+ rating from Standard and Poor's and were sold privately.¹⁸ The bonds had a yield of 4.8%, a somewhat high spread based at the low interest rates of November 2013 and today.

S&P evaluated and rated Solar City's ABS on the credit enhancement, the manager's operational and management abilities, the customer base's initial credit quality, the projected cash flow supporting the notes and the overall structure. Due to the limited operating history, S+P stated: "we expect the rating to be constrained to a low investment grade for the near future"¹⁹S&P noted a series of strengths and weaknesses. Strengths included the fact that the low leverage of only 62% of the assets cost were placed in the loan, interest reserve of six months of note interest due, an inverter replacement reserve account (inverters are crucial for getting solar power compensation), the fact that the solar assets have a very young age and thus will have long term value, and a decent performance structure. The debt service coverage ratio sweep also impressed the raters (The debt service coverage ratio is the ratio of net income to serviceable debt. A negative ratio means there is more debt than cash flows.) The assets had little debt and projected a strong return of cash flows.

In terms of weaknesses, S&P cited the limited history of solar performance and solar customer performance. There is strong "pen stroke" risk, since, if a utility commission were to reduce the rates that customers receive for the solar generation, then the securitized contracts will lose value. S&P believes solar energy production is unpredictable, as are the costs of managing the portfolio, in turn making the cash flows unpredictable. It also claims that solar panel quality may vary across manufactures. Moreover, there could be unforeseen competition from other renewable energy sources. The assets are centered exclusively in California, Arizona and Colorado. Renegotiations of contracts may also reduce cash flows. S&P cites mitigating factors such as the high FICO scores of residential solar customer and the investment grade rating of commercial customers. Currently, Solar City requires a FICO score, valid for at least 90 days prior, of at least 680 and no bankruptcy filings within last five years. For commercial and

¹⁶ Wesoff, Eric. "SolarCity's New \$201M Securitized Solar Portfolio Keeps the Capital Flowing." GreentechMedia. GTM, 25 July 2014. Web. 11 Mar. 2015.

¹⁷ "Solar Securitizations — SolarCity, PACE, ABS, SAPC, S&P, Credit Suisse, Deutsche Bank." Interview by Andrew Coronios, Eli Katz, Xilun Chen, Stephen Viscovich, and Michael Cheng. Solar Securitizations. Chadborne & Parke, 14 Sept. 2014. Web. 08 Mar. 2015.

<http://www.chadbourne.com/solar_secritizations_0914_projectfinance/>

¹⁸ Standard and Poor's Raiting Serivce "Presale: SolarCity LMC Series I LLC (Series 2013-1)" November 23, 2013 Available from standardpoors.com Accessed Feburary 1, 2015.

¹⁹ ibid

government contracts the customer must have investment grade rating, and must provide the last two year of CPA- audited, reviewed and compiled financial statements. Since 2008, only 2.4% of Solar City customers have experienced contract reassignment and only a handful of installed bases were removed. Because customers save money, Solar City offers a real value and customers will recognize this and continue to make payments. Existing solar customers, those under the ABS contract, may have “grandfathered” contracts and not face tariff cuts. S&P described Solar City as an integrated company that offers multiple products and services. An independent engineering firm certified the portfolios production and panel quality. S&P also took very conservative measures of the solar systems product value and the systems degradation value, making it likely that the systems will exceed these expectations. While PV industry has only begun to grow rapidly, the technology itself has existed for many years and does not face obvious competition. The three states do receive far more sunlight than most states in the US. Finally, the systems have not failed thus far, and solar systems failure usually occurs in the earlier years of installation. S&P made a series of cash flow assumptions based on the energy production estimates, customer contract reassignments and renegotiations and operating and capital expenditures.

The solar PPA lease contracts offer cash flow payments similar to those that customers pay to utilities. However, the contracts often differ between developers and state by state, depending on regulation. The lack of standardized terms combined with the short history of PPA makes the pooling of the securities difficult. Bond terms last much longer than the industry has existed. Also solar offers a qualitative value for consumers, either through life-style and/or savings. However, solar is not crucial to consumers’ lives, unlike an electricity bill or mortgage or auto loan payments, thus the downside of not paying is much less severe; therefore the risk of non-payment may be higher than the FICO score of residents suggests. Technological obsolescence is another risk. If new more efficient solar panels develop, customers will avoid paying the bill. It is also possible, although unlikely, that utility rates will drop, making a PPA contract not as beneficial or not beneficial at all.

The sheer length of the securitized revenue streams poses a risk to the asset. With payments of up to 20 year, the contract lasts longer than the duration of most families’ residence in a given home. A new home owner may renegotiate or cancel their contract. An even greater risk comes from vacancy of the home. Also, the length of the PPAs makes default more likely. However, Structured Finance News reported that: “Solar City did provide data that speaks to the risk of renegotiation of customer assets before a contract ends, according to S&P. Since 2008, Solar City has been given permission to operate approximately 39,000 financed systems; of these systems, roughly 900, or 2.4% of the total, have completed contract reassignments, of which the overwhelming majority have experienced full recoveries. Of these 900, approximately 82% were reassigned as the result of the normal sale of a customer’s home (and not because of foreclosure, short sale, death or divorce). The remaining cases were because of various other reasons. In 91% of the contract reassignments, there was a full recovery and the remainder resulted in a weighted average recover of 78%.²⁰ This rate is fairly high, although a new breakthrough in solar technology or financing may cause families to forgo contract on their system and adopt the new system. Solar City must ensure that their contract offers a PPA that saves customers money compared to the utility. If utility rates shrink or fixed charges (charges utilities bill regardless of

²⁰ Ibid.

how much electricity the customer consumes) continue to increase, then solar will lose its value proposition. Utilities have an easier time forcing customers to pay because they have a “stick” they can use, that of shutting off power.

To test the strength of the Solar City portfolio, S&P ran a series of stress tests. It created a base case scenario in which the solar panels themselves have no resale value (a reasonable assumption) and in which no customers renew their contracts, (unlikely according to Solar City). According to this scenario, interest coverage for the transaction is 2x, and interest and timely interest and full principal should be paid by final maturity. The S&P assumptions did include 25% to 30% customer default based on asset classes with similar credit profiles. Of those defaults 10% will not provide any further cash flows; the rest will return to the portfolio in 2 years at a lower monthly rate. These events, they believe, follow the pattern of other similar asset classes. They assume that half the customers will move to residential properties and have to renegotiate the rate at a lower value. They also assume that half of the remaining half, thus 25%, of the residential customers will seek to negotiate the rate due to better offers from competitors. They assume that the marginal utility rate will increase slowly, but that competing solar rates will decline in the future. Their stress test had up to 50% of customers defaulting --and thus a reduction in payments-- and 30% moving --and thus fewer negotiations. These assumptions did not affect the ability of the bond to pay. They also conducted a stress test aimed at back ended cash flow stress by reducing cash flow after 10 years by 50%, and this too did not affect the ability to fulfill obligations. The final stress test confirmed that even if 30% of customers were removed from the portfolio, the portfolio still could make payments.

The DSCR equals the sum of customer payments, performances based incentive payments, and insurance proceeds, minus the costs of managing the pool, divided by the sum of the note interest and scheduled principals for each payment date. As the first ABS, the DSCR ratio had high triggers for early amortization with 1.15x. If the DSCR is equal or less than 1.25x, there will be a DSCR sweep period until it is greater than 1.25x for two consecutive sweeps. If the DSCR is less than 1.05 for three consecutive dates, the manager will be terminated.

Bob Kelley, Solar City’s chief financial officer (CFO), at the time felt “disappointed yet understanding” of the ‘BBB+’ rating from S+P.²¹ The fact that the interest rate on the securities reached 4.8% impressed analysts who expected a rating of around 6.5%. An analyst described the rate as not bad for a first deal. The prevailing notion is that this securitization would serve very well if it led to more securitization. According to Kelley, the S&P wrongly analyzed the business from the lease of installation, default/recovery/ and foreclosure, instead of a direct to customer energy sales business, which has inherent risks of vacancy and reassignments. In an interview after the issuing, Kelley stressed the value that Solar City provided to customers, labeling electricity the “highest operating cost for households.”²² Thus the benefits that Solar City provided were not a fringe saving, but a strong product. Kelley declared that the value offered to customers and the years of operation data “made it A rated”. California, Arizona and Colorado made up the top three states in the pool backing the Solar City. They had a weighted average price per kWh is \$.15. California currently charges \$.25 per kWh. Thus, Solar City

²¹ "SolarCity Pulls It Off." Asset Securitization Report. Structured Finance News, 4 Dec. 2013. Web. 11 Mar. 2015.

²² *ibid*

saved California customers around .10 a kWh. The underwriters believe that these contracts will have a certain renewal value, so that after 20 years many customers will have been happy with the performance of the solar system and with what will be by then a 20 year track record, and sign a new contract with Solar City. However, S&P did not include this assumption in the deal.

According to Solsystems CEO Horowitz, the 4.8% interest does not reflect the true capital cost for Solar City.²³ Solar City had to pay Credit Suisse to underwrite and to structure the deal, which cost them 200 to 250 basis points. Furthermore, the securitization only financed 62% of the portfolio, and thus Solar City provided 38% of the capital directly. However, the ABS covers all payments in the system, making it highly over-collateralized –which is prudent for a first securitization. Also, there were significant transaction costs from assessing the securitization and developing metrics and processes to evaluate the portfolio and issue the product, estimated at around 50 to 100 basis points. Thus, Hurwitz summarizes that the ABS provided capital at a cost between 7% and 9%, depending on the cost of capital, for the equity component and the transaction costs. While it is likely that these transactions costs could fall, it is not clear what the floor is.

An off the record source for Greentechmedia declared: “I would say this is 'as expected.' All the metrics moved in the right direction as investors are gaining more experience with the asset class. There were no market events exogenous to the deal that would have affected the trend. Most interesting to me is the tail risk -- looks like a portion is non-amortizing, which means Solar City and investors expect future financing to be even more favorable and available. There is event risk, of course, that could change that conclusion, but we won't know that for just short of seven years.”²⁴

According to Standard and Poor's analysis, “trying to figure out what the stress and base case scenarios should be for a 20-year revenue stream when there are only a couple of years of performance data”²⁵ made the analysis account for more risk than presented within the historical data. They added: “We tried to make as many correlations as possible to utility receivables, but the comparison is not exact.” Thus, the current ABS stands as a more risky and more costly securitization. Despite, the average financing scale, the returns from the financing will provide more capital for Solar City to scale faster, and with lower debt it could offer homeowners better financing options for solar projects.

Stephen Viscovich, the lead banker from Credit Suisse to work on the securitization, stated that three initial factors made it possible: a company with a significant amount of solar contract assets from credit-worthy customers, the criteria to make a deal structure and a process for getting to a rating, and, finally, enough data on system performance to evaluate the systems' long term value. Currently, solar companies must not only develop their assets, but provide due diligence and build the IT platform and infrastructure to service customers, in order to maintain customer satisfaction and ensure long term performance of the assets. Now, Viscovich believes, they have created a more solidified model that other developers can refine and develop further.

²³ Horowitz, Yuri, and Will Graves. "Peering Over the 2017 Horizon for Solar, Part 2: Beyond the ITC." GreenTechMedia. GTM, 21 July 2014. Web. 09 Mar. 2015.

²⁴ Wesoff et al (2014).

²⁵ Project Finance et al 2014.

The ABS included assets that had received tax equity investing, thus surmounting a real challenge. It remains to be seen if tax equity investors will support further securitization. If the market response is strong, then tax equity investors will find securitization attractive.

Third ABS

In April 2014, Solar City issued its third ABS for \$70.4 million with a 4.08% interest rate.²⁶ This ABS followed the same structure but had more residential projects, a slightly more geographically diverse pool base, a higher beginning inter coverage ratio of 2.6 compared to 2.0. The project maintained the same DSCR structures and triggers. The ABS did succeed in providing a lower interest rate of 4.59%. Solar City's most recent ABS occurred on July 24, 2014. It involved a \$201.5 million principal that, for the first time, had tranches of two class notes, one with a new low rate of 4.026%, which represents a credit spread of 1.8% over the benchmark rate for \$160 million of the principal with a repayment date of July 2022. The rating agency report stated "The junior class of the notes consists of \$41,500,000 aggregate principal amount that will have an interest rate of 5.45%, which represents a credit spread of 3.224% over the benchmark rate, and an anticipated repayment date of July 20, 2022."²⁷ The average interest rate is 4.32%, a big improvement.

The first two ABS offered by Solar City involved the risk that if the collateral on the deal failed, then the tax credits would be forfeited. In the new ABS, the SPV just leases the assets from Solar City instead of buying them, thus the tax credits will not be returned in case of bankruptcy or distress. While the class A note received a lower interest rate, it also had lower leverage than the other ABS and class B, which had a higher interest rate than in the previous securitizations. Thus, while Solar City did achieve a reasonable improvement on the ABS, the overall risk analysis on the asset class did not improve. The interest rate depends on leverage and the credit quality of the customer. Viscovich described the rating process in these terms: "When we go in for a rating, we are approaching it from the perspective of someone who lives in a "what's expected" world. The rating agencies live in a "what if" world. What if this happened? What if that happened? There is a bell curve of outcomes. What's expected is the mid-point of the curve, while the rating agencies, depending on how much history you have with the asset, want to go farther and farther out the tail. So we tell them some of the stress cases they run are ridiculous. As there is more history, the ratings improve and move more toward the middle of the curve."²⁸ In addition, as the ABS perform and the solar asset classes develop more history, a solar ABS can be traded publically and rival Yieldco's. These series of ABS provided the groundwork for structure and tranching. If these assets perform well, the price for the next round of ABS from Solar City or another residential solar company may have a lower interest rate.

²⁶ Standard and Poor's Rating Service "Presale: SolarCity LMC Series II LLC (Series 2014-1)" April 1, 2014 Available from standardpoors.com Accessed February 1, 2015

²⁷ Ibid.

²⁸ Solar Securitization et al (2015).

Solar City has more market share than another residential solar company and thus has the assets to develop an ABS. Vivint solar, which recently went public, may consider creating an ABS. Another possibility is for a third party to pool a wide array of solar PPAS based on a standard contract and credit rating, and then create an ABS; however, the diverse origination of the assets might make this more complicated. The commercial solar market does not have a single dominant company, which owns assets large enough to create an ABS. I spoke with Director of Finance of Onyx Renewable Partners, a Blackstone-backed firm that focuses on commercial solar. Blackstone is the largest private equity firm involved in commercial real-estate. Onyx plans to finance commercial solar projects for Blackstone's assets and then create an ABS based on them.²⁹

Issue	2013 Pool characteristics	LMC II	LMC III	Improvements?
No of systems	5033	6596	15915	yes
pv of cash flows (million)	\$87.80	\$106	\$276	Yes
Advance rate (% of ADSAB)	62%	66%	73%	Yes
Agregate pv system size MW	44	47	118	Yes
Weighted Average Customer agreement intial term	223 months	237 months	240 months	yes
Range of customer agreemnt initial terms	120-240 months	168-240 months	156-240 months	yes
Average customer agreement remaining intital terms	201 months	225 months	233	yes
Range of customer agreement initial terms	78-238 months	120-239 months	148-240	neutral
Weighted average customer agreement seasoning	22 months	12 months	7 months	neutral
range of customer agreement seasoning	1-63 months	1-60 months	0-19 months	yes
Weighted average price per kWh	\$0.15	0.15	0.15	neutral
average per kWh fee escalator	2.07%	1.58%	1.61	neutral
Portfolio residential	71%	87%	86%	yes
Average FICO score	762	767	763	neutral
Yield	4.80%	4.59%	4.32%	yes
Bond Size \$ mm	\$54.40	\$70.20	\$201.50	yes
Raiting	BBB+	BBB+	BBB+/BB	neutral
Tranches	Single	Single	Senior/sub	yes

Figure 1: Comparison of the Three ABS

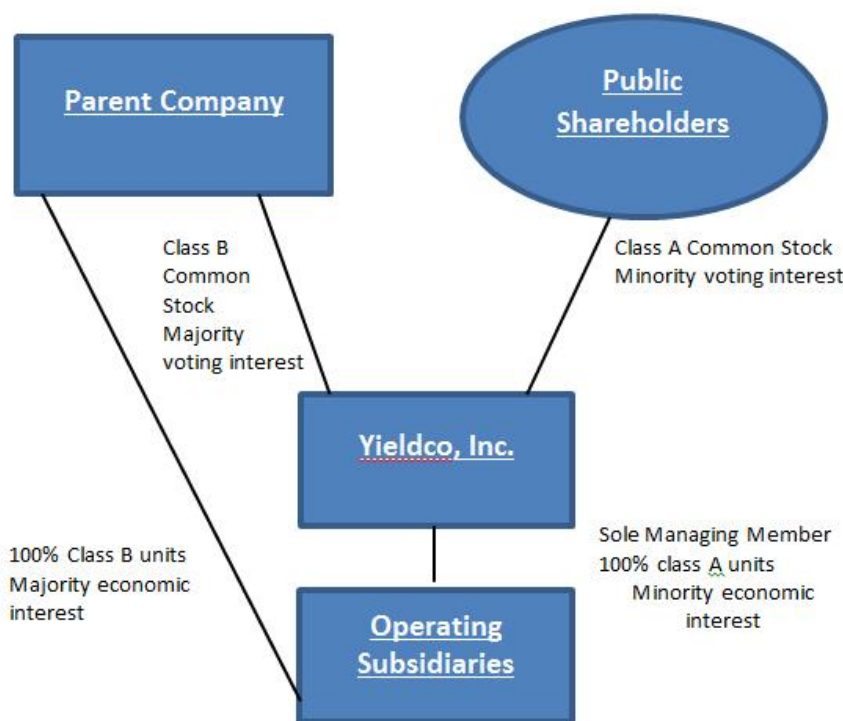
YieldCos

In the utility scale space, a dozen renewable energy companies were developing an alternative access to the secondary market through Yieldcos.³⁰ NRG Energy issued the first publicly traded Yieldco, NRG Yield, in its IPO of July 2013. Much like the securitization of ABS into a SPV, Yieldcos serve as a publicly listed and traded separate corporate subsidiary. The parent company, an energy developer, transfers a portfolio of operational energy projects into the SPV and promises investors cash dividends from the projects. Because investors have equity in the Yieldco, shares in the assets will be more liquid and offer developers access to public capital and a competitive rate. The projects in the Yieldco generate cash flows through long-term power purchase agreements. The regular payments from these cash flows contribute to the dividends. As with most forms of securitization this model allows investors to single out the cash flows generated by the power plant assets without exposing them to other aspects of the parent

²⁹ Personal conversation with Daniel DeBoer.

³⁰ Urdanick, Marley. "A Deeper Look into Yieldco Structuring." A Deeper Look into Yieldco Structuring. National Renewable Energy Labatory, 3 Sept. 2014. Web. Feb.-Mar. 2015.

company's business, such as more risky earlier stage development assets. Additionally, Yieldco investments are relatively liquid, since they trade in the open markets. Yieldcos provide a dividend yield, a ratio of dividend payments relative to the share price. For example, a company with a share price of \$20 and a dividend of \$1 has a dividend yield of 5 percent. Usually, solar companies can use the capital raised from selling the assets in the SPV to pay off expensive debt or finance new projects at rates lower than those available through tax equity finance, which can exceed 8%. Each Yieldco establishes a dividend policy and method for calculating cash available for distribution (CAFD). Generally, a Yieldco will distribute quarterly earnings, less interest and tax paid, maintenance capital expenditures, principal payments on existing debt, and reserves for prudent conduct of business. 70 - 90% of the remaining CAFD will remain for distribution to shareholders.



Yieldcos have the advantage of avoiding double taxation issues that other investment platforms face. The Yieldco's assets are not taxed at the corporate level, and instead are passed directly to investors. Yieldcos match the positive cash flows from the assets with losses from depreciation and expenses in order that the yield-company have net operating losses. This greatly reduces taxes on the Yieldco's profits or eliminates them entirely. Net operating losses can "carry forward" and remove the tax burden in future years. Therefore many Yieldcos do not expect to pay any income tax for the next ten years. Also, dividends may receive favorable tax

Figure 2: Basic Yieldco Structure (Source NREL: Urdanick, Marley. 2015)

treatment at the shareholder level if the returns are treated as a return of the original investment - as opposed to return on investment. This further reduces the cost of capital. However, if the parent company sells more than 20% of a subsidiary, in this case a Yieldco, the parent company cannot file a consolidated federal income tax. If the Yieldco files separate taxes and moves out of the net operating loss position, then both the investors and the Yieldco may face some taxation.

Creating Yieldcos does pose a risk for parent companies, since they are removing, and essentially selling, assets from their balance sheets. Thus, rating agencies may downgrade the bond rating on the corporate company's debt. According to Moody's analyst A.J Sabatelle: "In the best case scenario, this form of financial engineering could be considered credit neutral if all

or a substantial portion of the IPO cash proceeds are used for parent-company debt reduction or, in the alternative, credit accretive capital investments. However, Yields are a growth vehicle and we suspect that, in most cases, the net proceeds will not be used in this manner. Rather, proceeds from the IPO will typically be used for higher return, higher risk investments or by the parent company for share repurchases.”³¹ So far, Yieldco parent companies have not had rating reductions. There are number models for Yieldcos, but thus far the six principle ones have been created solely by large scale developers. The Yieldco must have at least \$500 million in assets and should issue enough shares to raise \$100 to \$200 million in the IPO. Unsurprisingly, the initial assets in the Yieldco come primarily from the parent company’s balance sheet. However, companies can purchase other projects, and diversification of risk related to construction, system operation, offtaker creditworthiness, and geography may strengthen portfolios. SunEdison, for example, purchased First Wind, a wind developer in order to have access to its assets, which it then sold to Terraform Power.

In order to continue to provide dividends, the Yieldco must acquire generation assets to counter the effect of initial portfolio assets that approach their contract expirations and in order to deliver increasing dividends. Thus, the Yieldco establishes a pipeline, or drop down, of assets, many of them from the parent company.³² To reduce the uncertainty of future cash flows and to ensure access to assets, agreements such as the right of first offer or call rights are common between the Yieldco and the parent company. In summary, Yieldcos hope to create a virtuous cycle by offering liquid investments that produce dividends, in a low interest rate market in which investors will willingly buy shares. In turn, this cycle will drive the price of the stocks up and the dividend yields down, providing low cost of capital for developers and the parent company, and thus spurring the development of more solar projects. Yield-Cos face interest rate risks --made acute by the long term contracts that fund the deals-- making it harder to raise rates. In addition, rather than spurring development, Yieldcos could inflate the price of assets, thus requiring them to lower cash distribution in order to pay debt, and eventually, grinding the virtuous cycle to a halt.

Currently, six renewable energy Yieldcos operate in the US market: NRG Yield Inc., Pattern Energy Group, Inc. (NASDAQ:PEGI), TransAlta Renewables, Inc. (TSE:RNW), Abengoa Yield Plc (NASDAQ:ABY), Next Era Energy Partners, LP (NYSE:NEP), and TerraForm Power, Inc. (NASDAQ:TERP). TerraForm Power closed its initial public offering on July 23, 2014. As treasury rates are very low and the stock market very high, investors have driven up the price of shares and thus lowered the yield co dividends.

NRG

NRG, now the US’s largest independent power producer, has made a strategic decision to focus on developing its renewable business.³³ In June 2013, NRG spun off the first large Yieldco

³¹ Stavros, Richard. "The YieldCo: Return of the Utility Spin-off." [Http://www.investingdaily.com/19042/the-yieldco-return-of-the-utility-spin-off/](http://www.investingdaily.com/19042/the-yieldco-return-of-the-utility-spin-off/). Investing Daily, 17 Dec. 2014. Web. 2 Feb. 2015.

³² Urdanik

³³ NRG Yield Form S-1 June, 7 2013 <http://investor.nrgyield.com/phoenix.zhtml?c=251846&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPXRlbmsmaXBhZ2U9ODk3MzY5NCZzdWJzaWQ9NTc%3d&ListAll=1> February 20th, 2015

from a publicly traded company. Much like NRG's own business strategy, the Yieldco will focus on renewable energy and natural gas. In its initial SEC filing, NRG yield stated: "Natural gas-fired and renewable generation resources are increasingly becoming the generation sources of choice."³⁴ The Yieldco will focus on those strong suits; believing that with low energy prices and continued incentives for solar, they should offer long term value. Unlike other Yieldcos, NRG will focus only on the US market, where NRG has a large footprint and a strong grasp on opportunities. The initial share offering had an oversubscription of over 10 times. The company listed at \$22 a share with a projected dividend yield of 5.45% based on the initial share price. Due to the stock's popularity, by December 2014, dividends yields had fallen to 3.2% and, as of February 2015, the price has risen to \$51.40.

After underwriting discounts and commissions by selling a 34.5% interest in 1,324 megawatts of conventional and solar power projects, 1,098 megawatts of thermal facilities (produce steam or chilled water), and another 123 megawatts of small cogeneration facilities located in 10 states, NRG raised \$471 million net. Most assets went into service from 2009 to 2013. They include two portfolios of solar installations on schools in California and Arizona. The power projects (not counting the cogeneration units) are 68.7% conventional power plants. 93% of the contracts have long term PPA, with a 16-year weighted average life. NRG Yield has a large pipeline of utility scale projects, and could include more residential solar projects, as NRG pivots to more renewable development. According to the S-1 filing, NRG also believes that it has a strong competitive advance with its e thermal infrastructure, which includes steam heating and chilled water supply. The thermal infrastructure business has high entry costs, but low customer costs. In many regions, NRG is the only third party provider of thermal energy, and thus this market is expected to present a competitive advantage both for NRG and for NRG Yield in terms of dividends for the Yieldco. In their S-1, NRG Yield stated that their newly built assets from top quality producers should lower O&M costs, and that their strong safety record also made additional costs unlikely, allowing them to give out a strong dividend.

In November 2013, NRG Yield agreed to purchase the assets of Energy Systems Co., a Nebraska-based district energy company that provides steam to buildings in Omaha. In June 2014, NRG yield acquired a CCGT plant with a 50 MW capacity and two 20 MW utility scaled solar projects both with a 20 year PPA. In the end of 2015, they purchased a 500 MW natural gas plant with a 10 year PPA, and a 204 MW and a 81 MW wind farm both with 20 year PPA. After those disclosures, NRG Yield announced its 2015 Adjusted EBITDA guidance as \$705 million, from \$585 million, and Cash Available for Distribution (CAFD) guidance as \$195 million –it thus expected 28% of EBITDA to go to dividends. Much of the EBITDA in those deals goes to pay down debt incurred in purchasing these projects. NRG plans to increase cash dividend per share to by 15%-18% in five years. Currently the dividend has risen modestly from \$1/32 a share to \$1.50. NRG Yield has both A and B shares. NRG owns all the B shares, giving it a 65.5% voting interest in the yield co, but no economic interest. The public shareholders own all the A shares, but this equals only 34.5% of the vote. The Yieldco contains a partnership in which NRG parent company owns a 65.5% interest. The Yieldco owns the rest of the partnership, but remains controlled by NRG, which acts as managing partner. NRG can exchange units in the partnership for A shares in the Yieldco. When these exchanges occur, the Yieldco will redeem and cancel a corresponding number of B shares that NRG holds, thus limiting the equity that NRG will hold. According to Chadborne and Parke's newsletter: "Over time as the Yieldco

³⁴ Ibid.

raises more equity to make acquisitions, the share of the partnership held by the yield co will increase, either because the yield co will make capital contributions for more partnership units or pay the money to NRG to buy part of its partnership units.³⁵ NRG will earn \$4 million a year, and in addition, it will be reimbursed for its costs (but not employee salaries or overhead). For each project acquired, the fee increases by .05% of the enterprise value.

NRG's combination of renewable and gas asset types allows it to match the renewables' tax benefits to income from its other assets.³⁶ Thus, NRG Yield does not expect to owe significant federal income taxes for approximately 10 years or longer, as long as it continues to acquire more renewable assets. Thus distributions to shareholders should be treated as returns of capital until the shareholders get their investments back; after that distributions should be reported by shareholders as capital gains. However, there are many assets both owned by NRG and in the market that NRG Yield can acquire. Also, NRG Yield has a right of first offer (ROFO) for a set list of NRG assets for the next five years. The initial offerings of distributed generation assets consisted primarily of government off takers. As NRG increases its distributed generation business and begins to compete with Solar City, NRG Yield could acquire distributed generation assets.

In its S-1, the company cited a number of risks such as the ability to replace expiring or terminated offtake agreements with other agreements. If the average PPA that they develop falls below current prices, then the dividends may not increase. Furthermore, if NRG Yield cannot acquire assets either from NRG or otherwise, it will lose the ability to increase the amount of dividends paid to holders. Also, there are risks of development delays or underperformance or additional cost with purchased projects. For example, both in the S-1 and in a recent investor presentation, NRG Yield discussed acquiring NRG's stake in the largest constructed concentrated solar development facility, Ivanpah. However, it has underperformed severely in its first year in operations, generating 50% less energy than expected. NRG Yield continues to trade well however. In February 2015, it remained above \$50/share, which pushed the dividend yield down to 3%. For NRG Yield, only 31% of projected adjusted EBITDA in 2014 -- and 37% in 2015-- is expected to be cash available for distribution, suggesting the existence of a large amount of senior debt ahead of the NRG Yield shareholders in the capital structure.

Trans Alta Renewables Inc.

The Canadian energy company Trans Alta created its own renewable focused Yieldco in June 2013. Trans Alta Renewables listed on the Toronto Stock Exchange in August 2013 at an initial price of C\$10 a share and a projected dividend yield of 7.5%³⁷. As of February 16, 2015 the stock had risen to \$12.83 and the Yield had fallen to around 6%. In the IPO, Trans Alta raised C\$202.1 million against a portfolio of 28 projects with a capacity of 1,112 megawatts.³⁸ The company sold at 19.3% interest. As long as the parent company owns 35% of the assets, it

³⁵ Chadborne: Project Finance Newswire Yield Cos Compared; Strategies, Benefits, And Drawbacks Of Yield Co Share Offerings; NRG Yield, TransAlta Renewables And Pattern Energy Group, Inc. Chadborne & Parke, 13 Dec. 2013. Web. 2 Feb. 2015.

³⁶ NRG yield 10k

³⁷ Chadborne 2013.

³⁸ Transalta Renewables 2015 Annual Report February, 13, 2015

<http://www.transaltarenewables.com/sites/default/files/RNW%202015%20AIF%20v%2021%20-%20SEDAR.pdf>

can name the majority of a six person board of directors and thus maintain control. All initial assets came from Canada, with wind accounting for 90.7% of them and hydro for the remainder. The initial Trans Alta assets have 5.8 years in weighted average years of operation. All initial assets have long term PPAs, but the parent company acts as the offtake for some of those assets, and then places the energy on the merchant market. The affiliate power contracts run for 20 years or the remaining life of the project, with fixed prices of C\$30/MWh for wind and C\$45/MWh for hydro adjusted annually by the consumer price index. The company will have to be careful before entering into affiliate power contracts on any US projects as it could lose the ability to claim net losses from depreciation. The average remaining life of the output contracts on all the projects is 17 years. Trans Alta Renewables has agreed with the Trans Alta parent company that it will rely “exclusively” on the parent to identify investment opportunities. Trans Alta will earn C\$10 million a year, adjusted for inflation, and be reimbursed for costs, including employee wages and benefits “not captured by the fee.” The fee will increase by 5% of the projected change in the Yieldco’s EBITDA as a consequence of buying assets. The 2014 ratio for CAFD to EBITA is around 62%.

Pattern

In 2009, Riverstone, a private equity firm, gained a controlling stake in Pattern Energy Group a wind farm developer, based in San Francisco, with a majority of its assets in Canada.³⁹ In August 2013, Pattern Energy Group founded Pattern Energy Inc. its Yield co, which owns the operating assets. Pattern Energy LP, the parent company will continue to develop different projects. The Yieldco, Pattern Energy Group Inc. listed both on the NASDAQ Global Exchange and the Toronto Stock Exchange, had an initial share price of \$22 and a projected dividend yield of 6.25%. The share price has since increased \$27.81, causing the dividend yield to fall to 4.6%. However, the Yield could go up if annual dividends increase. Pattern Energy raised \$318.6 million in the IPO off 36.8% interest in eight wind farms in the US (including Puerto Rico), Canada and Chile, with a total owned capacity of 1,041 megawatts. It retained 63.2% of the voting rights. Six of the projects have been operating between two and four years. While still under construction at the time of the offering, the Chilean and Canadian project reached development in 2014. 95% of the power has a long term PPA with an average remaining contract life of approximately 19 years. Pattern energy began as a standard Yieldco with a portfolio of operating or near-operating projects; it will become a full-fledged development company once its market capitalization reaches \$2.5 billion⁴⁰. The Pattern workforce will be split between the Yieldco and the original parent company until the merger. The Pattern Yieldco has a ROFO for the next five years to make bids on any projects in the 3,000-megawatt development pipeline that Pattern Development informs the Yieldco it plans to sell. This ROFO will terminate early if the Yieldco fails to make offers on at least three projects that Pattern development, the parent company, is able thereafter to sell. Unlike the other Yield cos, the parent company will not compete with its Yieldco for acquisitions of generation and transmission projects, for as long as the Yieldco retains a ROFO over Pattern Development projects. The three Yieldcos plan to

³⁹ Pattern Energy Group S-1 August 9, 2013 <http://investors.patternenergy.com/secfiling.cfm?filingID=1193125-13-329269&CIK=1561660> March 2, 2015

⁴⁰ Pattern Energy Group 10-K, March 2, 2015 <http://investors.patternenergy.com/secfiling.cfm?filingID=1193125-15-73104&CIK=1561660> March, 2 2015

distribute between 80% and 83% of cash after debt service. The 2014 ratio for CAFD to EBITA is 25.4%.

SunEdison

Sun Edison manufactures and installs solar, using the downstream supply chain to lower costs.⁴¹ Their consolidated solar business offers to integrate the design, installation, financing, monitoring, operations and maintenance portions of utility, commercial and residential solar. SunEdison pioneered the PPA and lease model starting in 2003, focusing on commercial and government space. The company has grown, expanding into residential solar and into international solar development. In July 2014, SunEdison filed an IPO for its Yieldco, the first exclusively solar backed IPO. However, in their SEC filing they stated: “Over time, we intend to acquire other clean power generation assets, including wind, natural gas, geothermal and hydro-electricity, as well as hybrid energy solutions that enable us to provide contracted power on a 24/7 basis.”⁴² The Yield included utility scale and commercial solar systems in the US, Canada, the UK and Chile. The offtakers in the US consisted mainly of commercial and government institutions with high credit ratings (Aa-BBB+) for a total of 135.30 MW of capacity. However, less than 30% of the offtakers for the small scale distribution systems have credit ratings. The utility off-takers, included all non US assets for a total of 338 MW of capacity. The utilities had decent credit ratings A-, with the exception of the Chilean utility which had only a BBB- rating.

In addition to this project, Terraform Power listed “Call Rights Projects” -- large scale solar projects developed by SunEdison that Terraform can purchase at market value. These projects exist in the same countries as the initial portfolio. First-call-right projects 308 MW of capacity and unpriced projects have 626 MW of capacity. Terraform will purchase some of these assets in 2015 and a majority in 2016. By June 30th, the S-1 predicted that they would have \$64,300,000 and \$81,900,000 by year end available for distribution as dividends. Terraform, like NRG Yieldco, follows the same asset strategy as its parent company. The company will look to purchase assets with long term PPAs with accredited companies and to focus on solar. They will also acquire more assets from SunEdison and from third parties. They believe the expertise in the market, especially for solar, as well as the low cost of capital from the Yield will allow them to purchase a large number of assets. They credit their ability to grow and the initial asset pool’s geographic and off-taker diversity with ensuring low risk returns. They also cite SunEdison, one of the top five developers and installers of solar energy facilities in the world in each of the past four years in terms of installed capacity, as key in their ability to finance and grow projects. The ROFO agreement with SunEdison promises offers of at least \$175 million worth of assets in 2015 and \$100 million in 2016, ensuring a drop down and subsequent increase of dividends. SunEdison, as acting manager will receive “2.5% of Terra LLC’s CAFD in 2015, 2016 and 2017 (not to exceed \$4.0 million in 2015 or \$7.0 million in 2016 or \$9.0 million in 2017), and “an amount equal to our Sponsor’s actual cost for providing services pursuant to the terms of the Management Services Agreement in 2018 and thereafter.”⁴³ The main risks cited included counterparty risks, for example contracts from PPA could be reduced based on electricity prices and counterparties could terminate or buy out contracts. In addition, as with

⁴¹ Terraform Power Form S-1 May, 29, 2014

<http://www.terraform.com/mobile.view?c=253464&v=201&d=3&id=9623820&idParam=RV^> February 2, 2014.

⁴² *ibid*

⁴³ *ibid*

most Yieldcos, Terraform Power depends heavily on SunEdison. The deal, like that of NRG, offers two classes of common stock, A and B. SunEdison owns all Class B stock, which is worth 10 times the voting rights of class A, but no economic interest. Class A shares are sold to the public. Terraform Power followed its plan to continue to acquire renewable assets for the remainder of 2015. In addition to acquiring \$175 million in assets from SunEdison, Terraform made acquisitions from third parties. In October, Terraform acquired 25.5 MW of operating solar assets from Hudson Energy Solar Corporation. Sun Edison acquired 4.5 MW of it, which Terraform will have the rights to acquire later. The assets cost \$35 million and make Terraform liable for \$21 million of the existing project debt. According to the CEO, this project provided approximately 14% return. Later in October, Terraform acquired 77.6 MW of solar plants from the private equity fund, Capital Dynamics. These assets consisted of 39 solar plants in California, Massachusetts, New Jersey, New York and Pennsylvania, all with a weighted average PPA of 19 years and a strong weighted average off-taker credit rating of A3/A-. The portfolio cost \$250 million with no debt responsibility. The CEO stated that it provided approximately 9% returns from the investment. Terraform has a loan facility, provided by its bank, which it increased to \$275 million to fund both purchases.

Visible Growth Delivers Shareholder Value

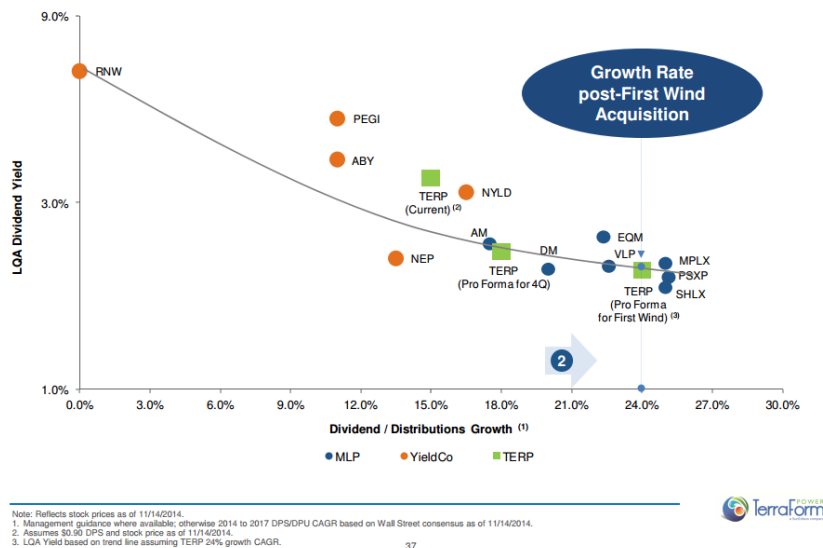


Figure 3: YieldCo: Growth vs Dividend (SunEdison)

In November, SunEdison and Terraform made a big move entering the wind power industry with the \$2.4 billion dollar acquisition of First Wind. Sunedison acquired the company with a plan to sell the assets to Terraform. In addition to financing the project, they raised \$1.5 billion from banks to fund growth in First Wind. This added 1.6 GW of assets to the pipeline, which will go to Terraform's dropdown and 521 MW of active generating assets. This acquisition provides, not only a unique growth potential for Terraform, but also diversification. By acquiring First Wind Terraform now has access to wind projects, and SunEdison can benefit from First Wind's expertise in wind development. At the investor presentation announcing the acquisition, First wind CEO Paul Gaynor described the projects as "high-quality assets," because the assets were

in states with high electricity prices and in states needing to meet Renewable Portfolio Standards (RPS) requirements. He said the firm has "a mindset of long-term ownership. [...] We develop projects to own them, and that's the mindset we're going to take forward."⁴⁴ He also claimed that the acquisition would create synergy, because SunEdison has international development experience that they can leverage to help First Wind develop wind assets overseas. The graph below shows that Sunedison believes the acquisition equals \$5.6 billion in value and a just cost of \$1.5 billion. The TERP assets equal \$0.6 Billion, the profit margin for the development of the pipeline of is \$1.8 billion, and the Incentive Distribution Rights, (IDRs), the cash-flow from existing projects, based on discounting free cash flows, equals \$3.2 billion. On the basis of this acquisition Terraform increased its CAFD from \$170 million to \$233 million; moreover, all additions are unlevered which will provide a return greater than 9%. This in turn will increase the dividends offered and attract more investment in Terraform, lowering the yield and thus the cost of capital. In addition, the CEO highlighted the high growth rate for the dividend due to the long pipeline, which in turn allows for a lower yield, as current stockholders will have higher dividends in the future and can expect the value of the shares to increase.

With the addition of First Wind, Terraform predicts a 24% annual growth rate, which will drive share prices up pushing the yield below 3%. However, as of February 19, 2015, the dividend equaled 3.2%. In addition, Sunedison created a \$500 million dollar "warehouse facility" with \$1 billion dollar of debt financing from six banks that fund specific projects in the First Wind or SunEdison pipeline. This debt financing provides cheaper cost of capital at the project stage, thus allowing SunEdison to sell these assets to Terraform Power for a rate that is cheap but profitable for Sunedison and keeps the dividends high. SunEdison achieved this type of financing because it has access to public markets through Terraform. Later that week Terraform sold 11,666,667 shares for \$350 million, for \$30 a share, lower than the price at the time or now, in order to help fund the First Wind operating assets purchase. In January, Terraform announced plans to issue \$350 million more of common stock. Terraform also issued \$800 million of senior notes with

Seasonal Generation Characteristics of the TerraForm Fleet

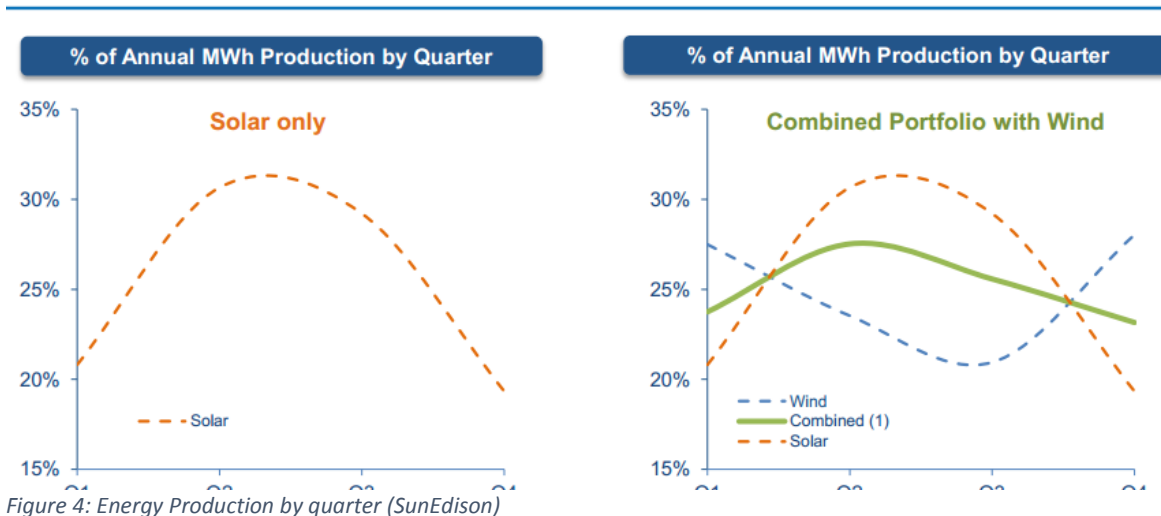
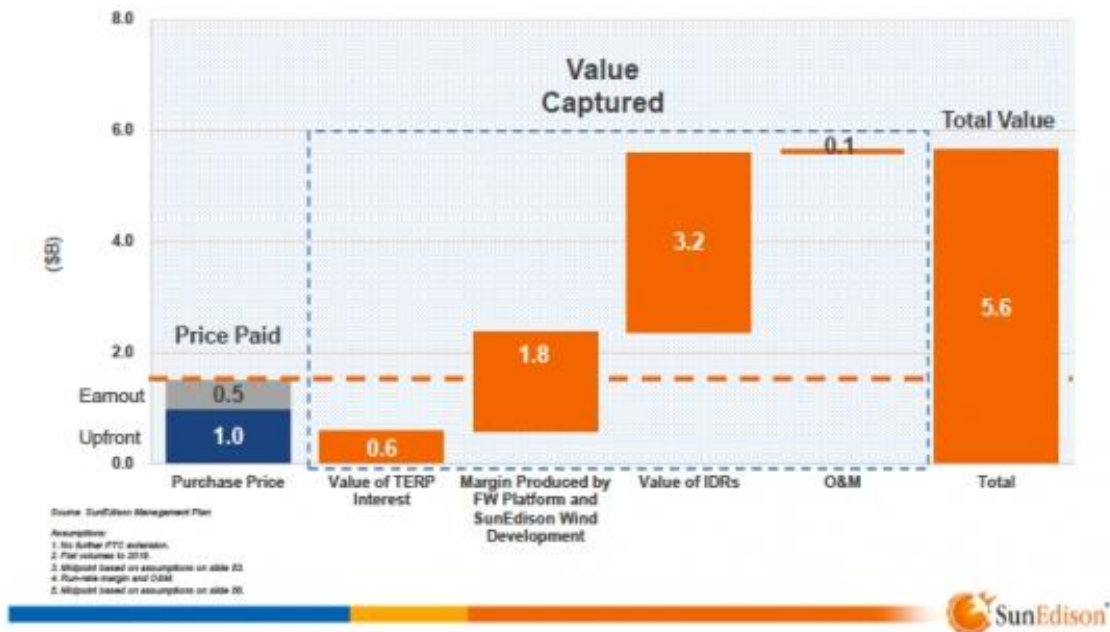


Figure 4: Energy Production by quarter (SunEdison)

⁴⁴ Terraform Power Q4 2014 Terraform Power.

<http://www.terraform.com/mobile.view?c=253464&v=200&d=2&id=5183654> February 18, 2015

SunEdison Advantage – First Wind Acquisition



.87% debt financing. The proceeds of the sale of these notes will fund debt payments and the cost of the First Wind acquisition.

On February 18, 2015, TERP announced annual dividends of \$1.08. It confirmed plans to raise dividends to \$1.30 a share. From the IPO to the present, they have acquired .9GW of third part solar, purchased an additional 6.1 GW from SunEdison and have 3.3 GW total. CAFD has increased from \$107 million to \$214 million. EIBTA increased to \$374 million from \$193 million. Thus the CAFD to EBITA ratio has remained relatively constant at 57%. The report highlighted that by acquiring the wind assets each quarter had a similar amount of energy production. Prior to this, the second and third quarter, that is the summer months, had the highest production, thus producing uneven cash flows from any PPA contracts. In the long term TERP plans to increase the DPS to \$2.61 by 2019 to have the high level of growth of 24%. As of February 22, 2014, with existing dividends of \$1.08, the dividend yield was around 3.2% at a price per share of \$33.4.

Next Era

Like NRG, Next Era, a Fortune 500 energy company, has made a strong push to develop renewable energy assets.⁴⁵ Unlike NRG, it owns a utility, Florida Power and Light. As of March 2014, Next Era had over 43 GW of assets in the U.S and Canada. It has steadily grown its renewable energy portfolio with 11.3 GW as of March 2014, with wind as the vast majority. On May 20, 2014, Next Era filed with the SEC to list its yield-co, NextEra Energy Partners LP

Figure 5: SunEdison Valuation of FirstWind (SunEdison 2014).

⁴⁵ NextEra Energy Partners Form S-1, May 20th, 2014, <http://www.investor.nexteraenergypartners.com/phoenix.zhtml?c=253465&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPXRlbmsmaXBhZ2U9OTYwOTAwNCZzdWJzaWQ9NTc%3d&ListAll=1> February 10th, 2015

(NEP) on the NASDAQ. Unlike NRG, Next Era hopes to make NEP solely focused on “clean energy” assets, and the Yieldco will stand as a distinct part of their business separate from the utility and conventional generation. Unlike TERP, NEP will focus on the Northern American market. NEP planned to have a three year annual growth rate of 15% for CAFD, based on its negotiated ROFO with NextEra.

The initial portfolio includes 989.6 MW of only utility scale renewable projects with utility companies as offtakers. The assets, located in Ontario Canada, California, Michigan, Arizona, Oklahoma and Colorado, are 71% wind and 19% solar. The contracts expire at the earliest in 2029 with some lasting until 2039, with a weighted average length of 20 years. The long term set PPA of this portfolio, coupled with their utility scale, lowers risks because utilities will not likely renegotiate or terminate these contracts and thus do not face a huge risk of losing future cash flows. Moreover, utilities do not pose great counterparty risk since they have stable credit, and may in fact be considered too big to fail due to their natural monopoly status.

At the time of filing, the counterparties had a weighted-average Moody’s credit rating of A2. However, this lack of diversification with offtakers does pose some risk. In addition, as these assets are quite large, NEP depends on its largest project Genesis for at least 40% of its income. In addition to the current assets, Next Era has established a drop down list of 1549 MW of assets that NEP has ROFO for. In the six year ROFO agreement, NextEra has no obligation to sell these assets nor does NEP have to buy them. Again, these assets, with the exception of an Iowa

wind farm owned jointly by Google and the City of Ames, have utility companies as counterparties. These projects expand the geographic diversity of the portfolio with new locations in South Dakota, North Dakota, Nevada and the aforementioned Iowa. The PPAs last to 2030 at the earliest, with some as long as 2041. NEP plans to focus on U.S. and Canadian projects, like those in its initial portfolio; these are newly commenced long term PPAs that have low operating costs and stable cash flows. They plan to stay financially flexible by using recourse and non-recourse debt and possibly bonds to strategically finance additional acquisitions.

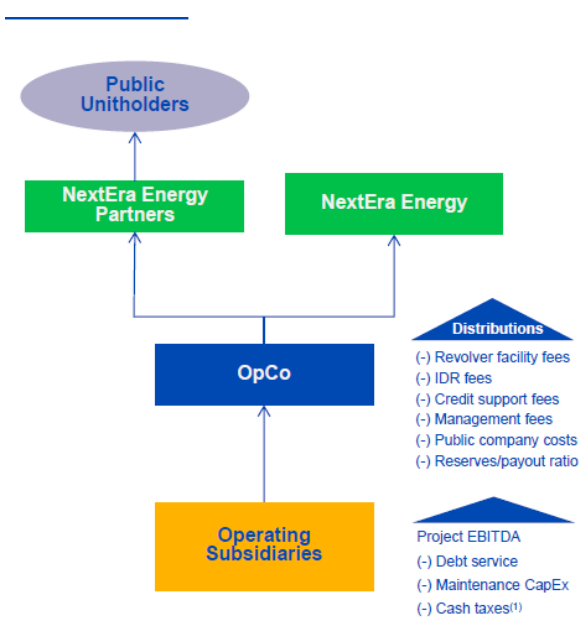


Figure 6: NEEP legal structure

impact of adverse regulatory conditions. Finally, NEP plans to avoid double taxation for the next 15 years -- with the exception of the state of Michigan-- due to the net operating losses it carries on the books. NEP faces the same risks as most Yieldcos: limited operating history, dependence on counterparties to generate cash flows to offer dividends, dependence on the parent NextEra to provide assets, potential conflict of interest with NextEra over assets, and risks that contract rates fall or are re-negotiated. NextEra will own all the special voting unit shares and a majority of the

common unit shares, which receive dividends. NextEra will receive a management fee of either \$4 million or, if greater, 1% of NEP EBITDA. NEP also lays out the possibility that NextEra will continue to provide capital and credit support for certain projects in exchange for annual credit support fee of \$1.8 million. NextEra finances and owns the operating subsidiaries and operating companies. The subsidiaries manage the projects, provide debt service and fund maintenance expenditures. The Operating Company manages cash flow from the projects between NEP and Next Era. Public shareholders receive cashflow. Based on its services, NextEra receives an Incentive Distribution fee of up to 50% of cash flows, but only after shareholders receive a minimum quarterly distribution level.

In 2014, NEP acquired a 250 MW Palo Duro wind farm, which is currently under construction in Texas, a 20-year (PPA).⁴⁶ It also acquired a 20 MW Shafter solar project, from NextEra. The project has completed construction and will begin energy production in 2Q 2015. As of February 22, 2015, it had a share price of \$41.27, a significant growth from its initial opening price of \$32 a share. The yield has fallen to 1.89%, making it the most successful Yieldco in terms of market valuation per dividend.

Abengoa

The Madrid, based energy developer Abengoa also launched a Yieldco in July 2014.⁴⁷ A 70 year old construction company with a global footprint, Abengoa leverages its expertise in engineering to develop a wide array of assets including solar, biofuels, desalinization and electricity transmission. The yield IPO included eleven assets. Abengoa aims to focus on conventional power transmission lines and renewable energy with global diversification with assets in the US, Mexico, Peru, Chile, Uruguay, Brazil and Spain. In the long term, they intend to expand assets to Africa and the Middle East. Like other Yieldcos, they have an ROFO with Abengoa to purchase assets. The initial offer consisted of 700 MW of renewable energy, 300 MW of conventional generation, 1,018 miles of high voltage transmission lines and an exchangeable preferred equity investment in ACBH, a subsidiary holding company of Abengoa that develops, owns and operates transmission lines in Brazil. This equity investment provides \$18 million annual dividends for five years. After five years, they can continue to receive this payment or convert equity into regular shares in subsidiary companies of ACBH. All assets have contracts with average life of 25 years. 90% of CAFD will be in US dollars, thus limiting currency risk. In addition, the firm has currency coverage contracts to maintain the ratio. The IPO set the annual dividend at \$1.04 share. The initial portfolio contained two Concentrated Solar Power plants in California with 280 MW of combined capacity, a 50 MW wind farm in Uruguay, two CSP plants in Spain with capacity of 50 MW, a 300 MW cogeneration conventional plant in Mexico, a total of 931 miles of transmission lines in Peru and 87 miles of lines in Chile. By June 30, 2016, all eleven Abengoa assets will have distributed cash for a full year. In the F-1 filings, Abengoa listed 8 assets it expected Abengoa to drop down. This includes 100% ownership of 50 MW of wind in Uruguay, 74% ownership of 100 MW of Solar in Spain,

⁴⁶ Nextera Energy partners Form 10 K, February 20th, 2015

<http://www.investor.nexteraenergypartners.com/phoenix.zhtml?c=253465&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPXRlbmsmaXBhZ2U9MTAwOTE4NDYmc3Vic2lkPTU3&ListAll=1&sXBRL=1> February 20th, 2015.

⁴⁷ Abengoa Yield Form F-1 April, 01 2014

<http://www.sec.gov/Archives/edgar/data/1601072/000119312514126175/0001193125-14-126175-index.html> February 20th, 2015

20% ownership in 100 MW of solar in the United Arab Emirates, and 25.5% ownership in a desalinization project in Algeria. In 2016, it expects to purchase full ownership of 220 MW of conventional power in Mexico, full equity in 220 miles of transmission lines in Peru, 50% equity in 100 MW of solar in Spain and 51% equity in a conventional power plant in Algiers.

Abengoa represents the most geographic and resource diverse Yieldco. Unlike other solar assets, it focuses on large scale CSP projects, which make it a market leader but require significant water to maintain. Many large industrial companies have abandoned CSP projects in the US, and CSP growth has slowed and pales in comparison to that of PV. However, CSP does have potential for large scale international projects. Within the CSP market, Abengoa has a strong competitive advantage, but this advantage may prove pyrrhic. In addition, Abengoa plans to focus on wind in Uruguay, as Uruguayan hydro power declines. Abengoa believes that Mexican electricity market reform, coupled with economic growth and subsequent demand for energy, will provide opportunities for independent power producers. Also Abengoa contends that increases in global demand for energy, grid development, demand response and the need to connect utility scale renewable projects will lead to growth in electricity transmission. Abengoa plans to focus on transmission in the US, Brazil Peru and Chile, and to drop its own developed assets to the Yieldco. While the initial pool of assets did not list water, the F-1 filing stresses the importance of water based solutions in terms of transportation and desalinization. Increased water scarcity and demand and regulation of water management will spur growth in water focused initiatives. Already, Sao Paulo, South America's largest city faces severe water shortages.

Like most Yieldcos, Abengoa's yield strength lies in Abengoa's ability to develop and drop down strong assets with stable cash flows as part of the 5 year ROFO. For management and services Abengoa will receive a total of \$4.5 million annually, with executives devoting 60% of time to the Yieldco. In addition, Abengoa will create a \$500 million credit facility for the Yieldco to manage its portfolio. In 2014, Abengoa purchased two dropdown assets, a 50 MW farm in Uruguay and 131 MW of solar in Spain for \$312 million.⁴⁸ In February 2015, it purchased the second dropdown from Abengoa of an 81 mile Peruvian transmission line, the aforementioned 100 MW Spanish and UAE solar plants, and minority stakes in two water desalinization plants that have a capacity of 10.5 Mft³ a day for \$142 million. It financed its debt by purchasing a \$255 million 5 year corporate bond with a fixed cost of 7% and a \$100 million 4-year credit facility at the cost of labor plus 275 bps. In January 2015, the parent company issued 9,200,000 new shares at \$31 per share netting \$285.2 million, less expenses and underwriters' discounts. The underwriter also has the right to purchase 1,380,000 shares. Abengoa's yield does not realize any funding from the underwriting. It expects the 2015 annual dividend to rise to \$1.60 from \$1.04. In the financial year 2014, Abengoa had \$81.6 EBITA, including the earnings from Brazil; the CAFD for the year was \$28.4 million, thus producing a ratio of 34%. In March, the firm will pay a late dividend, which will bring the annual dividend to .555 cents. They hope to raise the DPS \$1.92-\$2.00 by 2016. The current dividend yield is 3.11% \$1.60. Investors reacted negatively to 2014 investor call and share prices fell from \$35 to \$33.4.

⁴⁸ Abengoa Yield 2014 Full-Earnings Conference Call. February 23, 2015
<http://www.abengoyield.com/export/sites/abengoa-yield/.content/galleries/documents/Abengoa-Yield-Q4-Results-2014.pdf>

Paul Coster, a JP Morgan analyst, illustrates, by means of the following example, the mechanisms by which the Yieldco provides value for both the parent company and its shareholders: SunEdison has 65% equity in a 750 MW asset, and drops it into TERP.⁴⁹ Assuming a transfer price of \$2.5 million per MW, the parents company will get a gross margin of 20% on sales of the assets with 65% ownership; this equals \$243.75 million in profit. This 750 MW has a PPA that contributes \$0.08 per watt for \$60 million in CAFD. Assuming SunEdison's CAFD/EBITA ratio is 60%, the payout ratio will be \$36 million. Based on a 3% valuation rate and a growth rate of 15%, the market capital for the firm easily exceeds \$1 billion. Moreover, the parent company receives payments for management in addition to dividends. Thus, creating a Yieldco builds value for new investors and for the parent company while reducing the cost of capital.⁵⁰

The Yieldco structure provides benefits both for developing companies and for investors. Investors in developers, either established publically traded firms or small private equity backed firms, face high risks; significant gains are possible, as are partial or complete losses. Because Yieldcos provide dividends and have only high quality established assets, they represent a less risky investment opportunity and have lower cost of capital. Developing companies that form Yieldcos not only reduce their cost of capital, but also receive long term exposure to the projects they have developed because they retain financial interest in the Yieldco and receive dividends for their shares. Sponsors can also retain incentive distribution rights, giving them excess CAFD if the set dividends are met. Done correctly, Yieldcos are good examples of sensible risk and return allocation, and if they can maintain growth they will provide a strong service by offering a lower cost of capital. With the exception of Pattern, which plans to move its own company into a Yieldco, the Yieldcos discussed above follow the same format: investors purchase a minority ownership in the project, while the original sponsors manage and control the assets and the dropdown pipeline.

The market has discussed a third type of Yieldco -- the role up, in which a group of investors purchase a number of assets and then take the new Yieldco public. For example, the company, Sol-Wind, purchased a large number of renewable assets with the plans to do just that; however, as a new company it lacked the development pipeline and has delayed its IPO.⁵¹ Investors and investment bankers did not know if the management team could secure enough assets to ensure long term growth. In general, a role up Yieldco does not have the backing of an energy company to ensure that there is a dropdown of the projects. As a result, no drop down Yieldcos have been developed so far. However many banks are interested in creating a Yieldco, and, unless they were to sign a ROFO with a developer, their model would have to be a roll up.

⁴⁹ Coster, Paul, Mark Strouse, and Paul Chung. CleanTech: YieldCo Update. Working paper no. North America Equity. New York: J.P Morgan, 2014. Print. Alternative Energy, Applied and Emerging Technologies.

⁵⁰ *ibid*

⁵¹ Levin, Adam. Sol-Wind Renewable Power postpones IPO. TheDeal.com The Deal Pipeline, 13, February 2015. <http://www.thedeal.com/content/energy/sol-wind-renewable-power-postpones-ipo.php> February, 20, 2014

So far, the established Yieldcos have come to market at a modest size and sold at most 40% of the stock at IPO. The market has responded due to the strong pipeline established by these developers. As the value of the stock increases, the sponsor benefits because it can sell its shares at a higher price. However, Sol-Wind or another firm without a backer, can't promise pipeline growth and then experience a corresponding stock increase.

Groundwork

Yieldco success partially derives from the uniquely low level of interest rates during the last five years. Due to the financial crisis of 2008, the Federal Reserve has kept interest rates historically low, thus lowering yields for corporate or municipal bonds and limiting options for higher yields. This low yield allows Yieldcos to find a cheaper cost of capital than that offered from investors in private companies and to easily purchase assets from their parent company and other developers at the highest price. However, if interest rates rise, then other yield providing assets will prove more attractive, and Yieldcos' valuation may fall to bring the dividend yield in line with new market development.

Currently Yieldcos can self-shelter income from taxation due to the tax benefits associated with the renewable energy assets. In addition, by retaining ownership companies with large tax appetites can file joint returns and match operating losses with income from Yieldco assets. However, the assets have a long life span and may face taxation in the future, when, for example, Production Tax Credits for wind expire and ITC falls to 10%. Jerry Peters from Credit Suisse stated: "Without these tax benefits, a Yieldco will have to pay dividends in after-tax dollars. And if your after-tax dollars are reduced because the Yieldco is now paying taxes, it will not be able to maintain the current yield. That will push yields down."⁵²

In addition, many Yieldco assets came from the Department of Energy 1603 cash grant program, which did not involve tax equity.⁵³ These assets now produce cash flows, and Yieldcos can purchase them without dealing with the complications of tax equity. The six major Yieldcos derive a majority of their assets from the cash grant program. This program has expired though, and it will be difficult to use tax credits efficiently in a Yieldco structure.

Cost of capital

One can easily assume that Yieldco's cost of capital by examining its dividend yield. The Yieldco investors who bought early look at returns from the stock growth and the dividend growth. Once investors do not see higher growth, they will sell their Yieldcos in order to make a

⁵² Radtke, Christopher, Jerry Peters, Gerhard Hinse, and Ted Brandt. "Yield Cos: Where to Next? – Yield Cos, Dividend Yields, NRG Yield, TerraForm, Cost of Capital, Discount Rates, AuctionsYield Cos: Where to Next? – Yield Cos, Dividend Yields, NRG Yield, TerraForm, Cost of Capital, Discount Rates, Auctions." Interview by Eli Katz. Project Finance Newswire. Chadborne & Parke, Nov. 2014. Web. <http://www.chadbourne.com/Yield-Cos-Where-to-Next-yield-cos-dividend-yields-NRG-Yield-TerraForm-cost-of-capital-discount-rates-auctions_projectfinance/>.

⁵³ *ibid*

gain on their stocks; in turn the stock value will fall pushing dividend yields higher. However, discovering the actual cost of capital for yields isn't as simple as it seems. That cost is not merely the growth rate plus the yield. According to the CEO of Marathon Capital, "It is the price on a leveraged piece of equity that will allow the Yieldco to give a raise to its current shareholders and sell enough shares to raise the needed capital. I think it might be in the 10% to 13% after-tax range."⁵⁴ However, the unlevered cost of capital can fall to 6% to 7%. In other words, the cost of capital is the cumulative cost of purchasing assets and providing enough dividends. However, Yieldcos have not figured out how to use tax equity efficiently, and thus this capital is lowest when tax equity is not involved. Currently, Yieldcos roll tax benefits forward to shelter further income. Yieldcos grow based on the difference between the cost of bringing assets into the Yieldco and the cost of capital for the Yieldco.⁵⁵ As assets get more expensive it will become harder to provide dividends that keep stock prices high and cost of capital low. Thus companies need a large development pipeline and the commitment of the parent company to feed the pipeline. As assets get more expensive, pension funds and other investors will be able to offer

ROFO, Call Right, or Planned Assets								
	NRG Yield	NextEra	Abengoa Yield	Transalta	Pattern	TerraForm	Sol-Wind	Brookfield
Solar	276	567	95	0	0	2,328	1,099	0
% Solar	12%	37%	9%	0%	0%	70%	100%	0%
Concentrating Solar	193	0	135	0	0	0	0	0
% Concentrating Solar	8%	0%	13%	0%	0%	0%	0%	0%
Wind	934	982	0	99	977	1,017	0	0
% Wind	41%	63%	0%	9%	100%	30%	0%	0%
Hydro	0	0	0	813	0	0	0	0
% Hydro	0%	0%	0%	76%	0%	0%	0%	0%
Conventional	895	0	794	0	0	0	0	0
% Conventional	39%	0%	78%	0%	0%	0%	0%	0%
Other/Unknown	0	0	0	164	0	0	0	2,000
% Other	0%	0%	0%	15%	0%	0%	0%	100%
NON - MW ASSETS	1.2M ft3/day							
Total Assets	2,298	1,549	1,023	1,076	977	3,345	1,099	2,000

In addition to identified asset pipelines, NRG (NRG Yield's parent company) has approximately 2 GW of operating renewable projects. NextEra Energy Resources (NextEra Energy Partner's parent company) has approximately 10 GW of operating wind assets.

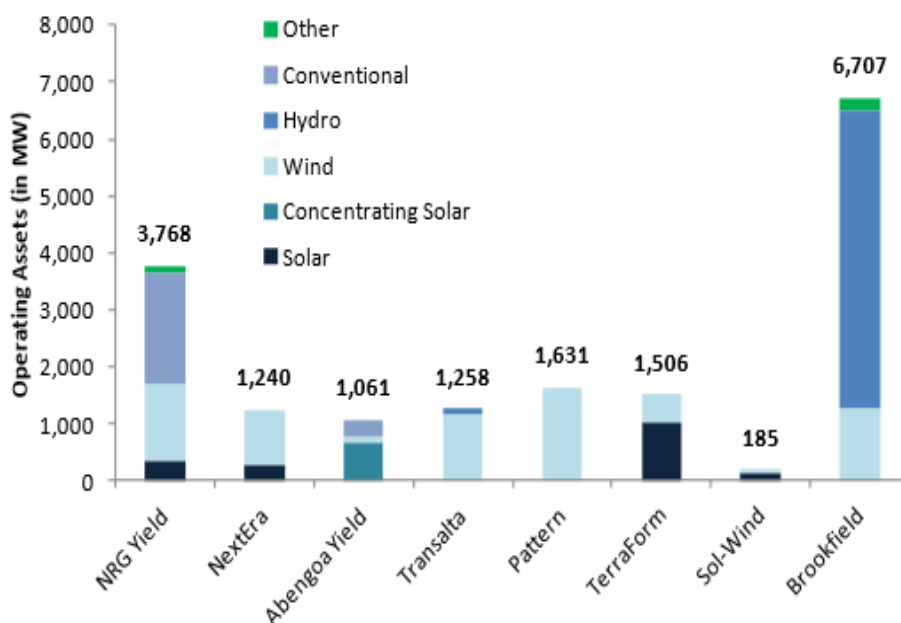
Figure 7: Drop Down for Yieldcos (Source FBR Research 2015).

⁵⁴ *ibid*

⁵⁵ Redinger, Andy, Carl Weatherley-White, Alejandro Burgaleta, and David McIlhenny. "Yield Cos: State Of Play - a Roundtable Discussion about Yield Cos at the Infocast Projects & Money Conference in New Orleans in January." Interview by Keith Martin and Hunter Armistead. Project Finance Newswire. Chadborne & Parke, 18 Feb. 2015. Web. 20 Feb. 2015. <http://www.chadbourne.com/Yield-Cos-Where-to-Next--yield-cos-dividend-yields-NRG-Yield-TerraForm-cost-of-capital-discount-rates-auctions_projectfinance/>.

higher prices for assets. However, private equity firms will not purchase those assets since they seek much higher returns.

Yield Co. Operating Assets by Type



Current Operating Portfolios								
	NRG Yield	NextEra	Abengoa Yield	Transalta	Pattern	TerraForm	Sol-Wind	Brookfield
Solar	353	290	0	0	0	1,007	145	0
% Solar	9%	23%	0%	0%	0%	67%	78%	0%
Concentrating Solar	0	0	785	0	0	0	0	0
% Concentrating Solar	0%	0%	66%	0%	0%	0%	0%	0%
Wind	1,332	950	100	1,153	1,631	499	40	1,270
% Wind	35%	77%	8%	92%	100%	33%	22%	19%
Hydro	0	0	0	105	0	0	0	5,222
% Hydro	0%	0%	0%	8%	0%	0%	0%	78%
Conventional	1,960	0	300	0	0	0	0	0
% Conventional	52%	0%	25%	0%	0%	0%	0%	0%
Other	123	0	0	0	0	0	0	215
% Other	3%	0%	0%	0%	0%	0%	0%	3%
NON - MW ASSETS	1346 Mwt		3.1M ft3/day					
Total Assets	3,768	1,240	1,185	1,258	1,631	1,506	185	6,707

Note: This excludes certain NRG Yield and Abengoa Yield assets, which are not directly comparable on a MW basis.

Figure 8: Yieldco current assets by MW and type (Source:FBR Research)

Constructed versus Development Pipelines

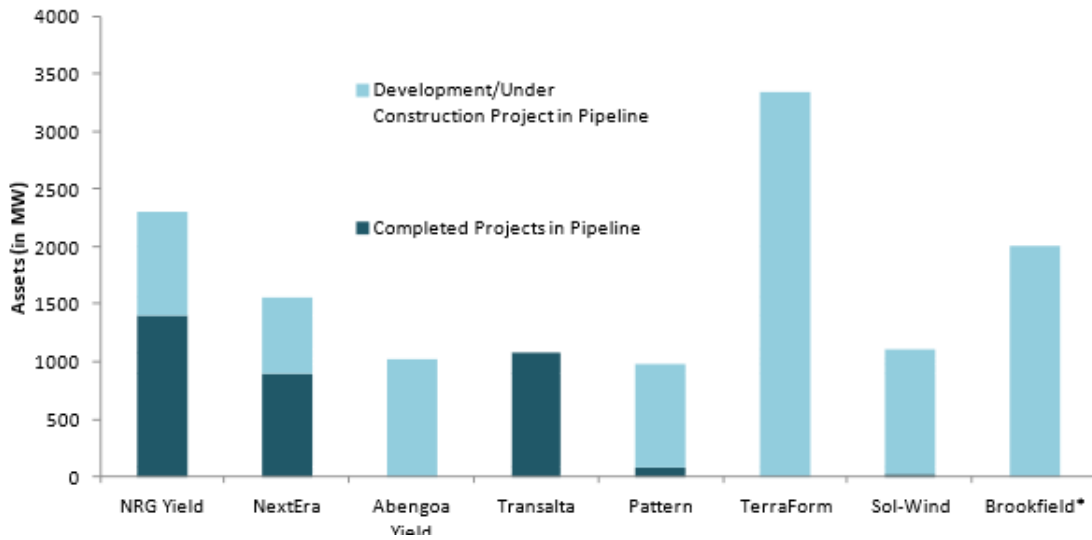
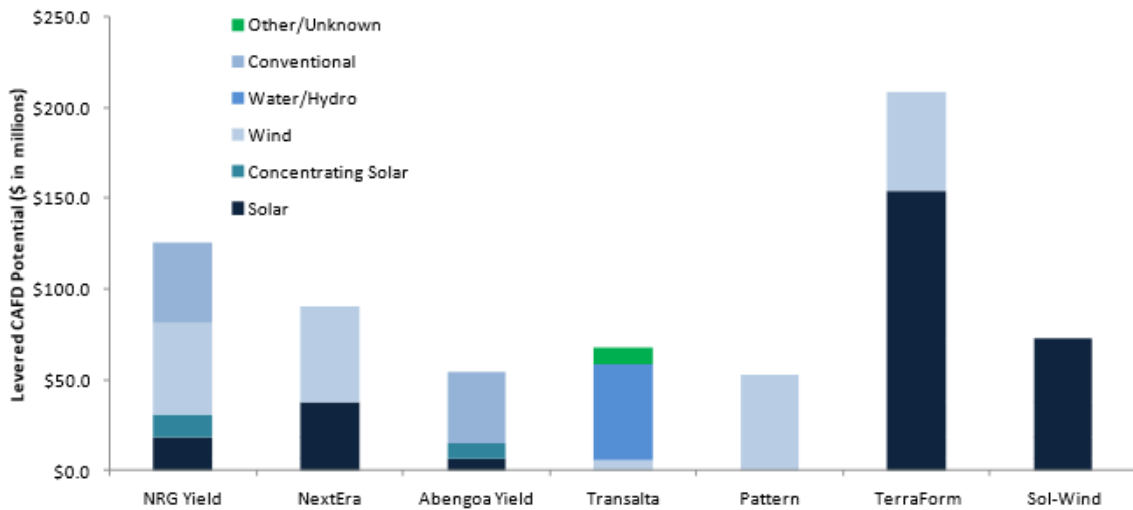


Figure 9: Complete vs Developing projects in ROFO

Potential CAFD of Yield Co. Project Pipelines



Abengoa Yield's desalination plants are excluded from this analysis.

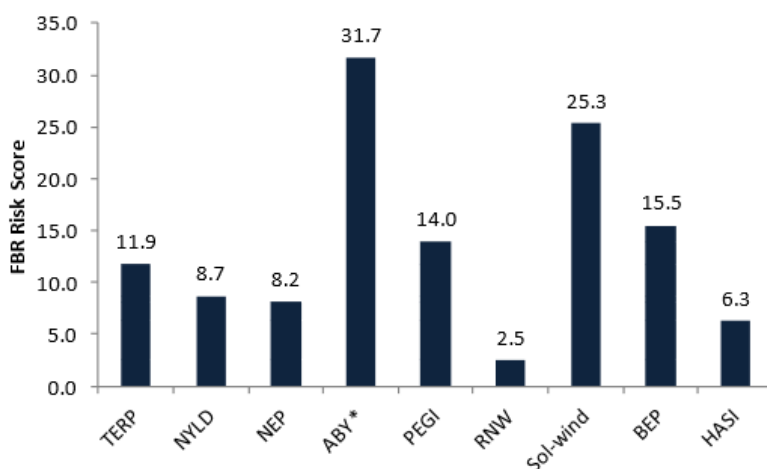
Source: FBR Research and company reports

Figure 10: Possible CAFD from ROFO

Yieldcos' valuation based on dividends are comparable to Master's Limited Partnerships, funds that invest in conventional energy projects with no tax liability. However, Yieldcos offer a higher growth rate than those funds. Their popularity is in line with the widely voiced criticism of the market -- that it only focuses on short term growth.

The two Yieldcos with the lowest yields, NextEra and NRG Yield have well established founding companies as well as many pipeline projects that are already active. The other Yieldcos are much more exposed to development risk because their pipeline assets have not begun commercial operations. The firm FBR created a matrix to evaluate existing Yieldcos based on six criteria: assets outside the US, planned assets outside the US, assets that are not hydro solar or wind, planned assets not in operations, quality of pipeline disclosure and the ratio of EBITA from the pipeline to expected dividend growth⁵⁶. International assets prove a liability due to currency risk and the volatility more common in foreign markets. Assets that are still at the developmental stage may never actually be built, face delays, or underperform, and therefore also carry excess risk. By evaluating pipeline disclosure, FBR can attest to how much information the companies provide to investors. Greater disclosure on future pipeline development obviously allows a better understanding of potential CAFD for investors.

FBR Yield Co. Comparative Risk Assessment



FBR Risk Score										
	Weighting	TERP	NYLD	NEP	ABY *	PEGI	RNW	Sol-wind	BEP	HASI
% of Operation Non-U.S., U.K., Canadian Assets	5	7%	0%	0%	67%	5%	0%	0%	10%	0%
% of Planned non-U.S., U.K., Canadian assets	10	4%	0%	0%	100%	7%	0%	30%	0%	0%
% of Rev contribution not Solar Wind, 1/2 point conventional (or assets) or	10	0%	35%	0%	26%	0%	0%	0%	0%	0%
% of assets in planned portfolio not operating	10	100%	39%	42%	100%	92%	0%	98%	100%	25%
Pipeline Disclosure Quality	5	0%	0%	0%	0%	0%	50%	50%	100%	75%
Growth Expectations vs. Disclosed Pipeline	10	11%	13%	40%	57%	38%	0%	100%	0%**	0%
Risk Score	50	11.9	8.7	8.2	31.7	14.0	2.5	25.3	15.5	6.3

*Desalination plants are not included in calculations for Abengoa Yield.

**BEP's asset pipeline is not disclosed in detail.

Source: FBR Research

Figure 11: Risk Ranking for Yieldcos

Abengoa scores the highest for risk mainly due to its assets and pipeline consisting of foreign projects. Abengoa also has more risky projects in development. The high risk for Abengoa corresponds to its low dividend yield. Sol-Wind also scored very highly, confirming investor

⁵⁶ FBR RESEARCH, "Yield Co. Landscape Analysis; HASI Stands Out As Low Risk, High Growth--Raising Price Target to \$24" Energy & Natural Resources: Energy Efficiency." March, 14, 2015. Available from Thomson One, accessed March 16, 2015.

wariness which caused delay in filing an IPO. The last criterium, based on EBITA to planned asset ratio, does not follow market expectations since NextEra and Terraform Power have planned more growth for their assets.

Yield Co Relative Risk Ranking

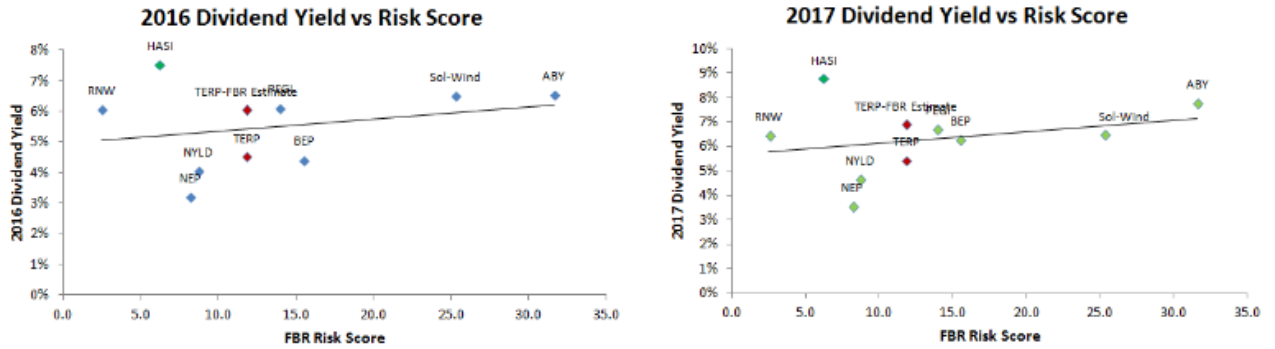
Company Name	FBR Risk Score	Additional Details
TransAlta Renewables	2.5	The company's pipeline consists of 100% renewable assets, 100% of projects are located in Canada, 100% of operating projects are either hydroelectric or wind assets, and there are no uncompleted projects in the current portfolio.
Hannon Armstrong	6.3	The company has a very low risk score because of the nature of Hannon Armstrong's assets, which consist primarily of senior debt transactions on renewable and energy efficiency projects, as well as the favorable geographic location of all of the company's assets.
NextEra Energy Partners	8.2	Lower risk due to the company's asset mix, which consists entirely of renewable solar and wind assets, as well as the favorable geographic location of its assets. However, this is offset somewhat because of the relatively high level of projects in the pipeline, which are not yet constructed, as well as high consensus growth expectations versus the company's current disclosed portfolio.
NRG Yield	8.7	Lower risk due to the favorable geographic location of all of the company's planned and operating assets, and that the company's pipeline consists primarily of assets that are already completed. Counting against NRG Yield is the presence of non-renewable assets in the company's operating and pipeline assets, as well as some development risk remaining in the company's planned assets.
TerraForm Power	11.9	Lower risk due to the favorable geographic location of most of the company's planned and operating assets, all operating and planned projects are wind or solar assets, good pipeline disclosure quality, and consensus expectations that are largely in line with the current disclosed planned portfolio. This is offset by the factor that all of the company's planned assets have yet to be completed.
Pattern Energy Group	14.0	Lower risk as the vast majority of the company's operating and planned projects are located in the U.S., U.K., or Canada, and all of the company's current and planned assets are wind assets. However, the majority of the company's identified pipeline has not yet been completed.
Brookfield Energy Partners	15.5	Brookfield's asset disclosure, both in terms of its current assets and the company's acquisition pipeline, is less complete than most of the other Yield Cos. in the market, and it appears that the company's 2.0 GW pipeline is a development pipeline of assets that have yet to be completed. However, Brookfield does have assets located primarily in the U.S. and Canada, as well as a portfolio that is heavily weighted toward renewable assets.
Sol-Wind	25.3	The company's identified project list mostly consists of projects that have not been constructed yet, and a meaningful portion of planned assets is located in less favorable geographies. This company has not yet completed its planned IPO; the latest S-1 was filed January 29, 2015.
Abengoa Yield	31.7	The high risk score is primarily a result of the company's geographic mix of assets, a pipeline that consists of assets that are not yet completed, and the types of assets in the Yield Co., which include solar, wind, and electricity transmission lines, as well as desalination plants.

Source: FBR Research

Figure 12: Explanation of Risk Assessment

Companies' risk scores do have some correlation with dividend yield. However Hannon Armstrong (discussed below) and Terraform Power act as outliers.

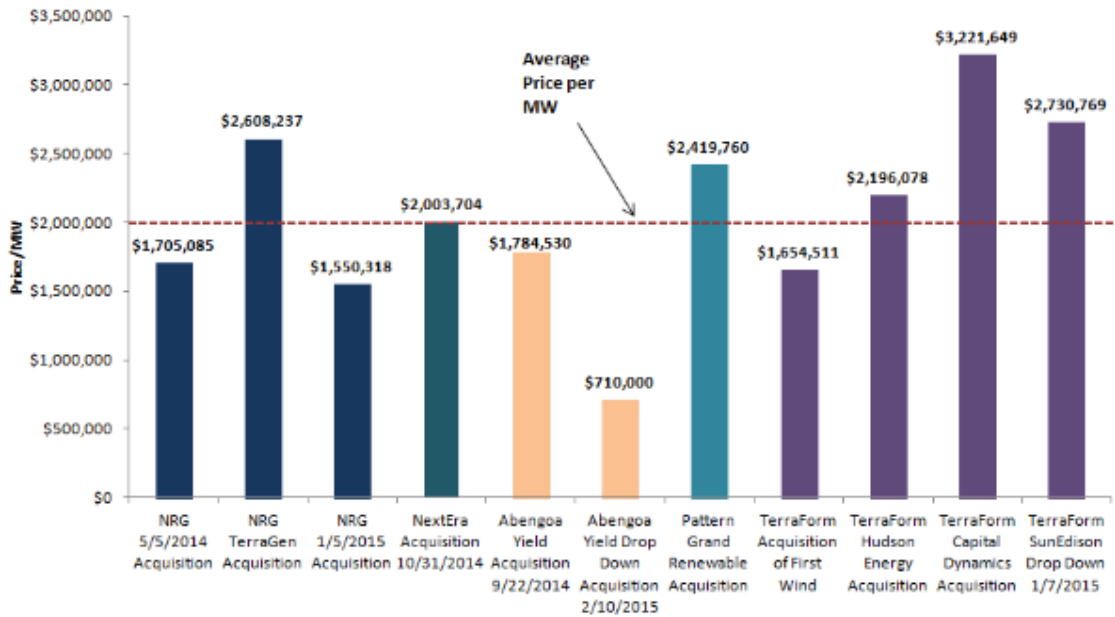
2016 and 2017 Project Dividend Yields versus FBR's Risk Score



Source: FBR Research and FactSet

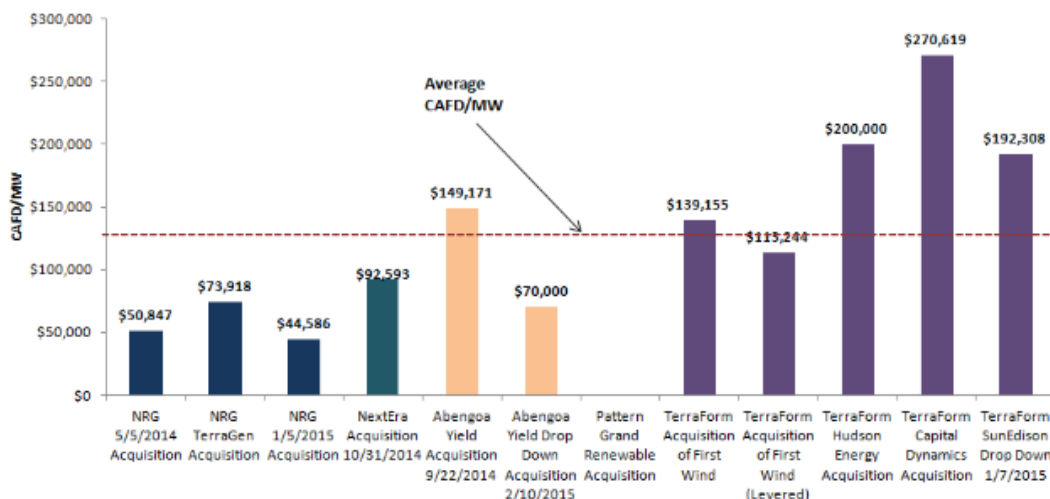
FBR also looked at the cost per Mwh for drop downs from Yieldcos.

Recent Yield Co. Acquisition—Price Paid (Enterprise Value) per MW



Source: FBR Research

Recent Yield Co. Acquisitions—CAFD Generation per MW



Source: FBR Research and company reports

Figure 13: CAFD/MW

The two charts above show the cost of dropdown assets and the corresponding CAFD. Terraform Power has paid the most for assets, but the same assets generate the highest level of CAFD. Terraform has used less leverage to fund these assets. If an asset is acquired with leverage, future cashflows must be used to pay down debt and cannot go to CAFD. Distributed Generation assets will generate more CAFD per MW than utility scale assets. Many Yieldcos received debt financing, which can serve as a floor for the cost of capital, since the cost of equity is always higher than that of debt.

Selected Recent Debt Transactions Summary

Recent Debt Transactions				
Closing Date	Description	Size	Coupon	Due
NRG Yield				
8/5/2014	NRG Yield's "Green Bond" due 2024. The senior unsecured bonds were issued for total aggregate principle of \$500M, with a coupon of 5.375%, and are due in 2024.	\$500	5.38%	2024
TerraForm Power				
1/23/2015	TerraForm issued \$800M in "Green Bonds." These notes were for an aggregate principle amount of \$800M, have a coupon rate of 5.875%, and are due in 2023. The notes will be senior obligations of TerraForm and will be guaranteed by TerraForm's parent company.	\$800	5.88%	2023
Abengoa Yield				
11/17/2014	Abengoa Yield issued a \$255M aggregate principle senior note due 2019. The notes will accrue 7.00% interest payable semi-annually. The proceeds from the bond are expected to be used to finance the recent previously announced acquisition of three renewable assets.	\$255	7.00%	2019
Brookfield Renewable Energy Partners				
3/25/2014	Brookfield Renewable Energy Partners issued CAD \$150M to finance its Great Lakes Power hydroelectric portfolio in Canada. The company issued \$90M Series 3 senior bonds with a 3.77% coupon and average life of six years, and a CAD \$60M Series 3 subordinate bond bearing a 4.96% coupon and an average life of nine years.	\$90	3.77%	2020
		\$60	4.96%	2023
Hannon Armstrong				
12/23/2015	Asset backed securitization for \$100M. The company issued the security in a private placement; it has a principal amount of \$100M, a coupon of 2.79%, and a December 2019 maturity. It is secured by approximately \$110M of on-balance-sheet assets.	\$100	2.79%	2019

Source: FBR Research and company reports

Figure 14: Recent Debt Transactions

If, Yieldcos continue to perform well, debt financing will become cheaper and Yieldcos can grow faster.

The Future of Yieldcos.

Both Yieldco CEOs and financial analysts demand the continual growth of Yieldcos, with the phrase “feed the beast” a constant refrain. This need will push many Yieldcos to expand beyond the US into international markets. Some foreign markets may also offer higher returns, which will help dividends continue to grow, albeit adding risk. Yieldcos promise growth of at least 10%, with some promising as high as 24%. This justifies their high valuation and low dividend yield. If interest rates rise then Yieldcos’ value may fall, and they may not make the best offer for dropdown assets, since other companies, such as banks or private equity firms may offer a better price. Then parent companies will seek to get the most return for their assets and the pipeline for Yieldcos could dry up.

On the positive side, Real estate Investment Trusts and Master Limited Partnerships suggest an ideal future for yieldcos. However, both benefit from distinct tax advantages, which would only be extended to Yieldcos if Congress were to act, a highly unlikely scenario. REITs have been around for more than 25 years and have a current market capitalization of more than \$400 billion. The assets within Yieldcos present as much risk as those of REITs, according to Andy Redinger, Managing Director of Alternative Energy and Utility at KeyBank. If Yieldcos can attract REIT investors, there is strong potential for growth and expansion. He concluded “more than 50 times as much capital is looking for opportunities like Yieldcos than is invested in the existing Yieldcos. The question is whether there are enough assets to support that type of growth, and I think there are. Many new energy and other infrastructure projects are being built worldwide.”

Future Steps for Securitization

In order for the solar industry to continue to securitize and to gain access to public markets it must create streamlined standards and effectively reduce the perception of risk. Perceived risks of the solar asset class discussed above include technology risk, offtaker creditworthiness, geographic risk and regulatory policy all of which slow investment in capital and raise yield. Risk perception comes in large part from the short history of the asset class. Not only are Solar City’s ABS novel, but the company itself went public only in 2012. While in the following three years, solar continued to grow, historically the company and the asset class remain very young. In order for solar to mature rapidly as an asset class, it must behave like commonly securitized asset classes in terms of standardization and performance.⁵⁷ As solar becomes easier for investors to understand and meets or exceeds investors’ expectations, the

⁵⁷ Mendelsohn, M.; Urdanick, M.; Joshi, J. “Credit Enhancements and Capital Markets to Fund Solar Deployment: Leveraging Public Funds to Open Private Sector Investment.” February 2015. NREL Report No. TP-6A20-62618

narrative can flip from one of perceived risk to one of perceived opportunity in which investors compete to fund projects.

NREL highlights key points for industry projects: asset and contractual consistency, due diligence tools, standardizing of contracts, best practices for installation and set O&M protocols, and robust data sets of both technology performance and contracts.⁵⁸ NREL and a number of private companies are working to facilitate this transition. In order for investors to quickly perform due diligence and to willingly finance large portfolios of projects or projects from different developers, asset development, documentation, contracts and O&M should be uniform. Standardization, at a high quality, reduces risk and allows investors to recognize which new projects offer the same opportunity based on similar structure as a previously successful project. NREL has established set PPA contracts for residential and commercial solar and set O&M agreements. Investors also need data on contracts and system performance in order to perform satisfactory due diligence. For example, how do solar systems degrade in different markets and how do off-takers perform in the long term? Likewise analytical and due diligence services that assess risks and performance of future projects make the asset class easier to understand for investors and reduce perceived risks.

NREL has also filed mock securitizations for commercial and residential portfolios in order to help developers understand perceived risks. The rating agencies have not released their evaluation of the mock securitization filings, but the rating agencies' eventual feedback will allow NREL and companies such as Distributed Sun and Mercatus to gain key insights into further reducing risks. While NREL and startups have laid the groundwork for progress, financial institutions must embrace tools and standards and leverage them to drive the market. The graphic below highlights how the industry can embrace a virtuous cycle that will lead to growth in securitization, declining cost of capital and continued solar development.



Figure 15: Virtuous Cycle for Securitization Development. (Source NREL: Joshi Mendelhsen 2014)

⁵⁸ ibid

In addition to standardization, warehouse facilities have been created to facilitate the pooling of assets.⁵⁹ These facilities, also known as “conduit structures”, are created prior to the selling of securitizations in the capital markets. They allow for a “carry/risk-sharing” structure, in which companies share the income from interest and the risk that the underlying assets will default or not enter the final securitization structure. Investment banks will often establish the facility, prior to securitizing the portfolio. Commercial banks have worked to create a warehouse line of credit for other asset classes such as mortgage backed securities. The warehouse facility purchases the assets. For example, in solar, the warehouse facility could purchase a diverse array of residential or commercial solar PPA or the systems themselves. In order to enter the warehouse facility, the solar assets would have to meet a set of conditions and to follow standardization rules; in turn products developed by smaller firms would be able to enter the secondary market, increasing the market size and reducing the cost of securitization.

Securitization through warehouse facilities can create a virtuous cycle. When solar developers create products with the intention of selling them to warehouse facilities, they embrace the standards mentioned above and ensure that the projects have reliable performance, while receiving the financial benefits from the warehouse facility. The state of Connecticut’s Clean Energy Finance and Investment Authority (CEIFA) has acted as a warehouse facilitator to help residential solar grow. They offered credit enhancement through the warehouse facility to help installers establish leases, homeowners receive loans, and banks make loans on solar projects. According to Bert Hunter, CIO of CEIFA, these warehouse facility programs all provide loan loss reserve, which acts as a credit enhancement, making costs cheaper for customers in terms either of the loan rate or of cheaper capital costs for the installers or the bank, which will pass on the savings to customers.⁶⁰ In addition, the loan loss reserve enables banks to offer better terms because CEIFA shares in each loss, capped at a total amount of potential losses, so that the state of Connecticut has a floor in terms of costs. Finally, private lenders that finance the products have some reinsurance, but can still face losses, and thus have a strong incentive to provide quality underwriting practices.

For the residential solar product, CEIFA partnered with the residential solar loan start up, Sungage Financial, and the solar financier Mosaic to launch CT Solar loan. CEIFA established a \$5 million SPV for residential solar projects. According to NREL, “CEIFA will leverage this warehouse facility with debt from Mosaic by lending against the cash flow of the residential loans for customers with a FICO score of 680 or higher. To re-capitalize the SPV, the loans are pooled into \$500,000 tranches and sold to Mosaic at 6% yield and 15 year maturity (the term of the loans).”⁶¹ SPV retains the capital and leverages it against specific tranches, providing a buffer against default. As the CEIFA established the SPV, it has first lost position of 20% of cashflows. Mosaic receives 80% loan repayment cash streams. The diagram below depicts the complete structure of the CT SOLAR LLC. Sungage pays and manages the pv contractor, loan agreements and repayment. In turn it receives funding for the loan from the SPV, marked below

⁵⁹ *ibid*

⁶⁰ Hunter, B. (February 2014). “CEIFA’s Residential Solar Financing Products.” Presented at the Green Bank Academy, February 6, 2014, Washington, D.C.

⁶¹ Mendelsohn, M.; Urdanick, M.; Joshi, J. “Credit Enhancements and Capital Markets to Fund Solar Deployment: Leveraging Public Funds to Open Private Sector Investment.” February 2015. NREL Report No. TP-6A20-62618

as the LLC. CEIFA receives an initial loan repayment of 20% and subordinate debt. As, loan payments are made, CEIFA can create new tranches of customers.

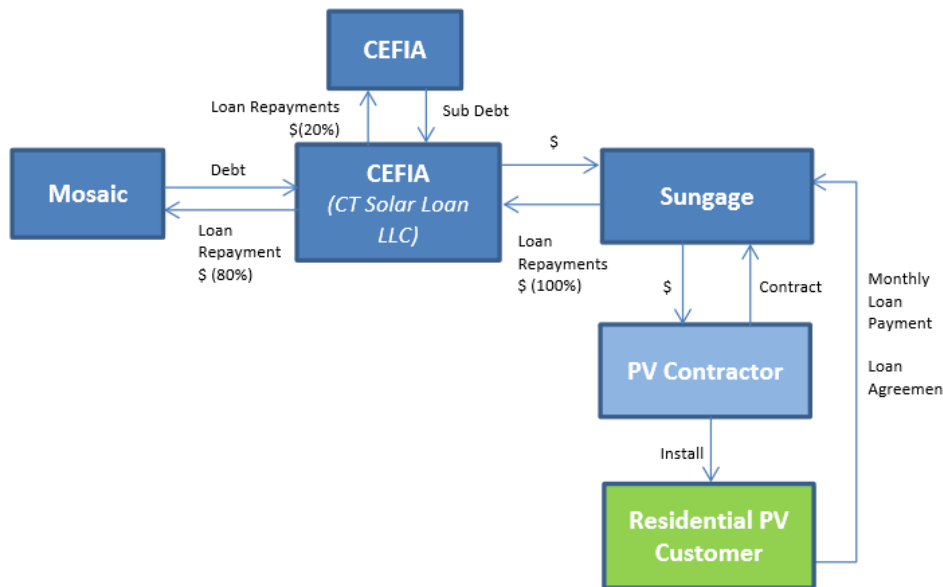


Figure 16: CT Solar Structure (Source Hunter 2014)

In March of this year, CEIFA created a pool of Property Assessed Clean Energy (PACE) commercial projects and successfully sold them to the private finance company Clean Fund.⁶² PACE projects use property taxes to finance renewable energy and energy efficiency projects both for residential and commercial entities. If the property taxes are not paid, then the property can be appropriated by the state; thus, there is less market risk for default on PACE projects. By selling the loans CEIFA demonstrated the feasibility of warehouse facilities for other PACE projects and removed any risk for the loans. Eventually, it may be possible for banks to securitize PACE projects or to create warehouse facilities for them.

Finally, a bank or a public fund can combine credit enhancement and warehouse facilities into Partial Credit Enhancement Structures, which pool cash flow and assets for securitization and provide credit enhancement to attract private capital. This could take the form of a loss reserve for warehouse facilities, which would only be used in case of large losses, and have a cap or a reserve to facilitate securitization.

Conclusion

With the help of warehouse facilities and standardization, distributed solar projects have the potential to develop more ABS. Also, both ABS and YieldCos have longer term potential to

⁶² CEIFA. (2015). "CEIFA Announces Sale of Commercial Property Assessed Clean Energy Benefit Assessment Liens." accessed February 1, 2015:

http://www.ctcleanenergy.com/NewsEvents/PressRoom/tabid/118/ctl/ViewItem/mid/1364/ItemId/292/Default.aspx?SkinSrc=/Portals/_default/Skins/subpages/subpage_level0

grow if they can minimize risk and provide steady cash flows to investors. In the United States, securitization cannot work against regulatory risk. Regulation that changes net metering or limits utility scale solar development, will limit project growth regardless of developments in securitization.

Bibliography

Hunter, B. (February 2014). "CEFIA's Residential Solar Financing Products." Presented at the Green Bank Academy, February 6, 2014, Washington, D.C.

CEFIA. (2015). "CEFIA Announces Sale of Commercial Property Assessed Clean Energy Benefit Assessment Liens." Accessed February 1, 2015:
http://www.ctcleanenergy.com/NewsEvents/PressRoom/tabid/118/ctl/ViewItem/mid/1364/ItemId/292/Default.aspx?SkinSrc=/Portals/_default/Skins/subpages/subpage_level0

NRG Yield, Q4 NRGY Yield Earnings call Presentation, February 27, 2015.
<http://investor.nrgyield.com/phoenix.zhtml?c=251846&p=irol-EventDetails&EventId=5184776>

NextEra Energy Inc. & Next Era Energy Partners 2015 Investor Conference March 11, 2015
<http://www.investor.nexteraenergypartners.com/phoenix.zhtml?c=253465&p=irol-EventDetails&EventId=5186181>

Abengoa Yield 2014 Full-Earnings Conference Call. February 23, 2015
<http://www.abengoayield.com/export/sites/abengoa-yield/.content/galleries/documents/Abengoa-Yield-Q4-Results-2014.pdf>

Terraform Power Q4 2014 Terraform Power.
<http://www.terraform.com/mobile.view?c=253464&v=200&d=2&id=5183654> February 18, 2015

Nextera Energy partners Form 10 K, February 20th, 2015
<http://www.investor.nexteraenergypartners.com/phoenix.zhtml?c=253465&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPX RlbmsmaXBhZ2U9MTAwOTE4NDYmc3Vic2lkPTU3&ListAll=1&sXBRL=1> February 20th, 2015.

NextEra Energy Partners Form S-1, May 20th, 2014,
<http://www.investor.nexteraenergypartners.com/phoenix.zhtml?c=253465&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPX RlbmsmaXBhZ2U9OTYwOTAwNCZzdWJzaWQ9NTc%3d&ListAll=1> February 10th, 2015

Abengoa Yield, Form 6-K, February 23, 2015
<http://www.sec.gov/Archives/edgar/data/1601072/000119312515057197/d878188d6k.html>
February, 24, 2015

Abengoa Yield Form F-1 April, 01 2014
<http://www.sec.gov/Archives/edgar/data/1601072/000119312514126175/0001193125-14-126175-index.html> February 20th, 2015

Terraform Power Form S-1 May, 29, 2014
<http://www.terraform.com/mobile.view?c=253464&v=201&d=3&id=9623820&idParam=RV^>
February 2, 2014.

NRG Yield Form S-1 June, 7 2013

<http://investor.nrgyield.com/phoenix.zhtml?c=251846&p=IROL-secToc&TOC=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9vdXRsaW5lLnhtbD9yZXBvPX RlbmsmaXBhZ2U9ODk3MzY5NCZzdWJzaWQ9NTc%3d&ListAll=1> February 20th, 2015

NRG Yield Form 10-K February 27th 2015,

<http://investor.nrgyield.com/phoenix.zhtml?c=251846&p=irol-SECText&TEXT=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9maWxpbnmcueGlsP2lwYWdIPTEwMTEwMDE2JkRTRVE9MCZTRVE9MCZTUURFU0M9U0VDVEIPTI9FTIRJUkUmc3Vic2lkPTU3> February 28, 2015

Wesoff, Eric. "SolarCity's New \$201M Securitized Solar Portfolio Keeps the Capital Flowing." GreentechMedia. GTM, 25 July 2014. Web. 11 Mar. 2015.

Pattern Energy Group 10-K, March 2, 2015

<http://investors.patternenergy.com/secfiling.cfm?filingID=1193125-15-73104&CIK=1561660> March, 2 2015.

Pattern Energy Group S-1 August 9, 2013

<http://investors.patternenergy.com/secfiling.cfm?filingID=1193125-13-329269&CIK=1561660> March 2, 2015

Transalta Renewables 2015 Annual Report February, 13, 2015

<http://www.transaltarenewables.com/sites/default/files/RNW%202015%20AIF%20v%2021%20-%20SEDAR.pdf>

SolarCity deal lights way for securitization (Reuters) By: Wiltermuth, Joy.

<http://www.reuters.com/article/2014/07/29/structured-finance-solarcity-bonds-idUSL6N0Q049O20140729>

Konrad, T. (2014, October 22). How do SolarCity's new bonds stack up against other green investments. The Guardian, p. 1.

SolarCity deal lights way for securitization (Reuters) By: Wiltermuth, Joy.

<http://www.reuters.com/article/2014/07/29/structured-finance-solarcity-bonds-idUSL6N0Q049O20140729>

Urdanick, Marley. "A Deeper Look into Yieldco Structuring." A Deeper Look into Yieldco Structuring. National Renewable Energy Laboratory, 3 Sept. 2014. Web. Feb.-Mar. 2015.

Lowder, T.; Mendelsohn, M. (2013). Potential of Securitization in Solar PV Finance. 37 pp.; NREL Report No. TP-6A20-60230.

Katz, Eli and Marsi, Michael How Yieldcos are Re-Shaping the Tax Equity Market. January 2015 Power Finance and Risk. Chadborne.com

Chadborne Project Finance Newswire "Yield Cos: Where to Next? – yield cos, dividend yields, NRG Yield, TerraForm, cost of capital, discount rates, auctions". Radtke Christopher, Peters

Jerry, Hinse Gerhard, Brand Ted and Katz Eli. November 2014.
http://www.chadbourne.com/Yield-Cos-Where-to-Next--yield-cos-dividend-yields-NRG-Yield-TerraForm-cost-of-capital-discount-rates-auctions_projectfinance/

Chadborne: Project Finance Newswire Yield Cos Compared; Strategies, Benefits, And Drawbacks Of Yield Co Share Offerings; NRG Yield, TransAlta Renewables And Pattern Energy Group, Inc. Chadborne & Parke, 13 Dec. 2013. Web. 2 Feb. 2015.

Horowitz, Yuri, and Will Graves. "Peering Over the 2017 Horizon for Solar, Part 2: Beyond the ITC." GreenTechMedia. GTM, 21 July 2014. Web. 09 Mar. 2015.

Terraform Power 4Q 2014 Results February 2018, 2015. Bethesda, Maryland. Terraform Power. Online Presentation.

Horowitz, Yuri and Graves, Will. "Peering Over the 2017 Horizon for Solar, Part 1: Securitization." Greentechimedia. GTM, 17 Jan. 2014. Web. 08 Mar. 2015.

"Solar Securitizations — SolarCity, PACE, ABS, SAPC, S&P, Credit Suisse, Deutsche Bank." Interview by Andrew Coronios, Eli Katz, Xilun Chen, Stephen Viscovich, and Michael Cheng. Solar Securitizations. Chadborne & Parke, 14 Sept. 2014. Web. 08 Mar. 2015.
http://www.chadbourne.com/solar_securitizations_0914_projectfinance/

Standard and Poor's Raiting Serivce "Presale: SolarCity LMC Series I LLC (Series 2013-1)" November 23, 2013 Available from standardpoors.com Accessed February 1, 2015.

Standard and Poor's Raiting Serivce "Presale: SolarCity LMC Series II LLC (Series 2014-1)" April 1, 2014 Available from standardpoors.com Accessed February 1, 2015

Doyle, Christopher, and Matt Golden Golden. "As Securitization Grows, Is the Solar Industry Ready for Wall Street's Scrutiny?" GreentechMedia.com. Greentech Media, 1 Aug. 2014. Web. 11 Mar. 2015. <<http://www.greentechmedia.com/articles/read/wall-street-assessing-whether-solar-really-shines>>.

Mull, Richard. "The Encyclopedia of Solar Securitization, Part 1." GreentechMedia.com. Greentech Media, 3 Sept. 2013. Web. 11 Jan. 2015.
 <<http://www.greentechmedia.com/articles/read/The-Encyclopedia-of-Solar-Securitization-Part-1>>.

Mull, Richard. "The Encyclopedia of Solar Securitization, Part 2." GreentechMedia.com. Greentech Media, 9 Sept. 2013. Web. 11 Jan. 2015.
 <<http://www.greentechmedia.com/articles/read/The-Encyclopedia-of-Solar-Securitization-Part-2>>.

Coster, Paul, Mark Strouse, and Paul Chung. CleanTech: YieldCo Update. Working paper no. North America Equity. New York: J.P Morgan, 2014. Print. Alternative Energy, Applied and Emerging Technologies.

Redinger, Andy, Carl Weatherley-White, Alejandro Burgaleta, and David McIlhenny. "Yield Cos: State Of Play - a Roundtable Discussion about Yield Cos at the Infocast Projects & Money Conference in New Orleans in January." Interview by Keith Martin and Hunter Armistead. Project Finance Newswire. Chadborne & Parke, 18 Feb. 2015. Web. 20 Feb. 2015.

<http://www.chadbourne.com/Yield-Cos-Where-to-Next--yield-cos-dividend-yields-NRG-Yield-TerraForm-cost-of-capital-discount-rates-auctions_projectfinance/>.

Levin, Adam. Sol-Wind Renewable Power postpones IPO. TheDeal.com The Deal Pipeline, 13, February 2015. <http://www.thedeal.com/content/energy/sol-wind-renewable-power-postpones-ipo.php> February, 20, 2014

FBR RESARCH, “Yield Co. Landscape Analysis; HASI Stands Out As Low Risk, High Growth--Raising Price Target to \$24” Energy & Natural Resources: Energy Efficiency.” March, 14, 2015. Available from Thomson One, accessed March 16, 2015.

Mendelsohn, M.; Urdanick, M.; Joshi, J. “Credit Enhancements and Capital Markets to Fund Solar Deployment: Leveraging Public Funds to Open Private Sector Investment.” February 2015. NREL Report No. TP-6A20-62618