Ca' Foscari
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FINAL THESIS

TOPIC: The importance of project finance for renewable energy projects

Supervisor: PROF. MARCO CORAZZA

Submitted By: ABDUL RAHMAN ZAFAR

Matriculation Number: 871471

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Literature Review

1. Introduction

Starting a new project related to any industry requires financing in order to run that business/project. Mainly, we can look at financing into two categories: the first is Corporate Finance and the second is Project Finance. I will specifically discuss here about these two modes of financing and the differences between these two modes of financing and will spend substantial part of the time discussing project finance because project finance is the format, structure or the technique that is used in financing of infrastructure projects in a very common manner.

If we look at corporate finance which tells us that it's a firm's decision about undertaking capital investment decisions and taking their financial management decisions. So, corporate finance is nothing but how the decisions are being made by the company regarding its financial management. There are broadly two sources of funds, equity and debt. Equity is the capital contribution by the owners and on the other hand debt is a capital contribution by the lenders. So, in most circumstances the owners would not be able to make the entire contribution of that investment needs and therefore they will put part of their contribution as sponsors capital and the remaining that is borrowed will be debt capital. So, consequently we also have two types on investors in a company, the shareholders and the debt holders; the investors who invested in the equity are called shareholders and the investors who provided debt are called debt holders. It is important in the world of finance to really look at how different investors get returns. For example: an investor would expect a return for investing in the project, and he will also expect the return of capital that is actually invested in the project. So, the profit in a sense of the investment is a return the investor makes, and we need to understand the sources of both types of investors. The debt holders on the other hand will get the interest on their investments, so in that sense the interest that the debt holders get is the return on their investment, and at the end if the loan term the company would also give the repayment of principal, so that is their repatriation of their original invested capital. So if we look how the shareholders get their returns since they don't get any interest, but they get so called share in the company's profits. So, the company's profits are largely distributed to the shareholders by way of dividends, so the returns to the

shareholders are by way of dividend and whenever the shareholders get to sell their shares to another investor or back to the company, so they return against their capital. So the way the returns come to both the investors are very different, in the case of interest, the interest is contractually guaranteed by the company when it borrows But, as far as dividends are concerned, they are paid only when the company makes profits. So, therefore, dividends cannot be contractually guaranteed, and dividends are paid only after all the other obligations of the company has been serviced. So, to that extent the shareholders get only residual payments.

1.1 Project Finance:

The main features of project finance includes its sources where it gets its funding from and the sources of those funding depend on the type and scale of the project whether the project is a long term that includes renewable energy projects or short term. The most common parties to project financing include lenders, financial advisors, technical advisors etc. We will look at the most common and main two sources of a project finance which are: debt and equity. Debt is the part that is provided by the lenders that we are already aware of which are commercial banks and large financial institutions and also including the international banks. So the banks are considered to be the largest providers of debt project finance. Through this point we can also realize the relationship of the banks and financial institutions in this huge market of the project finance. The need of raising the capital and using the banks and those financial institutions makes it relatively more difficult to finance the projects having the negative net-present-value.

The net present value of a project describes the change in a company's net worth or its equity that would be the result from acceptance of the project over its life. We have the following formula for calculation of the NPV.

$$\text{NPV} = R \times \frac{1 - (1 + i)^{-n}}{i} - \text{Initial Investment}$$

In this formula:

- R= net cash inflow expected to be received over time period
- i= required rate of return per period
- n= number of periods

When the net cash flows are uneven (different from period to period) then we come up with the following calculation;

$$NPV = \frac{R_1}{(1+i)^1} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + ... - \text{Initial Investment}$$

Where:

i= hurdle rate/discount rate;

R_1= the net cash inflow during the first period;

R_2= the net cash inflow during the second period;

R_3= the net cash inflow during the third period and so on…

So the sign of NPV tells a lot about whether the investment in the project is worth it or not;

- NPV>0 = the investment is worth more than costs since the present value of inflows is greater than the present value of outflows;
- NPV=0 it shows that there is no difference between the value of money earned and money invested
- NPV<0 = the investment is worth less today than the costs so it's not a worthy investment

From the information we discussed we understood that the banks mainly focus on the ability of the project to generate some revenues to make the loan payments in the end. Several banks are involved in large projects as the financial advisers or the leading managers which underwrite the debt and place it in the capital market.

The second source to finance the large projects is equity. Equity can be contributed by the sponsors ordinarily subscribing to the share capital of the project company or through the loans provided by the shareholders. The other investors like the venture capitalist and private equity investors also serve as an attractive way of raising the capital, since a large number of funds are investing in renewable energy and green technologies in order to diversify their portfolios.

Let's discuss about what exactly is the Renewable energy Industry and what are the main facts of this industry that each country around the world is planning to go green as it is less costly than the fossils fuels that we have today.

Renewable energy is generated from sources that naturally replenish themselves and never run out. The most common sources are solar, wind, hydro, geothermal and biomass. Over 80% of the energy consumed by humans is derived from fossils fuels. However, renewables are the fastest growing source of energy in the world. Renewable energy has many benefits and the first and the foremost is that it can combat the climate change because it creates no direct greenhouse gas emissions and the only emissions they produce are indirect meaning that those that result from manufacturing parts, installation, operation and maintenance but even those are minimal. Secondly, renewable energy can decrease pollution and therefore reduce threats to our health. Wind, solar and hydroelectric systems create no air pollution emissions and geothermal and biomass energy systems are much lower than non-renewable energy source. Another benefit of renewable energy is that it is a reliable source of power because renewable energy sources are renewable meaning that they will never run out. Once built renewable facilities cost fairly little to operate the fuel is often free as a result renewable energy prices tend to be stable over time.

This convenient alternative to fossils fuels or coal is becoming the most debated topic these days but somehow it's still not growing as fast as our planet needs it to. Since climate change is a real threat and in order to preserve our species we need to shift our fossils fuels to these renewables alternatives. The following are some facts about the renewable energy industry and how is it growing around the world.

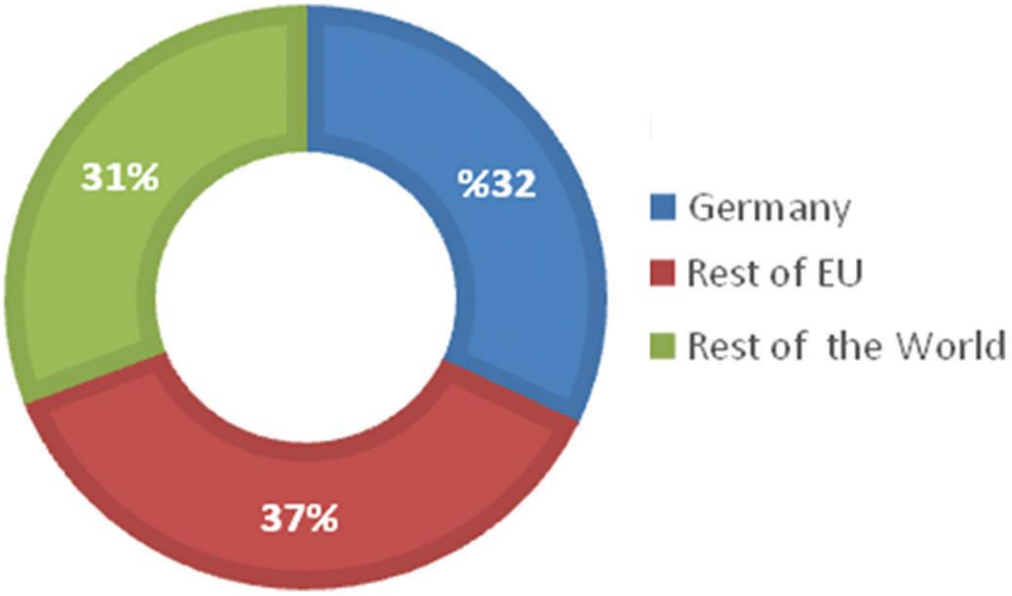
- China is the country that invests the most money into renewable energy. Because of the climate change the whole world is trying to reverse this process as much as possible. Many countries are investing in renewable energy since it's profitable on the long term and as well as ecofriendly. China is at the top of the list as far as the investments are concerned. They have invested billions of dollars into wind turbines and other alternatives and they plan to invest another 780 billion dollars by the year 2030. They have now over 3 million jobs in solar technology that is ten times more than USA. (Quartz).
- Over 100 cities are running on renewable energy. So far only Costa Rica bragged about being almost 100% on renewable energy. Sweden, Paraguay and Iceland are also on that list. It is still not enough to make a difference but on the bright side more cities claim to

be high as 75% green. By 2050 a lot of cities plan to be 100% green. (Power Technology)

- Mongolia is investing 85 million dollars in wind turbines and it's another unexpected country that wants to go green because their climate and geography allows them to adopt this kind of alternative. They are investing over 85 million dollars in renewable energy that would benefit 260000 people focusing on solar panels and wind turbines. The government of Mongolia shows the determination by helping their citizens even though the money comes from the Asian Development Bank. (Clean Energy World)
- Chernobyl is now a renewable energy area. The unfortunate catastrophe at Chernobyl might be the biggest hazard of the last 50 years. Although, the entire area is now open for tours and visitors. Ukrainian authorities decided to make the best of it. Not much can be made in the area due to radioactive waste and that's where wind turbines and solar panels come to the rescue. They plan to install one thousand miles of solar panels and they will expand the project if it all goes well. (Fortune)

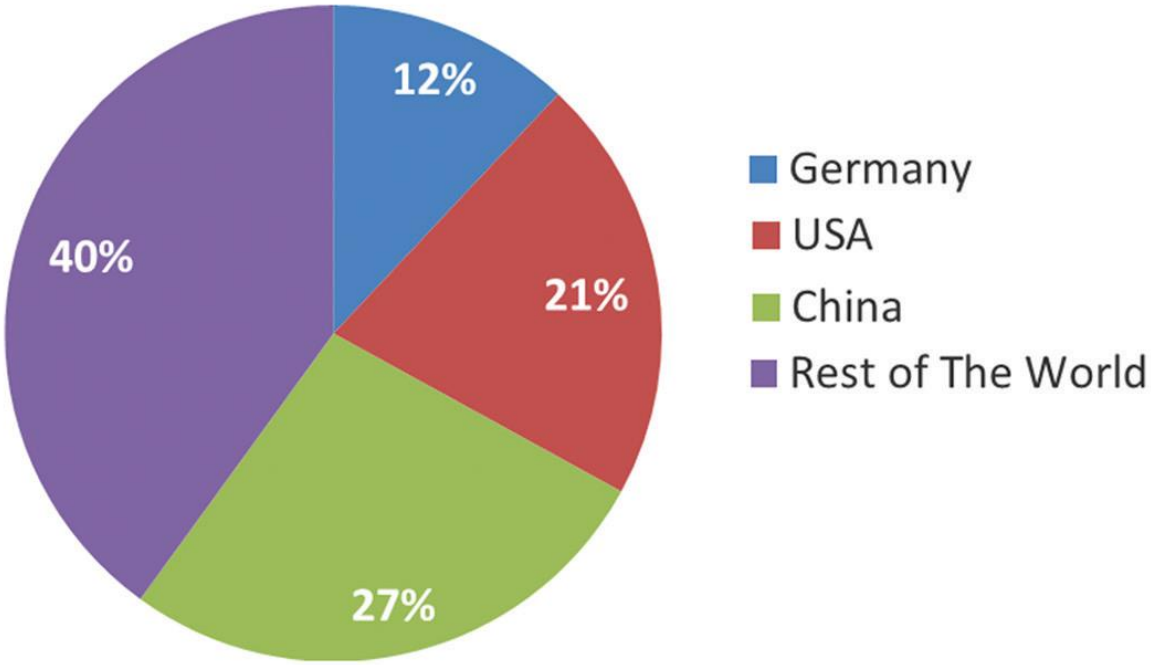
For instance, if we look in the area of the transition to the renewable energy we find out that Germany has been on top in this industry and has been a role model in the world. In Germany, the wind and solar electricity plant installations date back to 1983 (Kalamova et al., 2011. p. 37-38). Renewable Energy Law launched a turning-point for German electricity sector by paving the way for the boom of renewable including wind, solar, hydropower, landfill gas, mine gas, sewage gas, biomass and geothermal (Poser et al., 2014. p. 13). Germany was the leader within the EU countries with 27.2 GW of installed wind power capacity in 2013 Price water house Coopers, 2012. p. 22-23). It generated more than one-quarter of Europe's wind power in 2015 (IRENA, 2015. p. 92). More essentially, the portion of renewables in the total electricity supply of 2016 has been as of now 29.5% as an immediate after effect of the acts. The total power generation from solar and wind power plants have become more than hard coal and nuclear (Figure 3).

Figure 1: Solar operating capacity, Germany and Rest of World, 2012



Source: Morris and Pehnt, 2015. p. 19

Figure 2: Wind operating capacity, Germany and Rest of World, 2012



Source: Morris and Pehnt, 2015. p. 19

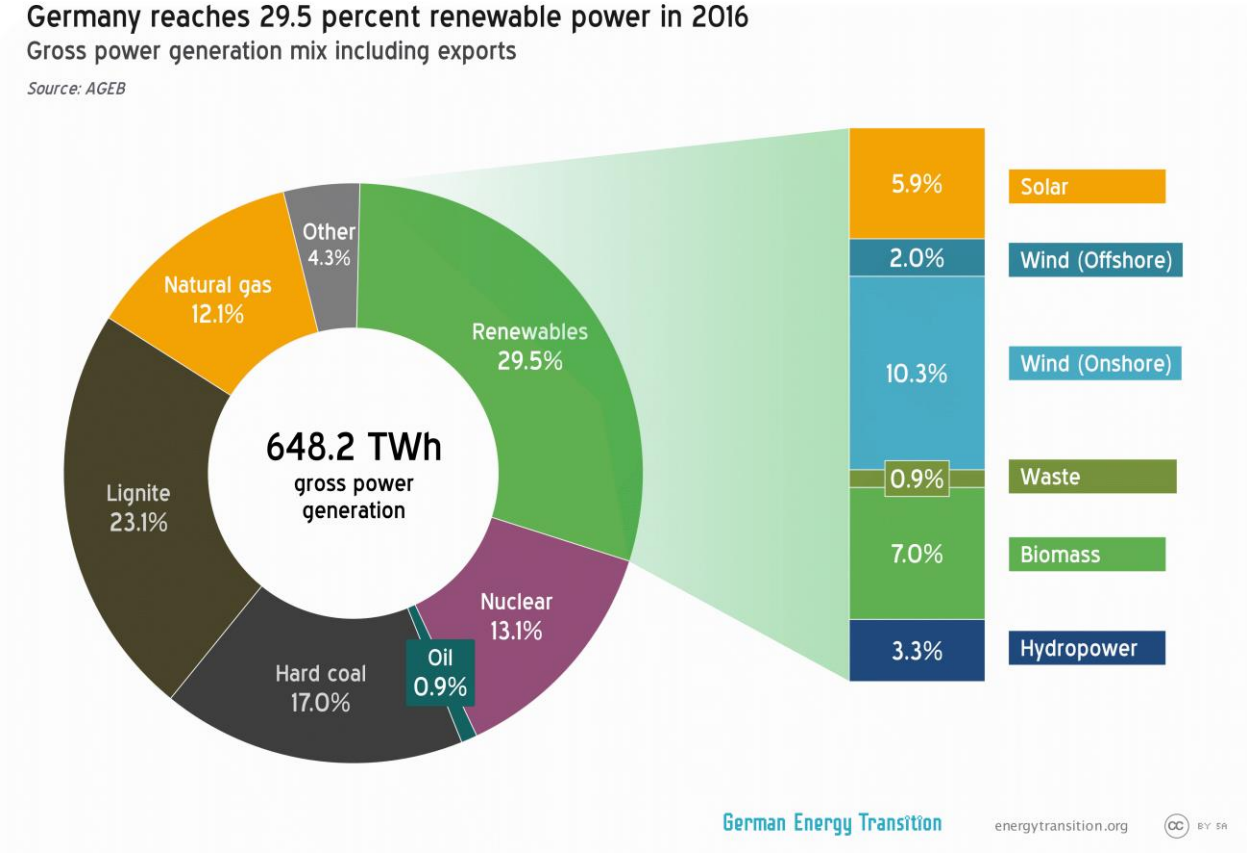


Figure 3: Germany's gross power generation mix in 2016

So taking into consideration these type of projects such as renewable energy projects that has been discussed above it is necessary that the project makes a reasonable return on equity investment in order to involve the equity investors.

Let's identify some features of a project finance that includes:

- Each and every project is established as a separate company (so each project will have its own financial statements, its own set of shares being issued, its own set of lenders etc.);
- It is most commonly focused on large infrastructure projects that includes Energy projects, highways, bridges, mass transit, airports and airways etc.
- It benefits all those industries and firms in which the project is acting a separate entity which having any intermediaries;
- Allows the firms to isolate asset risk in separate entity where it has limited ability to inflict collateral damage on the sponsoring firm. (Esty, 2004, p. 217)

So, it's a long term financing of an independent capital investment and when we say an independent capital investment really what we mean by that is it's a project that can be distinctly isolated where you consider the cash flows and assets that are contained together and a financing that is put around those is particular to them like a company that maybe a huge collection of project finance or operating assets all combined. So the cash flow has to be sufficient to cover the operating expenses and to fund the financing repayment requirements because it's a standalone entity and there is no other source of cash flow that can help repay the financing and typically the financing is made up of debt and equity but in particular its match to the life of the asset so if you are building a goldmine that has a life of 15 years and then you are going to try to match your financing to that and if you are building something that has a life of a 100 years like a railway or toll road you are going to match your financing to that.

Project finance also allows the sponsors to raise third party funds without being directly liable to the lenders. Therefore, it helps to free higher equity capacity to invest in more projects and keeping the financial structure strong at the same time.

The project finance comprises of several components that well define the relationship between the businesses and their financial operations.

Contracts of Supply	They ensure to provide the right amount of supplies needed for the project
Contracts for Constructions	Here they define the conditions on which the qualified contractor will start the construction foe the project
Financial Contracts	Raising the money in terms of debt and equity for financing the project and its operations
Operation Contracts	Supervision of daily jobs and tasks performed during the project

(*Article:*10.5539/ibr.v5n2p83)

The basic and the most important motivations for using project finance include:

Cash-flow based financing	These kind of decisions are relaying on the cash flow that the project will generate
Off-balance sheet financing	Here the projects finance tends to allow the investors to keep debt off the balance sheet
High Leverage Financing	It is more convenient to earn much higher leverage rations in project finance than sponsors could otherwise sustain on their own balance sheets
Large Project Financing	Project finance is used here when the investors have very large projects and it's hard for one investor to undertake on its corporate balance sheet
Long term financing	The project finance loans have a longer term than that of corporate loans

(*Article:*10.5539/ibr.v5n2p83)

Project finance is a very creative financial vehicle and it offers a significant way to outline that financing and the investments choices are not independent and free exercises. The structure of financing plays a very important role for sure and that's why the decisions of financing do affect the investments decisions and are directly proportional. Project finance originated in the energy generation sector and is now used to fund large-scale projects such as power generation facilities, oil and natural gas pipelines, electric utilities, chemical plants, water and waste water treatment facilities, renewable energy and green technologies, etc. (Scannella 2012) and, recently, Internet and e-commerce projects (Borgonovo, Gatti and Peccati 2010). The funds needed for designing, building and operating the new project are typically supplied by a group of sponsoring firms, which constitute the SPV's equity holders, and a group of banks, which constitute the SPV's debt holders (Gatti 2013). The making of a Special Purpose Vehicle (SPV) with a cautious financial examination of the limit of the entity to create adequate money to meet the desires for the capital suppliers. For this reason, significant time and resources are given to financial modelling and accounting. Specifically, broad exchanges intercede between equity holders and debt holders for the estimation of the income.

1.2 Value Drivers

In this section, I will introduce and explain appropriate financial ratios that will be used later in the calculations for evaluating the performance of the project.

1. **Weighted Average Cost of Capital (WAAC)**

$$WACC = R_e \times \frac{E}{V} + R_d \times (1 - T_{c)} \times \frac{D}{V}$$

Where:

R_e = Return on equity

E = Equity

V = Total value of the company (E+D)

R_d = Return on Debt

T = Tax rate

D = Debt

The purpose of the WAAC is to determine the price of each component of the company's capital structure that is formed of debt, equity and the preferred stock. Every component has some cost for the company. The company has to pay a fixed rate of interest on the debt and fixed return on the stock. The form doesn't pay a fixed rate for the returns of the equity but they do pay the dividends in the form of cash to the equity holders.

2. **Return on Assets (ROA)**

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

ROA is one the indicators of efficiency and tells that how well the assets in the firm are used to make money. It is also used to show how smoothly the company is running its operations.
It also gives the investors an idea about the effectiveness of the company and how that company is transforming the money they have invested in the form of net income.

3. **Return on Equity (ROE)**

$$ROE = \frac{Net\ Income}{Shareholder's\ Equity}$$

ROE is an important profitability measure for a company and especially for the shareholders since it measures the profit for all the money invested in the stock.

4. **Return on Investment (ROI)**

$$ROI = \frac{Current\ Value\ of\ Investment - Cost\ of\ Investment}{Cost\ of\ Investement}$$

ROI is the gain that an investor receives from making an investment. It helps the investors to evaluate the performance of their investments and comparing that to the performance of other investments.

2. Project Finance in the Renewable Energy Industry

2.1 Global Trends

Globally, the use of the project finance in new renewable plants increased from 16% of all projects in 2004 to a remarkable share of 52% in 2015 (FS-UNEP, 2016). In the low-risk environment the project finance is required for all the parties concerned with the renewable energy investments.

The private investments are the main focus of the policy makers since they are planning to design the regulations that attract more and more private investments in renewable energy technologies, project sponsors and financial intermediaries thinking about innovating the power generation financing and power plant investment decisions.

- The project finance is also concerned with the use of the Special Purpose vehicle (SPV) that is legally and commercially independent and only serves to realize the project.
- SPV allows the firm to legally minimize the risks of the project and share this risk with other investors of the project and it provides direct ownership of any specific asset.
- The SPV is very limited and is financed without guarantees from the sponsors since the lenders only depend on the project's future cash flows.

The use of Project Finance grew rapidly to develop oil and gas fields in the 1970s and got further importance as a mean to initiate transport projects such as bridges and tunnels from the 1980s on (Yescombe, 2013). The global project finance loans market is estimated at USD 277 billion in 2015 while still making up only a small part of overall capital investment.

There is an increase in the use of project finance recently in the projects related to renewable energy like solar and onshore wind many of which are smaller scale projects and less complex as compared to the conventional power plants that traditionally used project finance (offshore winds projects, in comparison to resemble more conventional plants concerning their size and complexity.

Figure 1 explains the investment in renewable energy by type of financing. We can notice that on a global scale the importance of project finance has increased over the last ten years and it has been used for more than half of all investments in 2015.

There is a straight increase in its share as the investments in renewables increased means that disproportionally high share of additional annual investments was directed towards the project finance.

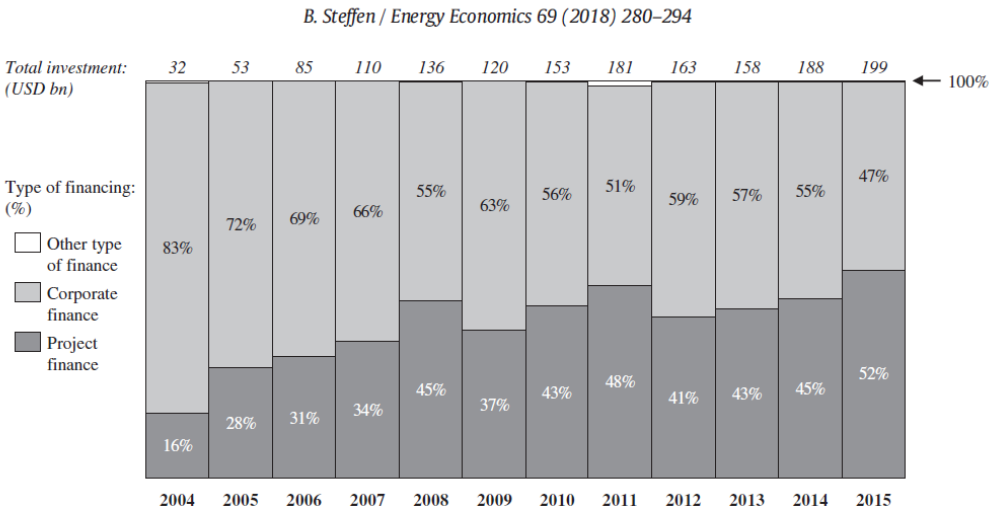


Fig. 1. Global asset financing of new investment in renewable energy. (Based on BNEF data provided by (OECD, 2016)).

This shift towards the project finance is directed by the expansion of renewables in the emerging markets such as China. For Germany, Enzensberger et al. (2003) describe a common structure for wind farm project finance in Germany, stressing that it allows individual households to invest in closed-end wind funds. Thereby, project finance is an alternative to the German energy cooperatives that engage inmultiple projects (Yildiz, 2014).

2.2 Economic rationales for using project finance

Using the balance sheet of the investors is the classical way in corporate finance while financing a project. On the contrary, when we look at the project finance we observe that it requires some extra time for setting up a new entity and also there are some costs of transaction included while structuring its financing. Given that project creditors cannot recourse on the sponsor's debt, the evaluation of the project cash flows requires additional scrutinizing and thus time and effort from legal, technical and insurance advisors, as well as careful negotiations of contract terms between all parties (Gatti, 2013). The related additional transaction costs depend on the project characteristics, but are often in the magnitude of 5–10% of total project costs (Esty, 2004). Project finance related costs are significant also for renewable plants even if the nature of the

project is set up in a way for higher degree of standardization. For a typical project finance-based wind power plant in Germany, practitioners estimate the cost for financial analyses, legal concept, and financial marketing at 3–5% of total project value (cf. e.g. PNEWind AG, 2016). There are a few reasons to use project finance to minimize some negative financial synergies and they are as follows:

2.2.1 Contamination risk

Assets and cash flows from the existing business serve as guarantee for additional lending used to finance the project, thus poor project performance can affect the existing business severely, increasing the bankruptcy risk of the core firm especially if the project is large compared to the existing business (Esty, 2003; Gatti, 2013; Leland, 2007). Financial theory implies that in perfect markets, companies should not be concerned about idiosyncratic bankruptcy risk as portfolios are diversified at the shareholder level (Sharpe, 1964) – in real markets, though, bankruptcies come with irreversible costs (Bris et al., 2006) and managers are risk averse (Lewellen, 2006), so bankruptcy risk matters. Realizing the project in a separate entity via project finance can preserve the existing business from contamination and thereby reduce financing cost for the core firm – the textbook reason for using project finance (de Nahlik, 1992; Gatti, 2013; Nevitt and Fabozzi, 2000). The effect is especially likely to occur if the new project comes with high investment compared to the existing balancing sheet, and if its cash flows are risky and correlated with the existing business (Leland, 2007).

If new projects are financed through corporate finance, they become part of the risk-return prospects of the developing company. Assets and cash flows from the existing business serve as guarantee for additional lending used to finance the project, thus poor project performance can affect the existing business severely, increasing the bankruptcy risk of the core firm especially if the project is large compared to the existing business (Esty, 2003; Gatti, 2013; Leland, 2007).

2.2.2 Debt overhang

We have seen that in corporate finance projects are always financed through equity and debt on the investor's balance sheet. If the balance sheet of that project has a good strength then it shows the overall ability of that project. Stulz and Johnson (1985) show that profitable projects might not be undertaken in such situations, but the availability of secured debt helps to realize them by providing an additional security beyond the general recourse on the balance sheet. Following the

same rationale, project finance is an even more effective instrument to finance such projects as it decouples the project completely from the sponsor's balance sheet (Esty, 2003). Following this argument, project finance not only allows a sponsor to realize projects that are otherwise unviable, but also potentially allows that sponsor to choose a higher debt ratio for the project than feasible under corporate finance, creating value through higher tax shields (John and John, 1991).

2.2.3 Securitization

Leland (2007) for instance refers to a bank with core banking activities that are high risk, and mortgages that have a low cash flow risk. By using project finance the low risk assets can be securitized to a separate entity and can be financed at a lower cost. The same rationale can apply in the energy sector: Some utilities have financing cost characterized by past high risk-high return investments into merchant thermal power plants, which are too high for low risk projects such as regulated renewable energy plants (Helms et al., 2015) – project finance could be a remedy. Beyond motivating the use of "classical" project finance on the debt side, it is worth noting that the securitization motive can also explain the recent emergence of the yieldco model on the equity side (mainly in the U.S.): Sponsors – often large utilities or independent power producers that own a mix of renewable and conventional generation assets – create a yieldco by carving out renewable energy plants with stable cash flows and low financial risks into a separate, publicly-traded corporation, attracting equity investors as minority shareholders (EY, 2015; Urdanick, 2014). Beyond U.S.-specific tax considerations, a key reason for choosing the yieldco model is to "replace high-cost capital with lower-cost capital", if the financial risk of operational solar and onshore wind plants is much lower than the sponsors' core business activities (Varadarajan et al., 2016, p. 7).

2.3 Market Imperfections

Project finance also can help to address the market imperfections in a broader way and to address asymmetric information and agency costs.

2.3.1 Information asymmetry between sponsors and lenders

The classical economic explanation of project finance is that it can be used a tool to reduce the asymmetries and allowing the investors to differentiate the performance of the project with a general firm performance. In their classical paper, Shah and Thakor (1987) postulate that it can

be advantageous to use project finance instead of costly revealing information about the entire firm that would provide a comparable level of transparency – especially for risky projects, which require a high level of scrutiny that consequently has to be applied to the project only (and not to the entire firm).

2.3.2 Agency conflicts between project owners and contractual parties

Project finance with a carefully crafted set of non-financial long-term contracts and a joint vertical ownership can mitigate these agency conflicts (Corielli et al., 2010; Esty, 2003). The power plants projects depend on contractual relationships between parties like the fuel suppliers and the electricity off takers. A different agency conflict potentially occurs with host governments, who might pursue measures leading to creeping expropriation after infrastructure assets such as a power plant are completed. Project finance can mitigate such risks by allowing for a high debt ratio and syndication of debt that improves the ex-post bargaining position of project owners (Sawant, 2010). It also opens the way to include international financial institutions such as the World Bank's IFC into the assetspecific financial structure, which provide a “political umbrella” to deter creeping expropriation (Hainz and Kleimeier, 2012; Steffen and Papakonstantinou, 2015). While empirical studies showed the relevance of these agency conflicts as driver for project finance in developing countries (cf. Hainz and Kleimeier, 2012; Sawant, 2010).

2.3.3 Agency conflicts between project owners and managers

The interests of corporate managers are not necessarily aligned with the business owners' – especially in companies with high free cash flows (such as capital-intensive power plants), managers might prevent the payout of cash to shareholders and instead maintain the resources under their control by pursuing value-destructing re-investments (Jensen, 1986). Using project finance allows to set up a tight project specific governance structure and implement a very high debt ratio to discipline managers (Esty, 2003; Jensen, 1986). Beyond the mentioned market imperfections, occasionally tax considerations are mentioned as motivation for project finance, if the project entity can be offshored to a different jurisdiction (cf. Pollio, 1998).

3. ***The Model***

In this chapter the model that I have intended to propose is named as Yieldco. A key reason for choosing the yieldco model is to "replace high-cost capital with lower-cost capital", if the financial risk of operational solar and onshore wind plants is much lower than the sponsors' core business activities (Varadarajan et al., 2016, p. 7).

3.1 Overview

Yieldco is a public company generally which has assets contributed by a sponsor. The top level yieldco owns an operating partnership which actually holds the earning assets and as the public buy shares in the yieldco and increasing percentage of ownership of those assets goes from the original sponsor to the public holders.

Yieldcos don't have a structured tax exemption. However, because they invest in an asset with a lot of tax attributes associated with them and they can zero at the taxable income and therefore at least in their early years all their pre-tax income is same as their after-tax income which can be dividend out. There is another attractive fact to the ultimate shareholders is that dividends in the excess of earnings are treated as a non-taxable return of capital and unlike Masters limited partnership (MLPs). Master Limited Partnerships (MLPs) are a tax-advantaged corporate form available to fossil energy companies, and utilized extensively to finance and own fossil energy infrastructure, like oil and gas pipelines. Yieldco business models had been patterned after those business fashions, but without the benefit in their tax advantages. Yieldco have not traded off any legal restriction on how they can operate their business in return for the tax break of non-taxability so they can invest in whatever they want and pay off whatever percentage of earnings they want.

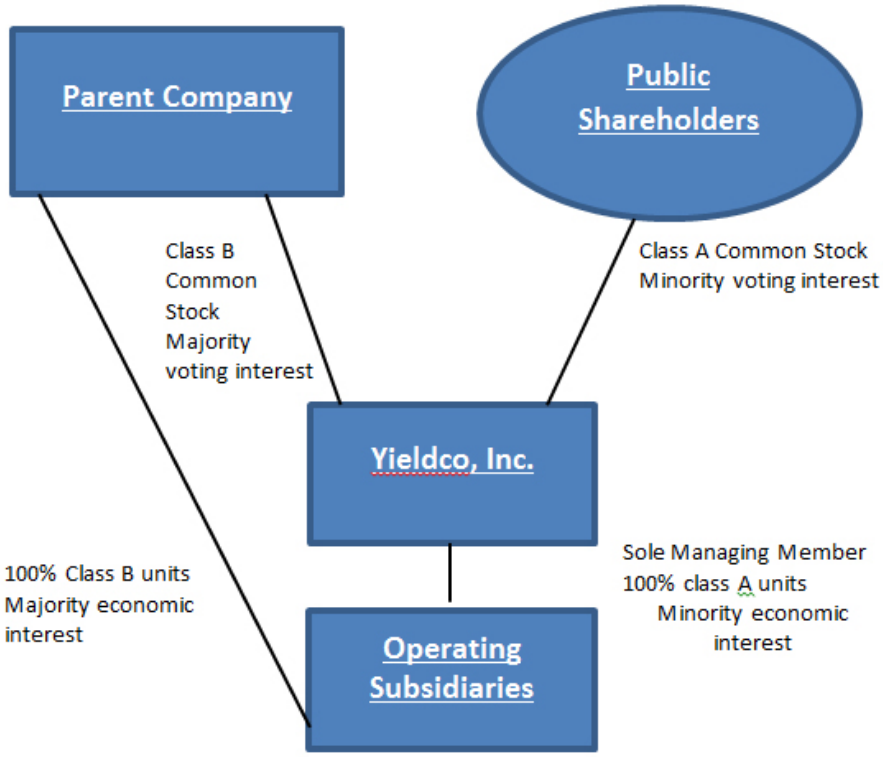
Yieldco overcame three critical limitations that prevented many yield-searching for buyers from investing at once in renewable energy projects.

- The high transaction costs of buying large-scale physical assets;
- The illiquidity, or issue of selling these assets if there is a need arising; and,
- The awareness of risks that comes from buying single investments that are huge as compared to an investor's standard portfolio.

Before the development of Yieldcos, only the largest institutional traders could afford huge renewable energy assets. Yieldcos opened those high-yield investments to all traders even at the

retailing level. Overcoming those three obstacles and attracting new resources of capital can upload as much as 20% to value of the underlying asset.

Blended Yieldco structure



Urdanick, M. (2014). A Deeper Look into Yieldco Structuring. Renewable Energy Project Finance

One of the advantages of Yieldco is the transparency of the cash flows from the operating assets and this structure still doesn't address many important decisions affecting the cash flows.

3.2 Benefits of creating Yieldcos

One of the leading banks (Deutsche Bank) in Europe mentioned some of benefits of creating yieldcos for the parent companies. *Deutsche Bank, Crossing the Chasm (February 2015)*

- Yieldcos enable investors to better value the company's ability to grow assets and assign a multiple on cash flows.

- By creating a Yieldco, solar companies have the option to create an IDR structure and potentially benefit from growth of the Yieldco in the longer term. Solar companies were previously not able to benefit from this strategy by simply selling projects to a Yieldco.
- More revenue streams can be dropped down into the Yieldcos especially as assets continue to grow. One specific example is inclusion of O&M revenues from installed base of operating assets.
- Yieldcos expand the investor base and contribute to valuation multiple expansion. Several energy/MLP/utility investors are looking to invest in solar companies that have announced plans to form a Yieldco.

3.3 Key positives of Yieldcos in Renewable Energy; Case of Solar Energy

- New Yieldcos structure offers the company significantly lower cost of capital. Not only do Yieldcos reduce the cost of equity from 10%+ to less than 5% but because in many cases, equity is trading at a lower cost than debt, Yieldcos also offer the potential to change the capital structure which should enable further reduction in cost of capital. *Deutsche Bank, Crossing the Chasm (February 2015)*
- Yieldcos with scale and development capability have the option to grow into international solar markets or move into residential solar (where cost of capital is higher) and also potentially grow into wind/hydro/transmission segments. *Deutsche Bank, Crossing the Chasm (February 2015)*

There is a significant amount of installed renewables transmission that is capacity available for sale and a lot of that capacity could be acquired/dropped down into existing Yieldcos. Solar costs are set to decline further whereas electricity prices could rise in many markets globally. We expect the addressable market for Yieldcos to only get bigger over time driving further interest from MLP/yield investors. *Deutsche Bank, Crossing the Chasm (February 2015)*

4. How Yieldcos work

4.1 Yieldco Cost of Capital

Large renewable energy project developers often use a type of financing vehicle colloquially known as a "Yieldco" to finance portfolios of assets that are expected to have stable cash flows over relatively long periods, such as solar or wind farms. In theory, investors should be willing to accept lower returns on investments in these "safe" assets than they would on investments in the developers themselves, thus reducing the cost of capital for such assets and increasing their value. (https://woodlawnassociates.com/yieldco-cost-of-capital/May 10, 2016 by Shirley You and Josh Lutton).

This relatively low cost of capital has implications for the value of the project held or purchased by Yieldcos. It should allow the developers that have yieldcos to sell their projects at attractive prices, and allow their yieldcos to pay more than many other project investors for projects they purchase from independent purchase.

Many of the investors confuse the term yield on to a yieldco stock but there is a difference between them and we must know what exactly Yield means at first.

Yield is simply when the dividend is divided by the price of the stock.

$$y = \frac{div}{E}$$

Y= yield (in %)

Div= current year's dividend

E= stock price

As an example of we see that the distributions of dividends are 4$ in a year and the price is 100$ so we see that the yield is 4%. If we rearrange we will see that the company's equity value is equal to the dividend divided by the yield.

$$E = \frac{div}{y}$$

The investors who are buying the stocks are not only buying the rights to today's distributions but also those in the future. When we talk about cost of capital, we are looking for what investors would demand independent of the rate of growth in the dividends. We will decompose the yield in the equation into two factors, one of which represents our expectations for growth and the

other one of which is the returns we would demand for any investment with a similar level of volatility.

$$E = \frac{div}{r_e - g}$$

Where:

$r_{e=}$ Return of equity investors

G= expected dividend growth rate

Before we go into the cost of capital we need to understand which cost of capital we are talking about here. Investors may take into consideration one of the following 3 different costs of capital.

- Levered Cost of yieldco equity; it describes the returns that the investors demand on a yieldco equity investment, having yieldco also financed with the debt.
- Unlevered cost of yieldco equity; investors demanding on a yieldco equity investment, assuming it doesn't have any debt.
- Weighted average cost of yieldco capital; the debt and the weighted average cost of levered equity above.

All of them mentioned above has to take into consideration all the risks linked with the future distributions from the yieldco. They should also consider the advantages of diversification sine yieldcos normally have assets from different geographies, with different technologies and with different contacted clients.

The most commonly used way to calculate the cost of equity is with the CAPM (Capital Asset Pricing Model). The levered cost of equity is described as:

$$r_{\text{levered equity}} = r_f + (r_m - r_f)\beta_{\text{levered equity}}$$

Where:

$r_{\text{levered equity}}$ = Cost of equity financed by debt and equity

r_m = Expected return from equity

r_f = Risk free rate

$\beta_{\text{levered equity}}$= measure if yieldco's equity riskiness

We calculate the remaining parameters by using the following formulas where we can just rearrange the CAPM formula to find the debt beta as:

$$\beta_{debt} = \frac{r_{debt} - r_f}{r_{m-}r_f}$$

Where:

r_{debt} tells us the expected return on the company's and the other variables are described above.

For calculating unlevered equity beta we have:

$$\beta_{unlevered\ equity} = \beta_{levered\ equity}\left(\frac{Equity}{Equity + Debt}\right) + \beta_{debt}\left(\frac{Debt}{Equity + Debt}\right)$$

And, finally the unlevered cost of equity is given by:

$$r_{unlevered\ equity} = r_f + (r_m - r_f)\beta_{unlevered\ equity}$$

The total average yieldco cost of equity of the yieldcos is given in the table as follows. The following data has been assumed.

Yieldcos	$\frac{\textbf{Debt}}{\textbf{Equity + Debt}}$	$\beta_{levered\ equity}$	$r_{levered\ equity}$	$\beta_{unlevered\ equity}$	$r_{unlevered\ equity}$
Brookfield	22%	0.90	5.85%	0.73	5.085%
NextEra Energy Partners	79%	1.38	7.91%	0.81	5.39%
Pattern Energy Group	65%	1.52	8.55%	0.83	5.50%
TerraForm Global	64%	1.29	7.52	1.06	6.50%
Total Average	57.6%	1.86	7.45%	0.85	5.61%

The figures that we have seen above are relatively less than the cost of equity of every developer we know so far, and also that of most of the large companies. The value can be increased of the projects overall if projects are placed in these types of vehicles. Yieldcos were designed to

exploit the opportunity in the market for creating liquid exchange-traded, yield investments, while also addressing major objectives of the sponsor, including:

- Creating a Yieldco and selling it to investors allows a sponsor to recover the capital invested in the underlying assets. This capital can then be invested into new projects that can drive the growth of the sponsor and, eventually, the Yieldco.
- Since the sponsors are often primarily developers or independent power producers, the bulk of their business activities feature both risks and rewards that are significantly greater than those provided by operating solar and wind facilities. (https://climatepolicyinitiative.org/wp-content/uploads/2016/06/Beyond-YieldCos-1.pdf)

Here are some of the alternative investment vehicles for low-risk, long-term contracted assets:

US yieldcos	Offer a growing exchange-traded portfolio of assets, but with risk associated with growth, asset acquisition and market uncertainty
UK yieldcos	Differ from US Yieldcos in that they feature more modest, inflation-linked growth — but with a less diverse portfolio of UK wind and solar assets subject to a greater degree of revenue risk due to exposure to market price volatility.
Privately-held infrastructure funds	Funds designed to meet the risk and return requirements of institutional investors, but are illiquid, generally have short time horizons, and relatively high fees.
Green bonds (in combination with developer equity)	Are publicly traded bond offerings backed by project cash flows that differ from traditional project finance in that the bonds are dedicated only to sustainable investments. However, these projects differ little from traditional financing methods and overall finance costs still depend upon the equity cost of the sponsor developer.
Municipal financing	Enable municipalities to access their low cost of finance from municipal bonds to achieve renewable energy finance that is essentially 100% low-cost debt.
Clean energy investment trust	Would offer an exchange-traded set portfolio of contracted renewable assets with well-defined long-term cash flows and no growth or reinvestment related risks

Uday Varadarajan, June 2016, Beyond Yieldcos

5. *Conclusion*

In this chapter we will sum up whatever has been done and keeping in mind all the shortcomings we will try to propose the model's implications.

In the first chapter we have presented the overall view of project finance and it uses in the renewable industries specifically as it is the most discussed topic these days by all the climate experts and scientists. We saw how the project is being funded and which parties are involved in processing of the specific projects and how they generate income out of their investments and paying back the investors their amount of profit earned. We have also seen how different countries are investing heavily and trying to switch to renewables since its very beneficial alternative to fight the greenhouse emissions and rapid climate change.

In accordance with all the facts and figures we presented a model named Yieldco that is basically a 3rs party that invests in the renewable energy projects for their sponsors and provides them with a lower cost of capital as compared to the other developers. We have assumed the data in order to present the findings and conclude our results and comment how Yieldco has provided access to the companies to a lower cost of capital.

The purpose of presenting this model was not to exclude all other alternatives but it was an attempt to understand the importance of the model and its implications and just like other it also has some drawbacks but overall the presented model might give us some edge while investing in renewables and also making the investors understand it's importance and long term benefits.

The creators or sponsors of Yieldcos looked to a world in which financial markets were craving investments that delivered a high-yield at relatively low risk. Recognizing that their portfolios of contracted renewable energy assets with strong cash flows and low risk provided the perfect match for yield-seeking investors, developers and independent power producers created new corporate vehicles to be sold and traded on stock market exchanges. By converting these illiquid investments into liquid ones, US Yieldcos opened up the opportunity to invest in renewable energy projects to a much wider range of investors than were previously available. (Uday Varadarajan, *June, 2016,* Beyond Yieldcos).

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