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Valuation of First Solar Inc.

A fundamental analysis of a solar company

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Abstract

The thesis conducts analysis and valuation of First Solar Inc, a renowned U.S. based solar company. The study employs theory in valuation and practical insights in profession to gauge a fair value estimate for First Solar after considering its present and potential aspects in business, financials, industry and environment. Additionally, necessary assumptions are made in the process. The results of fundamental valuation for the company reveal that it is overvalued at current levels.

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Executive Summary

The purpose of the thesis is to obtain a fair value estimate for First Solar Inc. by applying the Enterprise DCF model, supported by other valuation techniques. By thoroughly examining the company's business and financials, as well as gaining insights from key industry characteristics, necessary assumptions are made to forecast performance and conduct valuation.

First Solar is a leading global provider of photovoltaic solar modules and solar systems. The company uses cadmium telluride technologies for its panels as opposed to the conventional crystalline silicon and is currently transitioning to its Series 6 product (from Series 4), which is expected to have a higher conversion efficiency and substantially lower module cost per watt. First Solar generates a major portion of its revenue from the U.S., where it is also based.

Recent years have seen the solar industry experience substantial cost decreases, improving efficiencies, and increasing competition, as well as rapid expansions in capacity, globalization and government support. The trends are generally expected to continue and could establish solar power as an important player in the future of global energy, alongside the fossil fuels. With a superior technology, advanced project capabilities and a sound experience, First Solar is well-positioned in this emerging industry. However, its success going forward will be crucial in its ability to maintain the technology edge, capitalize on new market and opportunities and ensure sustainable growth in order to remain competitive and stay ahead of competition.

The company's fundamental valuation process, supported by relevant analyses yields an estimated price per share of $47 for First Solar. At its current trading price of $70 (Dec 10)[1], the company is considered overvalued.

[1]The company's price rose rapidly to more than 20% after the announcement of 3rd quarter results, and moved approximately another $10 per share in a few days following the analyst meeting.

1. Introduction

The world is currently over dependent on fossil fuels, which have been the primary source of energy consumption. With a growing global economy and a population that continues to rise, the fossil fuels may not replenish fast enough to keep pace with the increasing energy needs. Additionally, these fuels have been linked to the emission of greenhouse gases and pollutants in the atmosphere, which has become a significant cause of concern in global warming and climate change.

According to NASA earth observatory, the earth is expected to warm between 2 and 6 degrees Celsius in the next century, which is quite unusual and much faster rate than in the past. Concerns such as these have garnered significant priority of world leaders and organizations, as well as the masses in the past few decades. The year 2015 saw an important step in the form of Paris Agreement, which was a globally coordinated effort towards tackling climate change. The agreement set forth goals, one of which was aimed to limiting the global warming increase to 1.5 degree Celsius, and member countries for the first time agreed to determine their plans and regularly report their contributions. As of Nov 2017, 195 members had signed the agreement.

In recent years, key discussions around energy problems and climate change center towards potential technical solutions and mainly revolve around renewable energy resources as an alternative to fossil fuels. Renewable energy refers to energy technologies (such as solar, wind, geothermal etc.) derived from sources that are abundant and never-ending. According to the REN21's report (2017), modern renewables accounted for 10.2% share of the global final energy consumption in 2015[2]. Additionally, according to the International Energy Outlook 2017, renewables are expected to be the world's fastest growing energy source with consumption increasing by an average of 2.3% per year between 2015 and 2040.

Solar energy is one of the most economical and environmental friendly form of renewable energy resource, and continues to be effective with the decreasing prices and improving efficiencies of the photovoltaics. According to the International Energy Agency 2017, solar

[2]Renewable heat energy (4.2%), Hydropower (3.6%), Other renewable power sources (1.6%), Transport biofuels (0.8%). This share rises to 19.3% after accounting for traditional biomass (9.1%)

continues to lead charge among renewables, and for the next five years represents the largest annual capacity additions in this sector. In 2016, the new solar photovoltaic capacity around the world grew by 50% reaching over 76 GW, while the total global installed capacity exceeded 300 GW. The World Energy Outlook 2017-2021 expects this capacity to exceed 700 GW in 2021.

The solar energy, along with other renewables has great potential for the future markets. Beyond the cost and environmental advantages, these sources also improve public health and security[3], create jobs and boost economic growth. Further, they offer great energy security (low-risk of fuel spills, reduced need for fuel imports etc.) and price stability (do not entail fuel costs or transportation etc.), and are constantly improving in the form of reliable supply sources. Although their outlook is promising, they are not expected to replace fossil fuels anytime sooner which still see substantial investments and do exist as significant though depleting reserves. Further, it will take time and costs to change distribution and consumption of energy. The renewables, however, as they become more viable as major energy providers in the future, may eventually form an equal parallel with the current fuels.

[3]Replacing fossil fuels with renewable energy has been found to reduce premature mortality, and it reduces the overall healthcare costs (Machol, Rizk. 2013)

2. First Solar

2.1. Overview

First Solar is a leading global provider of comprehensive photovoltaic (PV) solar energy solutions. It designs, manufactures and sells PV solar modules with thin-film semiconductor technology (CdTe), and also designs, constructs and sells PV solar power systems that primarily use the modules it manufactures. The company operates through two segments: components and systems. The component segment involves the activities pertaining to solar modules, which mainly use cadmium telluride technologies (in contrast to the conventional crystalline silicon technologies) to convert sunlight into electricity. The system segment engages in the overall development of PV solar power systems that mainly use the company manufactured modules. The company also provides operations and maintenance (O&M) services to system owners that use solar modules manufactured by the company or by third-party manufacturers.

The company's mission is to provide enduring value by enabling a world powered by clean and affordable solar energy. By delivering high-efficiency CdTe modules and fully integrated systems, F aims to provide attractive energy solutions to system owners and low-cost electricity to end-users. Further, the company's systems business has enabled it to drive cost-reductions across the value chain, and provide affordable solutions to customers. First Solar is particularly focused in reducing costs in the areas of module manufacturing, balance of system parts, project development and operations, and is also committed to derive value across them through innovation and best practices. The company's vertical integration across the solar value chain enables it to be more competitive in these efforts, as well as in accelerating the integration of its technologies in photovoltaic systems, selling its products into key markets, maximizing value for customers and offering other benefits such as grid integration, stabilization etc., thus allowing itself to position as a competent and reliable provider of energy solutions across the globe.

2.2. Market

Solar energy is growing as an attractive complement (and substitute) to the traditional forms of electricity, and offers several economic and environmental benefits. Recent years have seen decline in the manufacturing cost of modules as well as the cost of producing electricity from

solar systems, which have seen this sector competing with wholesale prices of electricity in various markets and providing opportunities in locations with limited financial incentives. Being a natural renewable source, these systems provide a valuable hedging benefit in contrast to the traditional fuel-based electricity generation[4]. Additionally, such systems can function for more than 25 years with relatively low maintenance and oversight. The solar energy also provides a relatively clean mechanism of producing electricity and does not generate greenhouse gases or other emissions compared to the familiar fossil fuels. All these factors along with improving efficiencies and the demand elasticities resulting from decreasing industry average selling prices continue to develop and enhance the solar markets worldwide.

Recent years have witnessed great improvements in cell-efficiencies across solar sector and the enhancements are expected to continue. This, however, has been accompanied by intense pricing competition as the average selling prices of modules have rapidly declined in the past few years in the United States and abroad and the trend is expected to continue as per market forecasts. The company believes that in general, manufacturers currently have significant installed production and expansion capacities relative to global demand and as a result the industry is already experiencing a downward pressure on prices from time to time. Further, serious competition at the system level is expected to drive down costs rapidly, which would further increase demand for solar energy solutions but constrain the ability of companies to maintain consistent profitability. In order to address these concerns, the company has formulated its long-term strategic plan around its advanced module and system technologies and the vertically-integrated business model.

2.3. Strategy & Competitive Strengths

First Solar is pursuing strategies in differentiation, sustainable growth and financial viability, to remain the preferred energy provider.

[4]With the absence of commodity price risk, solar energy offers an added value proposition. Hedging costs of a commodity such as natural gas, along with the costs of credit support for long-term hedge can increase the conventional energy costs substantially

Differentiation

First Solar's CdTe modules provide key differentiation benefits over conventional technologies in terms of competitive efficiency, higher energy yield and long-term reliability. The technology is proven to deliver up to 10% more energy per watt in certain markets, as well as more energy consistently over the life of PV solar systems. In terms of yield, the company's modules offer significant production advantage over crystalline silicon of equivalent rating, by providing superior temperature coefficient and better spectral and shading responses.

These benefits are expected to increase as the company transitions to its Series 6 technology (from Series 4) by 2018. The company manufactures such modules in high throughput automated environments in its Ohio (U.S.) and Kulim (Malaysia) manufacturing facilities, and as of now has already sold over 17.0 GW of its modules worldwide.

Additionally, being vertically integrated across the value chain, its operational model offering PV solar energy solutions benefits from all such capabilities in terms of advanced module technology, project development, plant optimization, grid integration, procurement, construction consulting and O&M services, which are not easily replicable by competition.

First Solar regularly invests in R&D opportunities to sustain innovation, which in recent years has enabled much faster efficiency gains in its modules than the conventional crystalline silicon technology. Its R&D efforts generally focus on continually improving the efficiency and energy yield of it modules, and in the past ten years the company's module conversion efficiency has improved an average of more than half a percent every year. The company has also received two world records in this domain by achieving a research CdTe cell efficiency of 22.1% and a full area module efficiency of 18.2%.

First Solar has also developed one of the most advanced Operations & Maintenance (O&M) programs in the industry, which is a key driver for power plants to deliver on their projected revenues. The company has more than 7.1 GW (DC) of utility-scale PV plants under the O&M program that endeavors to optimize the customers' power plants to maximize output, while

substantially reducing unexpected maintenance costs. The company's expertise and scale in O&M are a significant differentiator and not easy to replicate.

Financial Viability

First Solar has shown a strong financial performance despite competitive pricing and substantial industry capacity. The company is committed towards increasing shareholders wealth and yielding significant return on their investment over time. It is also investing in R&D to be more efficient and increase long term profitability, and plans to reinvest excess returns to ensure sustainable growth.

Sustainable Growth

Sustainable growth and long term strategic plan of the company is to achieve technology, leadership and growth objectives. First Solar is focusing on least-cost best-fit solar solutions that can complement or compete with the fossil-fuels. Through mobilizing global resources and consideration on core strengths, the company aims to prioritize market opportunities that exist within the current environment, which includes rooftop and distributed generation. First Solar also considers strategic partnerships and joint ventures to be a crucial part of its plan to establish in key markets around the globe.

2.4. Global Markets

While First Solar is heavily focused domestically, it strives to competitively position itself around the globe considering the respective energy markets. Different drivers and market forces may impact electricity generation and demand in different regions. The company in this regard is evolving with time and remains committed to providing compelling and viable energy solutions to cater different markets and applications.

America

The United States accounts for a major portion of company revenues (83% in 2016) and exemplifies a sustainable solar market in terms of substantial demand (especially around population centers and industrial areas), high power prices, abundant solar resources. These

factors highlight the potential of this market, and the company competes favorably where these are most prevalent. Additionally, the US markets are also impacted by support programs at federal and state level, which includes the current 30% federal investment tax credit. First Solar has significant experience with the utility-scale power plants in these markets, which currently also account for the majority of projects in its advanced-stage pipeline. The company is also developing its business in South and Central American countries such as Brazil, Mexico, Honduras etc. Recently, Chile has come forth as a potential market as the government aspires to increase the contribution of renewables to 20% of total power by 2025.

Europe, Middle East & Africa

In the past markets across Europe to a large degree were driven by incentive programs, however, they have since then matured and entered a phase where their development will be determined by competition with traditional electricity forms. Even though declining industry selling prices of photovoltaic systems have improved demand for solar solutions, the capacity remains limited due to market constraints and government regulations. In Europe, First Solar is mainly engaged in business activities in U.K., Germany and France, but is also recently evaluating opportunities in other regions such as Turkey etc.

The Middle East is a promising market for solar energy driven by strong economies, robust policies and ample resources. While UAE and Jordan lead in policy mechanisms to improve the renewables share, other countries such as Saudi Arabi (KSA), Egypt, Oman, Qatar etc. also seek to diversify their energy offerings. Additionally, declining hydrocarbon revenue in many such countries has reduced the government support for conventional fuels, thereby paving the way for new sources. Although opportunities abound in these regions, so do the challenges which mainly pertain to legislations, infrastructure, financing, competition, geopolitical risk etc.

The current market potential in Africa mainly revolves around established renewable programs in Morocco and certain development-led initiatives in other countries. First Solar’s primary focus in these regions is the sale of its modules for utility-scale solutions, which are expected to realize substantial growth as the market matures.

Asia-Pacific & India

While prominent markets in this region are Australia, Japan and India, smaller countries like Indonesia, Philippines and Thailand also have a great potential for photovoltaic markets. Australia had a strong growth in 2016 driven by increased demands in PPAs from local utility companies and industrialists. The Australian market is expected to grow even more in 2017 due to focus on utility scale projects and sales opportunities. The Japanese government has announced various incentives and a long-term goal of increasing the installed solar power capacity. Japan completed a total of six projects and has started a construction on three projects to reduce the dependency on nuclear power and fossil fuel imports. Lastly India is a growing market for Solar PV and there is huge potential due to high population, high energy costs and mainly shortage of electricity.

2.5. Business Segments

First Solar operates in two business segments namely, components and systems. Its components segment involves the design, manufacture, and sale of CdTe solar modules that convert sunlight into electricity, while its systems segment provides complete turn-key PV solar power systems (or solar solutions), which employ its capabilities in project development, engineering, procurement and construction (EPC) services, and O&M services.

While advanced PV modules and utility-scale power plants form the company's key product offerings, others such as community solar offerings (residential and small business) and commercial and industrial markets are in the various stages of development that employ similar capabilities and present huge potential for solar solutions.

Components Business

Since its inception, the flagship module at First Solar has been manufactured using its advanced CdTe thin-film technology. It's current Series-4 module is a glass laminate (2ft x 4ft) that encases a CdTe thin-film semiconductor. In 2016 these modules had an average rated power of approximately 114 watts and could provide up to 10% more energy than the conventional

crystalline silicon (of equivalent efficiency rating) in certain markets. Cadmium Telluride (CdTe) can deliver competitive conversion efficiencies with significantly less semiconductor material used in crystalline silicon modules, as well as lower temperature coefficient at peak power, thus delivering high energy yields at elevated temperatures that typical of utility-scale solar plants in sunny regions.

I) Manufacturing

First Solar manufactures its modules on automated and continuous high-throughput integrated facilities in United States and Malaysia. The company is currently in the process of deploying its Series-6 technology which has been accelerated by the existing infrastructure in the ramp-down of Series-4 modules, as well as by reallocation of its divested crystalline silicon production capacity (to support next generation CdTe products).

The CdTe manufacturing is accomplished in three stages: I) Deposition (glass panel coating of semiconductor material etc.), II) Cell Definition and Treatment (transformation of coated-plates to a series of interconnected cells for desired current and voltage outputs etc.), III) Assembly and Testing (application of busbars, laminated glass covers, termination wiring etc. and testing). First Solar maintains a robust quality and reliability assurance programs to ensure internal and industry standards of quality, performance, reliability etc. Some of these include production surveillance and monitoring, acceptance testing for electrical leakage, visual quality, and power measurement on solar simulators, and accelerated life stress testing in compliance with IEC and UL Inc. etc. The company also conducts rigorous qualification process for its suppliers of raw materials.

II) R&D

First Solar devotes to R&D with the key objective to lower the lifecycle electricity costs generated by its Photovoltaic solar systems. In the component segment it focuses on module conversion efficiencies, energy yields, durability and manufacturing efficiencies etc. The company frequently explores technologies to sustain competitive differentiation of its modules,

and regularly produces research cells[5] in its laboratories of which some are tested and certified by independent labs.

III) Customers

Third-Party customers of First Solar's component segment include integrators and operators of PV solar power systems in United States and abroad. These accounted for approximately 23% of its total sales in 2016. Additionally, it also sells its modules as part of the solar power systems that it designs, develops and sells. In 2016, Southern Power Company and NextEra Energy, Inc. each accounted for more than 10% of its components segment sales, including the solar modules used in its systems. The company in recent years has been actively developing its customer base and exploring new global markets to develop relationships and reduce its geographic concentration.

IV) Competition

The solar sector is characterized by intense competition. The landscape is constantly evolving as participants vie to distinguish themselves and compete with traditional forms of electricity, which has resulted in reduced margins in recent years. The primary sources of the company's module business competition are the crystalline silicon (and other thin-film) manufacturers. Many crystalline silicon module manufacturers are currently transitioning to a more efficient mono-crystalline wafer technology, which is facilitated by low cost suppliers from China as well as through gradual industry transition to the Passivated Emitter Rear Contact technology (PERC).

The company also faces considerable competition from large corporations with significant financial resources and better brand recognitions, who may be more adaptive to industry-wide changes. Additionally, some with access to sovereign capital may be able to operate at minimal margins for sustained periods. The primary means of competition among module manufacturers lies in terms of sales price per watt, conversion efficiency, energy yield, reliability, warranty terms etc.

[5]Cell efficiency measures the proportion of light converted in a single solar cell at standard test conditions

The company may also experience pricing competition due to the excess industry capacity at certain times, and could face competition from future solar entrants with innovative solutions. Other sources of competition include semiconductor and their equipment manufacturers, and competitors operating in other renewables (or conventional forms) and/or investing in diverse portfolios.

(V) Warranties and Recycling Program

First Solar provides 10-year module warranties covering defects in materials and workmanship under normal use. The company also warrants its modules *(installed in accordance with agreed specifications)* to produce at least 97% of labeled power output rating in its first year and a coverage reduction by 0.7% every year up to the 25-year performance warranty period[6]. Also, a 25-year performance warranty at the system-level provides energy degradation protection for utility-scale systems and focuses on aggregate energy of the system rather than individual modules. It is calculated in terms of system's expected energy production, with the warranted levels declining each year linearly, but never falling below 80% during the warranty period.

First Solar has also established solar industry's first comprehensive module collection and recycling program, which enables the recovery of valuable materials for reuse in new modules and other products, as well as minimizes environmental impacts associated with the modules at the end of their useful lives. The company bears the cost for collection and recycling of modules covered under the program and can recycle up to 90% of each collected module into materials for reuse.

The company currently has recycling facilities at each of its current manufacturing facilities in the United States and Malaysia and at its former manufacturing facility in Germany. These produce materials which are further processed by third-party suppliers in the production of new glass products and semiconductor materials.

[6]Updated in Dec 2016 to 98% and a subsequent decline of 0.5% up to 25 years for future module sales

Systems Business

First Solar's fully integrated systems business provides complete turn-key PV solar power systems, or solar solutions. This includes Project Development, Engineering, Procurement and Construction Services (EPC), and Operation & Maintenance Services (O&M).

I) Project Development

Project Development activities include site-selection and securing rights to acquire or use a site and certain clearances such as obtaining requisite studies, executing an interconnection agreement, obtaining environmental and land-use permits, maintaining site-control, entering a PPA with an off-taker etc. The activities culminate in the right to construct and operate a PV solar power system. The company may collaborate with local development partners and may acquire projects in various stages of development (or project companies from developers) considering market opportunity or location. Usually, entering a PPA generally provides the underlying economics necessary to finalize development including permitting, construction, financing and marketing, and the development cycle could range from one to two years or sometimes even five years.

II) EPC Services

These include engineering design and related services, BoS procurement, development of grid integration solutions and construction contracting and management. The company provides EPC services to utilities, independent power producers and commercial and industrial companies, however, majority of these services are delivered to its self-developed projects intended for sale. The company also typically provides limited product warranty on BoS parts and conducts performance testing of its systems prior to completion, to adhere with expectations in the EPC agreement.

III) O&M Services

Typical arrangements involve performance of standard activities associated with operating and maintaining a solar power system, which are essential to optimize system performance and comply with relevant agreements and regulations. These services generally include system

monitoring, agreement compliance, energy forecasting, performance analysis, performance reporting, turn-key maintenance services, warranty management and environmental services.

IV) Customers

The systems business customers include utilities, independent power producers, commercial and industrial companies and other system owners. These may purchase completed solar power systems or any combination of development, EPC or O&M services. In 2016, North America accounted for majority of the company's systems business sales and the key customers included Southern Power Company, NextEra Energy, Recurrent Energy, each accounting for more than 10% of the segment's net sales.

V) Competition

The systems business competition includes providers and developers of renewable energy solutions as well as EPC companies and their joint venture arrangements with solar firms. Additionally, with the reducing barriers of entry in several parts of the solar value chain, competition at the system level can be intense, which may exert a downward pressure on the industry-wide systems profit margins, for instance aggressive low-price bidding for new projects and PPA's etc.

VI) R&D

These activities are primarily conducted in the U.S. and mainly focus on lowering the levelized cost of electricity of the solar system through reductions in BoS costs, improved system design and energy yield enhancements, and also focus on continuous improvements in system grid-integration and reliability.

VII) Own & Operate

The company, from time to time, may temporarily own, operate or retain interests in certain of its solar power systems often intended for future selling, which may allow it to gain control of the sales processes, provide a lower-risk profile to a potential buyer and improve its ability to drive higher eventual sale values.

VIII) Project Pipeline

The company continues to execute its advanced-stage utility scale project pipeline, and had approximately 2.0 GW systems business pipeline as of early 2017. The company may not immediately recognize revenue for the Projects Sold/Under Contract in its pipeline, which may be expected through the later of substantial completion or closing dates of the project[7]. Additionally, the company may remove projects from its pipeline on substantial completion of construction and after substantially all revenue recognition. Projects or portions may also be removed in case EPC-contracted or partner-developed projects do not obtain permits or financing, projects remain unsold or uncontracted due to changing project economics etc., or in case the company decides to temporarily own, operate or retain interests in certain projects considering strategic opportunities etc.

The company continually seeks to add to its pipeline and is actively developing its early to mid-stage pipeline to secure PPA's and is also exploring opportunities to acquire advanced-stage projects with PPA's in place.

2.6. Additional Information

The company was incorporated in 2006 as a Delaware corporation and began trading on the NASDAQ. It had approximately 5400 full and part-time employees as of 2016.

[7]As of 2016, the company had not recognized any significant revenue for the project Sold/Under Contract in its pipeline of 275 MW, which was expected at $0.8 billion

3. Valuation Methods

3.1. Introduction

Many theorists (and investors) believe that the market price is the best estimate of a company's value. The opinion has basis in the Efficient Market Hypothesis (EMH), which assumes that the current stock prices fully reflect all public and private information. Thus, according to EMH stocks always trade at their fair value at exchanges, making it impossible for investors to either purchase undervalued stocks or sell them at inflated prices. While academics point to a body of evidence in favor of EMH, an equal amount of disagreement also exists, one in the form of several investors who have consistently beaten the market over the long-haul.

From an investment point of view, one basic practice in valuation is built around finding undervalued (or overvalued) stocks and buying (or selling) them at attractive prices. The focus here is on the value (or true worth) of the company, which may be different from market price (this follows from assumption that the market frequently undervalues or overvalues certain stocks). This is one well-known application of company valuation and readily employs valuation methods. Over the years valuation methods have gained considerable popularity amongst academicians and practitioners for a variety of purposes. A good amount of text and research exists to refine the process, which has evolved considerably in the past years. Some practical benefits of company valuation include applications in mergers and acquisitions, IPO's, accounting & regulatory purposes, dispute resolution etc.

Of the different ways to value a company, a renowned approach involves the DCF-based valuation framework, which includes some well-known models such as Enterprise DCF (FCFF), Equity Cash Flow (FCFE), Adjusted Present Value etc. The underlying idea in these models is to obtain a company's intrinsic value, which is assessed through the present value of its expected future cash flows. The models may mainly differ in one or several aspects such as measure of cash flow, discounting factor and relevant application.

Since, these methods are based on fundamentals they are less exposed to market perceptions (Damodaran). Given this basis, the DCF models may be best suited for companies with positive cash flows that can be predicted with a reasonable degree of reliability. However, not all companies or industries may have positive cash flows always, and the predictions could be sensitive to assumptions made by the analyst.

Also, DCF models need a proxy for risk to estimate the appropriate discount rates. Even though methods in DCF theory use appropriate metrics for discounting the cash flows, some practitioners may choose to adjust them considering specific factors. For instance, smaller firms may be more vulnerable to adverse events; firms in cyclical industry may be difficult to forecast for cash flows or firms with extremely complex business structures may present a great deal of uncertainty in valuation. All these factors could increase a firm riskiness.

An important aspect of DCF-based valuations concerns the different stages of growth a firm is likely to experience during its tenure. For instance, young and rapidly growing firms may experience a high growth phase, followed by a transition period, before reaching a steady state. Such firms would require the application of a three-stage DCF model, which would entail reasonable estimates of the growth rates and the length of tenure of each period.

It is important to emphasize that despite some challenges, DCF models tend to be the most sought out methods and can provide sound valuations. Even though the above concerns could make these methods difficult to apply, they can be readily addressed with some degree of flexibility and rationale.

3.2. Enterprise DCF

Amongst the DCF framework, the Enterprise DCF remains a favorite of practitioners and academics as it relies solely on the flow of cash in and out of the company, rather than on accounting-based earnings (and therefore less prone to manipulation through accounting policies)[8]

[8]Valuation: Koller, Goedhart and Wessels (2012)

The Enterprise DCF discounts future income streams at the weighted average cost of capital (WACC). The measure in this model is the free cash flow to firm, which are the cash flow available to all investors, irrespective of funding. Since the investors in the firm (equity holders, debt holders, others) require different rates of return on their investment, the free cash flows are discounted using WACC, which is the overall cost of capital and thus adjusts for these returns.

According to Stowe, Robinson, Pinto, & MeLeavey (2002), free cash flow to the firm represents a cash flow available to those who provided shareholders and creditors with the capital necessary for business operations, and after all necessary investments in net working capital and fixed assets are conducted[9].

The equations in this regard are as given below.

$$FCFF = EBIT\,(1 - T) + Non - Cash\,Charges - Capex - \Delta\,Non - Cash\,Working\,Capital$$

Discounting the free cash flow to firm using WACC gives the enterprise value to which cash and equivalents etc. would be added and the debt is deducted to arrive at the value of equity. (In a related scenario when valuing using FCFF and the overall cost of capital, we may be valuing the operating assets of the firm. The value of relevant non-operating assets is factored in to get value of the firm and the market value of debt is deducted to know the intrinsic value of equity). The general form of the equation is given below.

$$Value = \sum_{t=1}^{t=\infty} \frac{FCFF_t}{(1 + WACC)^t}$$

Essentially, free cash flow represents the money that can be extracted from the firm every year without hurting its core business. From an investment point of view, we are likely to prefer firms that generate substantial cash relative to amount of investments in their business (although this

[9]FCFF = NI + NCC + Int (1-Tax rate) – FCInv – WCInv

this is just one important metric to look at). Using the FCFF approach not only allows us to ascertain the cash flow potential of the company, but also use this important measure to estimate its intrinsic value using the WACC.

WACC-based models work best when a company maintains a relatively stable debt-to-value ratio. If the ratio is expected to change, the method can still provide sound estimates but may be difficult to apply. According to Damodaran the method is best suited for firms with very high or very low leverage, or those in the process of changing it (Damodaran, 2012). Additionally, the method can be particularly useful for multi-business companies as well.

The key argument against the method relates to its 'as if no debt' approach. Typically, most would look at cash flows after debt payments, since most of us think like business owners. Additionally, in ignoring of debt the model, for instance would overlook firms in distress or at the verge of bankruptcy which may require new equity issue.

3.3. Free Cash Flow to Equity

Free cash flow to equity is the cash flow available to the company's equity holders after all expenses, reinvestments, and debt repayments have been paid[10]. This includes all financial obligations, including debt repayments, in addition to the outflows from the WACC model. Since debt has a higher claim in a firm it must be satisfied before any money could be returned to the stockholders in the form of dividends or buybacks[11].

The value of equity is obtained by discounting these free cash flows (FCFE) at the cost of equity as give below.

[10] FCFE = NI = NCC – FCInv – WCInv + Net borrowing

[11] It is interesting to note that many firms may choose to pay out less to stockholders than they have available in free cash flow to equity. This is because dividends are considered 'sticky' and the relative variability is higher in earnings and cash flows (than dividends). Companies may be reluctant to increase dividends due to uncertainty of maintaining higher levels, as well as due to factors such as future investment needs, tax factors, managerial objectives etc.

$$Equity\ Value = \sum_{t=1}^{t=\infty} \frac{FCFE_t}{(1+k_e)^t}$$

The strength of this approach is the direct computation of the equity value, and it is viewed as a more transparent method for assessing company's benefit to shareholders (Berk & DeMarzo, 2014). While this measure has an intuitive appeal in terms of real cash flows, its complicating aspects lie in determining debt capacity and related cash flows and sensitivity to changes in debt-to-equity ratio. It is quite easy to change the company's capital structure without realizing it which makes implementing this approach so risky (Koller, Geodhart and Wessels, 2012). Another limitation lies in valuing companies by business unit that requires allocation of debt and interest expense to each unit.

3.3. Adjusted Present Value

The APV method divides the value of a company into separate components, primarily the value of the unlevered firm and the present value of its debt tax-shields. This follows from the Modigliani & Miller proposition that only market imperfections such as taxes etc. affect enterprise value and in a world without taxes a company's choice of financial structure will not impact the value of its economic assets (Koller, Geodhart and Wessels, 2012). The basic form of the equation is given below.

Value = Value of Unlevered Firm + PV (Tax Shield)

The first component represents the value of the unlevered firm (all equity-financed)[12], found by discounting the free cash flows using the unlevered cost of equity. The second component represents the present value of the tax-shields, which are found using the marginal tax-rate and a given level of debt[13].

[12] Value of Unlevered Firm = $\sum_{t=0}^{t=\infty} \frac{FCFF_t}{(1+k_u)^t}$

[13] This expected tax benefit derives from the value of tax-savings viewed as a perpetuity, and can be found using the current-level of debt and the marginal tax rate, which is assumed to be constant in this case.

Benefits of leverage = $\sum_{t=1}^{t=\infty} \frac{\text{tax rate} * \text{cost of debt} * \text{debt}}{\text{cost of debt}} = \text{tax rate} * \text{debt}$

The above equation is the basic version common among practitioners, but it ignores the expected bankruptcy costs for the firm. This follows from the argument that as debt is added to the firm, its effects should be considered both with respect to the benefits and the costs of borrowing. Ignoring the bankruptcy cost is likely to overstate the value of the firm, especially at high debt ratios. The present value of expected bankruptcy costs forms the third component in the equation and is determined by the probability of bankruptcy and its direct and indirect costs[14]. Estimating this component, however, bears significant estimation errors. The full form of the equation is given below.

Value = Value of Unlevered Firm + PV (Tax Shield) + PV (Expected Bankruptcy Costs)

The advantage of APV approach is in its suitability with firms that do not maintain constant debt-equity ratio as it values any cash flow associated with capital structure separately, and allows flexibility to use different discount rates for different components. However, its limitations lie in the complexity and uncertainty of predetermining future debt levels to estimate future tax shields and the probabilities of default.

3.4. Economic Value Added

Economic Value Added is a measure of surplus value created on an investment. It is essentially a measure of a firm's economic profit that considers the opportunity cost of invested capital.

EVA ultimately measure whether organizational value was created or lost. The idea is that value is created when the return on capital invested exceeds the cost of that capital, and this can be useful to evaluate businesses or investments, particularly ones that are capital intensive. The economic value added is given by,

EVA = Invested Capital x (Return on Invested Capital – Cost of Capital)

[14]PV of Expected Bankruptcy cost = Probability of Bankruptcy * PV of Bankruptcy Cost = $\pi_a BC$

which can be rewritten as[15],

NOPLAT - (Invested Capital x Cost of Capital)

The economic profit for a company can highlight how its financial performance is expected to change over time. The valuation using this concept is gaining in popularity due to close links to economic theory and competitive strategy. In the general form, valuation using this method is given by,

$$[16]Value = Invested\ Capital_0 + \sum_{t=1}^{\infty} \frac{EVA_t^*}{(1+k_c)^t}$$

**these can result from assets in place as well as future projects*

3.5. Relative Valuation – A Market Based Approach

A relatively quick and easy method to gauge the value companies is through relative valuation, which uses standardized multiples of earnings, cashflows, book value or revenue etc. and compares them with multiples of peer companies in the industry. The market prices measured through this method are more likely to reflect market perception of investors, and could form a useful input to the valuation process.

Relative valuation is a traditional method of valuation and is quite popular with the press, stockbrokers, research firms and various investors as it is based on important statistics and can provide quick and meaningful insights on firm value. It is simple to use and easy to compute as the method is straightforward and the required data is readily available. Nevertheless, it also has some drawbacks which make it a secondary alternative to fundamental analysis techniques. Even though a robust tool, relative valuation does not fully capture the dynamic nature of business and competition and may converge various value drivers into a point estimate (UBS, Warburg). Some other issues that pertain to this technique include difficulty obtaining comparable firms,

[15] $\text{Return on Invested Capital} = \frac{\text{NOPLAT}}{\text{Invested Capital}}$

[16] $\text{Value} = \text{Invested Capital}_0 + \sum_{t=1}^{\infty} \frac{\text{Invested Capital}_{t-1} * (\text{ROIC}_t - \text{WACC})}{(1+\text{WACC})^t}$,

analyst bias towards a company value, and the implication that relative valuation can result in higher values when the market is overvaluing firms or low values when it is undervaluing them, considering the fact that multiples reflect market moods (Damodaran, 2002).

The issue of comparable firms is worthy of mention as it is fundamental to the relative valuation process. In most analysis, analysts define comparable firms as the one in the same business. The implicit assumption here is that firms in the same sector have similar risk, growth and cash flow profiles and therefore can be compared with much more legitimacy (Damodaran, 2002). In reality, though, finding comparable firms with similar relevant profiles may not be as straightforward. Additionally, there is no restriction to include firms from different sectors with similar profiles (in risk, growth and cash flows), and the process can be approached with reasonable discretion[17].

Of the many multiples available, the most commonly used are the earnings multiple (Damodaran, 2012). One popular multiple used to measure the value of a company is the Enterprise Value/EBITDA. This measure overcomes the problem of accounting differences as well as varying levels of leverage across the firms[18]. It also suits a larger number of peers than other common multiples such as price-to-earnings, since fewer firms have negative EBIDTA than negative earnings. Further, considering these attributes it is widely used in the capital-intensive firms (Damodaran, 2012) and across industries that require large infrastructure (or long gestation periods).

3.6. Contingent Claim Valuation

This approach to valuation uses option pricing models to measure the value of assets with similar features as options. The underlying premise for their use is that discounted cash flow methods

[17]Another common issue is the possibility of outliers, which can result in averages not representative of the sample. Discarding or capping the outlier is usually a common solution, but may skew the results. The sensitivity of estimated averages to outliers is one reason to look at the median values

[18]Compared to it, multiples such as PE ratio may be impacted by the choice of capital structure. For instance, companies which raise money via debt will have lower P/E ratio (and therefore look cheaper) than companies that raise an equivalent amount of money by issuing shares (low EPS, higher P/E), even though the two companies might have equivalent enterprise values. The enterprise multiple, however, is capital structure-neutral

tend to undervalue assets that provide payoffs which are contingent on the occurrence of an event (Damodaran 2002). For instance, an undeveloped oil reserve whose development may be contingent on the future level of oil prices. When valuing such assets using these models, it is assumed that the markets recognize such options and include them in the market price.

Option pricing models could be particularly useful in valuing assets, which may otherwise be difficult to value using conventional methods, such as discounted cash flow or multiples, For instance, stock of a small bio-technology firm with no revenues or profits etc. There are also limitations to using option pricing models, for example when valuing long term options on non-traded assets. When the underlying assets are not traded many of the inputs for the models could be difficult to obtain and must be estimated, which could cause the final values to contain significant estimation errors.

4. Choice of Model and Method

While the previous chapter highlighted different valuation methods and their attributes, the later chapters will present key characteristics of the company, its fundamentals and the industry. These together will be decisive in the overall valuation process.

Solar power has great potential in the energy sector, specifically in terms of a renewable resource, cost aspects, environmental benefits etc., but may also be subject to uncertainty and competition. As an emerging industry in development and rapidly changing economic climate, the market perception may not reflect the underlying fundamentals. The relative valuation, which is generally regarded as a 'shortcut' to DCF-methods (Berk & DeMarzo, 2014), may not be adequate as a foundational analysis. Even though it can provide good insights, it may also be prone to estimation errors. In order to form a best possible estimate for First Solar, an evaluation of its intrinsic value would be most reliable. Additionally, there are several characteristics of First Solar that will require the strengths of a DCF approach.

As a publicly traded company on the Nasdaq stock exchange, required information on the company's business and financials is readily available through its financial reports of more than ten years. Thus, fundamentals needed to conduct a DCF analysis are attainable. Additionally, renewables sector and particularly the solar industry, which have gained considerable attention in the recent decade, are widely covered by multiple intuitions and are well-documented. This provides a substantial base of information to forecast performance for valuation.

First Solar is assumed to be in a transition phase. As evident from its financials, the company experienced a high growth stage during the early years of listing, which was characterized by substantial earnings and high growth in revenues. These declined and slowed as the competition set in, putting pressure on prices and market share. It may not be far when the company transitions to a steady state as it matures and stabilizes. However, considering its recent restructurings, shift to a superior product and technology, improved focus on project systems and pursuit of new markets, the company apparently endeavors to restart the growth stage. This may not be similarly yielding, but nevertheless enable it to improve earnings and stay competitive. Such endeavors are not surprising among companies and especially technology sector, which

may cause repeating cycles or shift in phases. These facts altogether will require the flexibility of a multi-stage DCF based on reasonable assumptions.

Choosing a DCF approach to value the company is not sufficient. A complete firm valuation (WACC), direct equity method, capital cash flow etc. must be selected. Considering relatively stable and low-levels of debt over the past few years without signs of any expected significant shifts in capital structure, a WACC-based approach is chosen as the fundamental model. WACC-based approach tends to be a favorite among practitioners and can provide for an effective tool in valuation. Although FCFE method may be suited as well, the complex nature of predetermining debt capacity and interest levels point towards a simpler WACC model[19]. The WACC-based approach is supplemented by Adjusted Present Value and the Economic Value-Added techniques. The economic value-based measure would provide a different way of looking at the company and approach to its valuation. Although not as popular as the enterprise DCF, the method is gaining acclaim due to its close link to economic theory and competitive strategy.

Lastly, in addition to the above methods, relative valuation method will be employed as well. Although considered too simplistic and possibly prone to errors, the relative valuation may still provide added perspectives. Supporting DCF-based analysis with a relative valuation based on comparable firms enables the results to be tested against market prices. The values may vary; however, the overall valuation process could be more robust. Considering the scope of the study, and the limitations and requirements of the contingent claim valuation, the method will not be applied in the thesis.

[19]According to McKinsey it could be difficult to implement correctly as capital structure is embedded in cash flow and the approach may be more suitable for financial institutions where the operations are related to financing

5. The Solar Energy Industry

Solar energy is one of the most economical and environmental friendly forms of renewable energy and with the decrease in prices of PV solar power systems in recent years, the cost of producing electricity has gone significantly down. It is a great alternative to other forms of energy especially for areas with limited or no financial incentives. Unlike traditional electricity generation assets, PV Solar power systems provide a hedging benefit to the owners as it doesn't require any fuel. Apart from these economic advantages, there are a number of environmental benefits of adopting PV Solar power systems that includes zero greenhouse gas emissions and no to minimal water usage as compared to traditional methods. Once installed, these power systems can function approximately 25 years with relatively less maintenance.

The topics below highlight on the recent developments in this industry, its advantages, support systems, critical policies, and conclude with the analysis of industry outlook and its resilience towards the conventional energy resources.

5.1. Recent Developments

Module Price Decrease

Over the past decade, prices of solar PV electricity have decreased substantially and are expected to reduce further. Solar markets continue to grow with the availability of reasonable financing, monetary aid, economic policy and demand elasticity triggered from declining industry average selling prices of modules hence making the solar panel more affordable. According to market forecast, module price will continue to decline in the short term.

PV module prices fell by 79% between 2007 and 2014. The decreasing slope was restored in 2014, between the range of 7% and 20% for thin-film modules and German modules respectively. In 2013-2014, Germany and China experienced more price reduction than the average cost of Chinese modules. This slowdown was due to overcapacity of manufacturing of solar PV module and competitive pressure within the industry. Due to extensive cost reductions of module, the average global cost of PV system has been decreasing within the past few years.

Factors that effects Solar PV system prices can be a country of operation, type of system and system size. Following figures show the declining trend of PV module prices for each type of system.

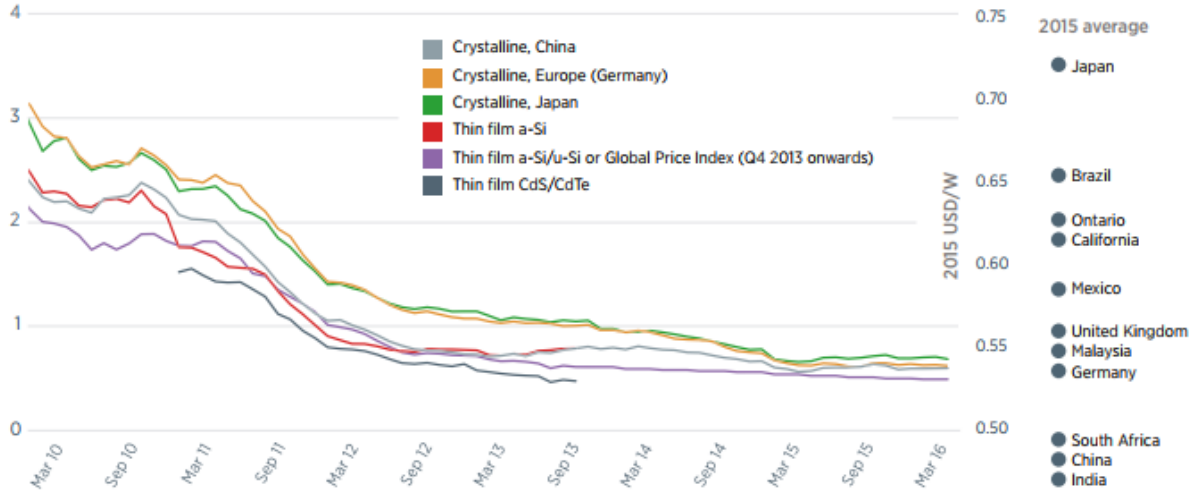

Figure 1. Global photovoltaic module price trends, 2009–2016 (Source: IRENA 2017)

Geographical Expansion and Cumulative Growth

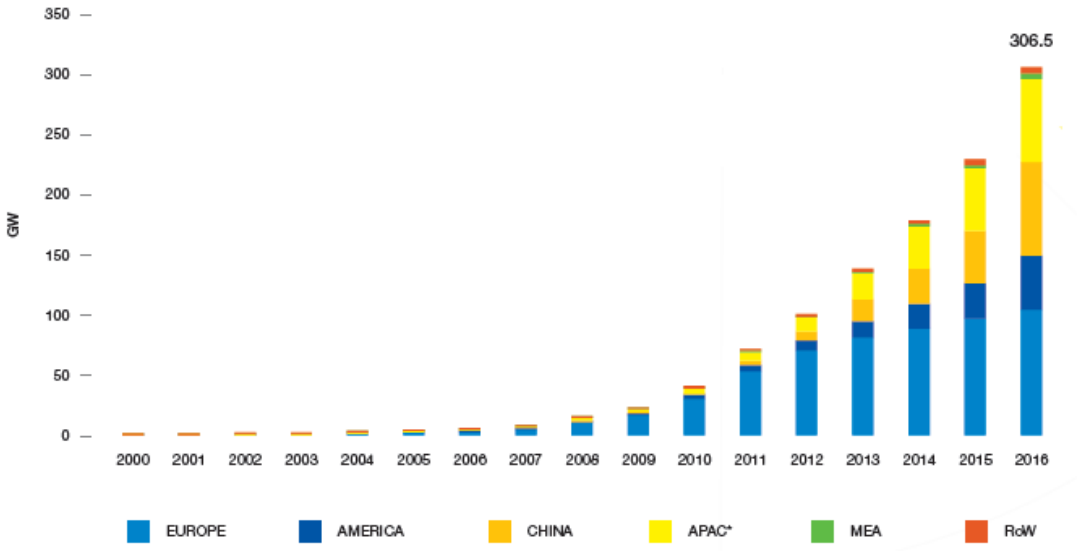

Figure 2. Evolution of Global Total Solar PV Installed Capacity 2000 - 2016 (Source: Global Market Outlook for Solar Power2017 – 2021)

While the European Solar pioneers had a major holding in 2015, Asia pacific became the largest solar powered region in the world. European markets have been taking advantage of solar panels since a decade and due to reduced financial and political support their growth flattened in 2013 and 2014. China took over the number one spot in solar market expanding their cumulative PV capacity in 2015.

Both United States and Japan exceeded Germany productions and as a result no European country is in the top 3 positions. There has been a major geographical shift in the solar industry with new players emerging and an impressive here is India with 3.1% of the totaled installed shares by the end of 2016. The pie chart below shows the Global Top 10 Solar PV Markets.

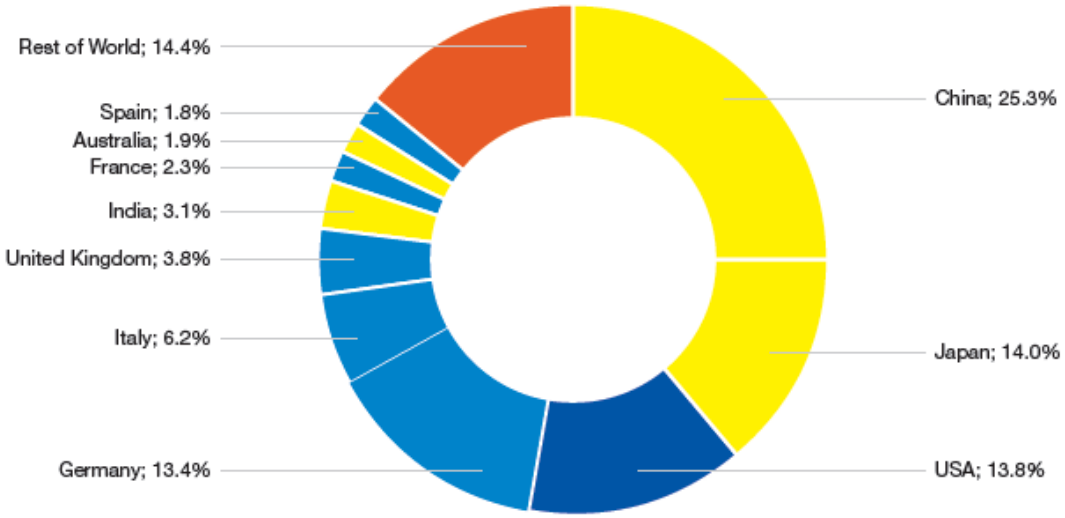

Figure 3. Global Top 10 Solar PV Markets Total Installed Shares by End of 2016 (Source: Global Market Outlook for Solar Power 2017 – 2021)

5.2. Policies and Support Mechanisms

There is a need of government to provide support mechanisms due to the high upfront cost of solar energy, therefore many countries provide assistance to the local companies to meet their national goals for renewable energy. Below are the six common types of renewable energy support mechanisms used by governments.

Feed-in Tariffs (FiTs)

A FiT is a predetermined price for every unit of electricity generated by a solar PV power plant, paid through a long-term contract. FiTs are secure and the long-term profitability with them can be predicted with the high level of certainty hence making them one of the most attractive incentives to the lenders.

Reverse Auctions and Tenders

Reverse auctions for independent power producers (IPPs) involves a competitive procurement of energy. The auctions are technology neutral where solar auctions compete with each other or with different renewable energy sources and the bidding could on or off the site. Though the process has higher transaction cost it is cost effective as the bid is competitively determined, which in turn keeps tariffs to the lowest levels.

Market-based Instruments

These are the certificates associated with the renewable energy traded on the market just like all the capital instruments. Examples include tradable renewable certificates or carbon certificates. These certificates can be highly complex but are efficient in reaching a renewable target set by the government. They are best suited for the competitive market where there is sufficient capacity amongst the market players

Tax Incentives

Tax incentives are one of the common forms where government promotes solar industry by offering tax credits, reducing VAT, lowering import/export duties and introducing relaxed rules on foreign investments. The United States investment tax credit provides project owners up to 30% in tax credits making US the largest market with tax credit support for PV solar projects.

Soft Loans

These loans have a lower interest rate usually below market rate or longer tenure to make capital easily available. Soft loans are useful in the early stages and are backed by the government therefore the loan volumes are small and are only available through financial intermediaries.

Capital Grants

Capital grants are useful in the early stages of PV development and reduce upfront financing burdens for the industry participants. However, grants can create boom and bust cycles, which means that equipment prices can get quite high prior to the incentive expiration and crash suddenly after the incentive is expired or the project opportunities are reduced. To mitigate these phenomenon investors may consider longer term contracts with the suppliers to lower their costs.

While above mentioned policies and support mechanisms are designed to help investors cover their PV Solar costs, not all the incentives are viable for every business and can vary depending on the location as the frameworks vary widely between countries and region.

5.3. Solar Power Market Outlook

Solar energy has gained popularity in recent years and was never as competitive as it is today. If conventional form of electricity was not highly subsidized then it would be cheaper to produce electricity by installing the solar panels on the roof. The cost of solar technology has decreased considerably during the past few years and the future looks very promising. Most analysts predict improved module efficiency but they aren't expecting any further groundbreaking technologies. One of the main focuses would be the grid enhancement to increase efficiency and reduce their cost. The companies are trying to improve their economies of scale and the industry might see integrated technologies working alongside PV.

As the industry gets saturated and more players get into the solar technology, the incentives would also evolve as the current dynamics may or may not be suitable in later years. This could happen either through anticipated policy expirations and adjustments or unexpected policy changes. This could be bad or beneficial depending on the actions taken by the government. For instance, in developed economies like Spain and Italy, the government has changed the policies

retroactively in order to reduce support levels to the existing PV projects; therefore companies must consider the risk that policies could change.

Since most countries rely on conventional forms of energy, manufacturers have significant installed production capacity of solar modules. They have the ability to expand production capacity but this may result in downward pressure in price from time to time as there would be a structural imbalance between the supply and demand. Additionally, many competitors may enter the market which may further lower the prices and increase capacity.

6. Strategic Analysis

6.1. Porter's Five Forces Model

Porter's five forces model identify the structure of industries and competition. The model analyses five competitive forces that determine long-term profitability as measured by long-term return on investment. This section uses Porter's model to identify and assess the dynamic elements at play within each force.

Competition

Competition in the renewable energy industry is generally high but varies by region. Since governments are offering many subsidies to promote renewable energies, many new firms are entering the industry and other firms already in the sector are switching to renewable sources. This is one of the reasons why solar PV market is rapidly growing. The competitors are more reactive towards emerging technology and change in customer's requirement.

First Solar's failure to sustain competition could result in price reductions, reduced margins, or loss of market share. Also the company will have to ensure product differentiation, which would otherwise pave the way for other competitors in the industry. Additionally, factors like product life cycle and performance may become more important when the market is mature. ***(Competition – Increasing).***

Supplier Power

Supplier power means that how easy is it is for the suppliers to drive up their prices and sustain at that level. It is driven by a number of factors such as uniqueness of the product, number of existing suppliers and the cost of switching from one supplier to another. Fewer supplier choices means that supplier has a considerable power and hence it is difficult for customers to switch. First Solar is highly dependent on the raw material that is supplied by limited suppliers therefore it poses a threat that they can increase the prices. Moreover, the company has customized equipment thus any problems with the equipment can result in higher costs in terms of production loss and equipment maintenance. (***Bargaining Power of Supplier – High).***

Buyer Power

Solar industry has only recently picked up and companies still rely on the conventional forms of energy. However, with a growing market many buyers have switched towards this less costly and environmentally beneficial option but have not quite captured the market in order to gain power. There are comparatively lesser suppliers of this form of energy and while their power remains high, the bargaining power of buyers is low.

On the other hand, First Solar depends on a limited number of customers with a few customers accounting for substantial module net sales. As the renewable energy industry grows and First Solar's long-term supply contracts expire, buyer power will most likely increase. (***Bargaining Power of Buyer – Low).***

Barriers to Entry

With the popularity of solar energy many firms have entered the industry and taken advantage of the government support mechanism such as subsidies and tax incentives. Therefore countries like Germany and France are cutting back on subsidies, hence making it less attractive. Secondly, the solar power industry demands a lot of research and development that can impede entry of the new firms into the market. With the high development cost, economies of scale are favorable to the existing companies. Although the barriers to entry have reduced in recent years, they tend to be generally high. (***Barriers to Entry – High).***

Substitutes

The industry has several substitutes that include other forms of renewable energy (wind, geothermal, ocean etc.) and silicon based photovoltaic cells. Also, hydrogen fuel cells, which are based on natural gas, are gaining recognition due to the less carbon emission and high production levels of electricity (especially attractive to small scale power generation and transportation sector). Additionally, with time and research new technologies may emerge that could adversely impact the company's business. (***Substitutes – High).***

6.2. SWOT Analysis

Strengths *Leading global provider of Photovoltaic (PV)* *Long Term contracts with Suppliers* *Low-Cost per watt Generation* *Technological Expertise*	**Opportunities** *Photovoltaic (PV) industry is untapped* *Ability to increase demand* *Creating Synergy* *Expansion of manufacturing capacity*
Weakness *Dependency on Raw Material - CdTe* *Toxicity concerns of CdTe*	**Threats** *Substitutes and Competition* *Cuts in FiTs*

Table 1. SWOT Analysis

Strengths

First Solar is a leading global provider of comprehensive photovoltaic (PV) solar systems. The company is the largest solar module manufacturer in terms of market capitalization, and has been consistently increasing its production lines due to the increasing consumer demand. It also has long term contracts with suppliers allowing company to earn future predictable revenues. Additionally, First Solar has technological expertise that continues to drive low-cost per watt generation and as a result the average solar module cost is among the lowest. Moreover, First Solar has a strong balance sheet which can provide substantial flexibility with respect to changing demands and developing new technologies.

Weakness

First Solar is highly dependent on Cadmium Telluride, one of the key raw materials in Solar PV panel. It is a rare metal and may also impact the number of solar panels the company could manufacture. Additionally, there are toxicity concerns with respect to the material.

Opportunities

The photovoltaic (PV) market is untapped and being a major industry player, First Solar can increase demand through lobbying efforts and also decrease manufacturing costs by creating synergy. This would profit the company and allow it to expand its operations geographically, especially in the U.S. to take advantage of government support systems. First Solar's capacity expansion offers huge growth opportunities and would enable it to reach (or exceed) consumer's expectations.

Threats

As pointed in the Five Forces Model, there are several substitutes in renewable energy. Also, other energy companies are more likely to enter the solar PV market, which may cause lower profit margins and loss in market share. In addition, the industry heavily relies on government support systems such as FiTs, tax incentives, soft loans and capital grants and once these are taken away, each industry player might suffer.

7. Financial Performance

7.1. Recent Financials

The following section presents a brief overview of the recent financial performance for First Solar. The company's net sales for 2016 decreased by 18% to approximately $3.0 billion compared to $3.6 billion in 2015, which was primarily due to sale of majority interests in some of its projects (North Star and Lost Hill) and the completion of nearly all construction activities in others (Imperial, Decatur etc.), as well as lower revenue from module plus transactions (module plus selected balance of system parts). This was offset by an increase in volume of modules sold to third parties and the commencement of construction on certain projects (Taylor, East Pecos etc.)

Operations

The company's revenue categorized in component and systems segments amounted to $1.48 billion and $1.47 billion, respectively. First Solar generally prices and sells its solar modules per watt of nameplate power. During 2016, a major portion of the company's component business included modules installed as part of its solar systems. Net sales from its component business increased by 7%, primarily due to increase in volume of watts sold, partially offset by 9% decrease in the average selling price per watt. The system segment sales decreased by 33% mainly due to sale of majority interests in certain projects as well as completion of others, and was partially offset by revenue from commencement on other projects.

The company's component cost of sales mainly comprises cost of raw materials and components for manufacturing solar modules, direct labor, manufacturing overhead and other expenses, while its system cost of sales include project-related development costs, engineering and procurement costs and site-specific costs.

The company's cost of sales decreased by 16% to $2.25 billion from $2.66 billion in 2015 (although increased 1.8 % points as a % of net sales) primarily due to the decrease in its system's segment cost of sales as a result of volume of projects under construction and the timing of when

all revenue recognition criteria were met. This was partially offset by increase in the component segment cost of sales mainly due to higher costs associated with increased volume of modules sold.

% of Sales	2014	2015	2016
Revenue	100.0	100.0	100.0
COGS	75.7	74.3	76.2
Gross Margin	**24.3**	**25.7**	**23.9**
SG&A	7.6	7.6	8.9
R&D	4.3	3.7	4.2
Other	—	—	27.7
Operating Margin	**12.4**	**14.4**	**-17.0**
Net Int Inc & Other	0.3	0.1	1.1
EBT Margin	**12.7**	**14.5**	**-16.0**

Table 2. Income Statement (% of Sales)

Note: the detailed historic income statement is presented in the Appendix A

The company's research and development expense mainly comprise salaries and personnel-related costs, the costs associated with its process and product R&D activities and other expenses. The company's R&D expense decreased by 4.5% in 2016 ($124.8 million) compared to 2015 ($130.6 million) primarily due to reductions in its R&D headcount employee compensation expense resulting from its restructuring activities.

The company's selling, general and administrative expenses consist of salaries and other personnel-based costs, professional fees insurance costs, business development, selling expenses etc. These amounted to $263 million in 2016 due to higher development costs for early-stage projects and impairment of certain projects, and were offset by lower employee compensation due to restructuring activities.

During 2016, First Solar incurred a heavy restructuring and impairment charge of $819 million, of which $663 million pertained to its decision to accelerate the transition to the Series-6 module manufacturing and restructure its operations. An additional $88 million charge was associated

with the end of its crystalline silicon module manufacturing operations, while a charge of $69 million pertained to goodwill impairment.

First Solar's interest expense in 2016 ($20.5 million) increased significantly over 2015 ($7.0 million), primarily due to lower interest costs capitalized to certain projects and higher level of project specific debt financing outstanding during the year.

First Solar's income tax expense increased to $58.2 million in 2016 compared to a benefit of $6.2 million in 2015, mainly due to certain U.S. taxes on a cash distribution received from its foreign subsidiary, partially offset by cash benefits from restructuring charges and a significant reversal of an uncertain tax position pertaining to earnings of a foreign subsidiary.

The company's net equity in earnings of unconsolidated affiliates increased (2016: $171.9 million, 2015: $20.4 million) primarily due to recognition of a net gain of $125.1 million on the sale of its residual interest in the Desert Stateline project to a subsidiary of the partnership ('OpCo'), as well as higher equity in earnings from the company's investment in it.

First Solar incurred a net loss of $358.0 million in 2016, compared to a net income of $546.4 million in 2015.

Financial Position

First Solar had $2.0 billion in cash, cash equivalents and marketable securities compared to $1.8 billion in 2015, which primarily increased due to proceeds from sale of certain equity method investments and cash flow from operating activities, offset by expenditures for property, plant and equipment.

The company's net trade receivables decreased substantially (2016: $266.7 million, 2015: $500.6 million), while the account receivables - unbilled and retainage increased (2016: $205.5 million, 2015: $59.2 million). Additionally, account payables decreased substantially to more than 50% from 2015 (2016: $148.7 million, 2015: $337.7 million). The company's inventories on the other hand decreased slightly and were relatively stable (2016: $363.2 million, 2015: $380.4 million).

Balance Sheet (in %)	2014	2015	2016
Total Current Assets	47.5	45.7	55.1
Non-Current Assets	52.6	54.3	44.9
Total Assets	**100.0**	**100.0**	**100.0**
Total Current Liabilities	14.9	13.1	13.1
Total Non-Current Liabilities	10.4	11.0	11.0
Total Liabilities	**25.2**	**24.2**	**24.1**
Total Stockholders' Equity	**74.8**	**75.8**	**75.9**
Total Liabilities & Equity	**100.0**	**100.0**	**100.0**

Table 3. Balance Sheet (in %)

Note: the detailed historic balance sheet is presented in the Appendix A

First Solar's net Property, Plant and Equipment decreased to $629.1 million compared to $1,284 million in 2015, and were characterized by various impairment charges associated with its crystalline silicon operation and transitioning to Series-6 manufacturing. The depreciation of property, plant and equipment was $211.2 million compared to $245.7 million in 2015. Purchases for this item amounted to $229.5 million, which increased from $166.4 in 2015.

The company placed $391.2 million projects in service in 2016, which increased to $448.6 million in 2016 from $93.7 million in 2015. These PV solar systems represent systems that the company may temporarily own and operate or retain interests in, often with the intention to sell later. The company also recognizes revenue from sale of energy from such systems under PPA's or open contract basis. A revenue of $25.9 million was recognized from such sales in 2016.

The company's total long-term debt decreased to $188.4 million in 2016 from $289.4 million, in 2015 primarily characterized by $137.4 million in repayments.

Cash Flow

The increase in cash provided by operating activities was primarily due to lower volume of solar power projects under development and construction, which usually require significant liquidity when financed using working capital. The increase was also driven by sale of certain other power projects at or near completion. (CFO 2016: $206.8 million, 2015: $-325.2 million).

The increase in cash provided by investing activities was mainly due to proceeds from sale of equity and cost method investments of $291.5 million that included the sale of First Solar's remaining interest in Desert Stateline project. Additionally, it also increased due to higher net proceeds from sale and maturities of marketable securities and restricted investments compared to net purchases of same in 2015. The increases were partially offset by lower distributions received from equity method investments in 2016. (CFI 2016: $144.5 million, 2015: $-156.2 million).

Cash flow in financing activities during 2016 was mainly driven by payments of long-term debt. This varied from 2015 where the cash provided mainly resulted from proceeds from borrowing under certain project construction credit facilities. (CFF 2016: $-136.4 million, 2015: $101.2 million).

7.2. Analysis

The section will focus on company analysis pertaining to areas such as growth, profitability, financial health and management review etc. The section concerns with evaluating the quality of the company and is not a conclusive argument to enter a certain position in its stock. The analysis must, therefore, be used with other sections to have basis for a reasonable decision. Even the best of companies may be weak investments if purchased at too high a price and thus an appropriate valuation comes in handy, as well as endeavors towards a holistic understanding of the company in the competitive and changing environments.

Growth

While researching a company's growth, it is important to consider factors such as the rate, sources and sustainability of the growth. A company that manages to increase its earnings

consistently over a few years would be tempting and may point towards positive character and strategies, however, a past track record may not be a true predictor of future's growth. One reason being that the strong and increasing profits attract intense competition sooner or later and this fact gets more substantial for companies operating in businesses such as technology and renewable/alternate energy, which generate a quick interest among organizations and masses, and where innovation becomes a driving factor for survival and success.

A quick glance at the First Solar's income statement reveals that the company registered a loss in the recent year but reported a profit and increase in earnings consistently in the three years prior to that. The loss in 2016 appears to be due to a heavy restructuring charge on the statement due to the ramp down of its latest Series-4 production lines to accelerate towards the advanced Series-6 modules. A similar trend is observed in the years prior to 2013 where a few years of profit and earnings growth are followed by some years of loss with the similar basis in restructuring as 2016. This may indicate industry potential, which has already attracted significant competition; however, also a need to constantly re-evaluate decisions and upgrade technologies to keep competitive.

As commented earlier, a net loss reported by First Solar in 2016 appears mainly due to restructuring of Series 4 operations. However, as we investigate into the company financials, we note that aside from this, the company also reported a decrease in revenue (18%), which was primarily attributable to sale of majority interests in certain projects (North Star and Long Hill in 2015), as well as substantial completion of construction activities on others (Imperial, Decatur, McCoy etc.). This was offset by an increase in revenue due to beginning of construction on additional projects (Taylor, East Pecos etc.). Given the basis of decrease/loss, the facts may not be as troublesome as they appear. This is because amidst all this, the company is also adding new projects, which is evident from project details in the company report that inform us on various projects pipeline as well as due for completion and/or recognition of revenue in the years following (Malindra Australia, Miyagi Japan, Multiple projects in India, Switch Station Nevada, Helios Honduras, etc.). Further, that despite tremendous growth potential, the industry is also cyclical with regular ups and down in the short-term, which has already rendered many companies to exit the market. Additionally, solar manufacturing is a complex and cost-driven

business that requires swift responses to shifts in demands, which may impede the best of manufacturers, especially for a significant time before things stabilize. Nevertheless, the opportunities are immense in the long term and need for alternate/renewable sources abound.

It is useful to assess the quality of a company's growth as well as look at its sources. Growth that comes from selling more or new product and services and entering new markets may be sustainable in the long-term compared to low-quality growth that stems from regular cost-cutting. Hence, sales growth may drive earnings growth in the long run. In the case of First Solar, it is important to understand the way its sales are structured.

The latest annual report of the company tells us that a major portion of its sales are driven by solar power system revenue (77%), while the remaining is generated by revenue from solar modules (23%). A different categorization tells us that the company's business is also presented into its Component and Systems business, which roughly constituted an equal portion in sales in 2016. The Components business comprised solar modules (priced per watt), which were generally sold to third party customers such as integrators and system operators as well as other project customers in the United States and abroad. This also included solar modules installed as part of the solar power systems, which were major contributors of revenue in the component business. The Systems segment involved fully integrated systems that provide turn-key PV solar power systems or solar solutions and may include their development and other services such as Engineering & Procurement, Operations & Maintenance etc. Further, the company may also temporarily own, operate or retain interests in such systems, which may become the basis of PPA's for utilities, distributed generation etc.

This points to a range of related products and services that are vertically-integrated and link well across the value chain, as well as the fact that the company caters to markets and customers around the globe. It is also important to note that First Solar's CdTe (cadmium telluride) technology for solar panels has so far competed well with the conventional crystalline silicon technology of its competitors. More so the company has since managed to consistently improve the efficiency of its cells at a reduced cost, and even registered an increased volume of watts sold in 2016 despite reductions in the average selling price per watt. First Solar has also endeavored

to upgrade to better technologies, such as its upcoming transition from Series-4 to Series-6 panel technology, however, this has come at a cost of heavy restructuring, impairments and layoffs. Nevertheless, given the nature of its business and increasing competition in the industry, the company has strived well to remain competitive and has thrived successfully so far. All this information points to the fact that the quality of growth and the key sources in the case of First Solar seem reasonably sound and possibly sustainable in the long-term.

One source of First Solar growth through acquisitions has served to improve its business and technology through gain of intellectual property rights, access to research and development and ownership interests in solar system manufacturing firms. The quality of this growth is, however, difficult to assess, since while First Solar has been able to improve the efficiency of its key cells in recent years, it has also divested its crystalline silicon operations and reported significant impairments in intangibles and goodwill.

Profitability

Profitability is a crucial part of analysis process, the basis of which is the profit the company makes, especially relative to the amount of money invested in it. This fact alone can provide introductory evidence to differentiate good businesses from mediocre ones as a higher return may point to a more attractive business. We must first do a preliminary analysis of a company's profitability using the net profit margin, which can tell us how well a business converts sales into profits (profit a company makes per dollar of revenue). It is a good measure of both efficiency and overall business health but may also hint at chances of survival during periods of economic contraction or when the products don't meet expectation. First Solar had a net profit margin of -12.1 in the year 2016, primarily due to a significant one-time restructuring charge despite a decrease in sales that year. Adjusting for restructuring costs pertaining to divesting of Series-4 lines leads to a positive net margin (rationalized to 7.5% - regular and 5.9% - conservative, considering normalized earnings of $220 million and $174 million, respectively), which is above average. Also, we see that industry margins of 10% are relatively high although the industry itself may be somewhat volatile.

Looking to previous years, we see that First Solar posted high margins (15.3% in 2015, 11.7% in 2014 and 10.7% in 2013). Also, it is noticeable from the company's income statements that operating expenses in all those years, including 2016 have either decreased or remained relatively stable, thereby indicating an efficient conversion of revenue to income.

Net Margin	***2016***	***2015***	***2014***	***2013***
First Solar	*-12%*	*15%*	*12%*	*11%*
Canadian Solar	*2%*	*5%*	*8%*	*2%*
SolarEdge	*16%*	*1%*	*-16%*	*-36%*
SunPower	*-18%*	*-12%*	*8%*	*4%*
Jinko Solar	*9%*	*4%*	*7%*	*3%*
SMA Solar	*3%*	*1%*	*-22%*	*-7%*

Table 4. Net Margin

The section proceeds in this analysis by interpreting other profitability ratios for the company. These include its Return on Assets (ROA), Return on Equity (ROE) and Free Cash Flow. For this section and to focus more on reasoning and interpretation, the company's ratios are obtained from the Morningstar website.

Note: The section employs regular and conservative estimates of normalized earnings for analysis purposes (as above)[20], which have been discussed in the valuation metrics section

Beginning with ROA, we find that First Solar has an ROA of -5.1 as of 2016. This is logical as First Solar reported a loss of $358 million the same fiscal year and may appear discouraging on the first look, but some awareness of the facts pertaining to it may mitigate the disapproval. We are aware that First Solar has been accelerating its transitioning into the Series-6 cells, which has caused heavy restructuring and impairment charges to tarnish its income statement. This poses a problem to evaluate its true profitability where we may take the numbers at face value and thereby overlook strategy as well as historic performance. In such a case, one way forward may

[20] $220 million and $174 million, respectively

be to look at the average for the past 3 or 5 years, which could hint at the performance and potential. Another way could be to revise the current year for one-time changes or extraordinary items, which may enable a sufficient approximation. The tactics may cause a disconnect from company's strategy, but nevertheless allow for a reasonable assumptions to evaluate the company.

Moving forward, results are viewed in two different ways. In the first approach, a simplified assumption of performance is made after excluding key extraordinary items, while in the second past ratios of three years prior to 2016 are viewed and it is assumed that the company carried out in a similar manner without drastic measures (These are simplified assumptions for evaluation; in reality the dynamic nature of businesses may affect various important variables and hence performance in different ways. For instance, ignoring restructuring and impairments may affect sales in a positive way as the machinery and technology retain capacity, thus increasing the volume of panels sold. Similarly, it may affect the company's decision to delay debt repayment in 2016, as well as its choice to sell a major stake in one of its solar projects. Such decisions could in turn affect the overall cash flow and the balance sheet).

Proceeding with this methodology, a positive ROA is obtained (rationalized to 3.1% - regular and 2.5% - conservative) which does not seem impressive. ROA, simply is an indicator of how profitable the company is relative to its total assets. Another way of looking at it, for instance, the case of First Solar's revised ROA of 3.1%, is that it generates $1 dollar in profit for approximately every $32 dollars invested in its assets. The best way, however, is to look at industry norms, which tell us that an ROA of 3.1% may be average at best, while a ratio of 8% or higher may be desirable. Further, it is noted that prior to 2016, First Solar had an increasing ROA which is something investors would like to see.

ROA	***2016***	***2015***	***2014***	***2013***
First Solar	*-5%*	*8%*	*6%*	*5%*
Canadian Solar	*1%*	*5%*	*9%*	*1%*
SolarEdge	*22%*	*2%*	*-34%*	*-57%*

SunPower	*-10%*	*-4%*	*6%*	*3%*
Jinko Solar	*7%*	*3%*	*5%*	*2%*
SMA Solar	*3%*	*1%*	*-15%*	*-5%*

Table 5. Return on Assets

Another information that comes to light while investigating ROA is that is typically driven in the industry by Net Margin in contrast to Asset Turnover (considering its two components, where ROA = Net Matgin * Asset Turnover), which makes sense as the industry is not a conventional retail but rather based on relatively limited consumers, and projects that take a while to complete. Building on a similar principle, a modified Return on Equity is obtained for First Solar (4.1% - regular and 3.2% - conservative) which is reported at -6.65% in 2016. Comparing these to other players in the industry (below), it is found that even the company's 3-year average of 9% prior to 2016 are no where near the high ROE's of some of its peers, such as Canadian Solar, SolarEdge and Jinko Solar. Even though we see some volatility and low returns among other companies, the high ratio among the rest suggest industry potential and perhaps a much better work at using shareholder wealth. However, it would not be sensible to make quick conclusions without investigating further, as the result seem somewhat too good to be true. *(Usually very high ROE's may be result of distortion due to a firm's financial structure, for instance in cases of spin-off companies, significant share buy backs, massive charges incurred or other variable that may depress the equity base etc.).*

ROE	***2016***	***2015***	***2014***	***2013***
First Solar	*-7%*	*10%*	*8%*	*9%*
Canadian Solar	*8%*	*22%*	*43%*	*9%*
SolarEdge	*36%*	*23%*	*-*	*-*
SunPower	*-38%*	*-13%*	*19%*	*9%*
Jinko Solar	*34%*	*17%*	*24%*	*11%*
SMA Solar	*5%*	*3%*	*-28%*	*-9%*

Table 6. Return on Equity

A little examination reveals that all the companies have been around for at least a decade now, even though some are older than the others (SMA Solar, 1985; First Solar, 1999; Canadian Solar, 2001). It is, however, difficult to guage the phase for each of them in the business lifecycle as the solar industry itself is relatively new and expanding.

A look at the fundamentals of these companies informs that First Solar is the largest of all in terms of market capitalization and more than 4 times the size of the next largest. However, the facts also reveal that many of these firms have comparable assets to First Solar, which suggest on the large size of their debt. This becomes apparent from the relatively high leverage ratios of these firms, which is a constituent of ROE (ROE = ROA * Financial Leverage).

The ROE of First Solar might not be as bad as it appeared initially as it is able to generate decent returns without excess leverage, since most of the other firms are substantially leveraged, which exxagerate their ROE. This is also the reason their ROE have escalated well above their ROA ratios. This also highlights one of the limitations of ROE, which could show a highly leveraged firm with a risky debt as substantially profitable if their debt is generating income. Of course, not all debt is bad and a judicious amount can improve returns, however, it also means that in a relatvely volatile and unpredictable business such as solar and renewables, high amounts of debt may cause potential issues, since interest payments will be due nevertheless and earnings could be more depressed in bad times (just as they could be decent during good times). Financial leverage ratio for these companies are given below.

Financial Leverage	***2016***	***2015***	***2014***	***2013***
First Solar	*1.3*	*1.3*	*1.3*	*1.5*
Canadian Solar	*6.1*	*5.4*	*4.3*	*6.3*
SolarEdge	*1.6*	*1.8*	-	-
SunPower	*4.5*	*3.4*	*2.8*	*3.5*
Jinko Solar	*4.0*	*6.3*	*5.4*	*5.3*
SMA Solar	*2.1*	*2.0*	*2.1*	*1.7*

Table 7. Financial Leverage

The limitation of ROE can best be addressed by using it in parallel with other metrics. One such metric is the Return on Invested Capital which can deal with the debt-related distortion when using ROE to focus on productivity of the core business.

A final consideration in this section is a quick evaluation of the company's free cash flow, which is a valuable profitability metric. A company that generates free cash flow may use it for expansion, dividends, debt retirement etc. Firms that generate free cash flow (especially consistently) are financially flexible and may not have to rely on outside funding. A look at First Solar's financials tells us that it generated almost no free cash flow (FCF) in the current year, while a negative FCF in the year before (although had consistent FCF in 3 years prior). This is not desirable but may be understandable considering an unconventional year, an unpredictable industry and the cash flow of other companies. Also, First Solar had a negative free cash flow to sales in the same years (although high ratios in 3 years prior). FCF/Sales% could tell us how well the company converts its sales into free cash flow and if it is any good at generating excess cash. The tables showing FCF data for various companies is given below *(Figures are converted to USD using current rates)*.

FCF (USD Million) ***FCF/Sales%***	***2016***	***2015***	***2014***	***2013***
First Solar	*-23* *-0.8%*	*-527* *-14.7%*	*423* *12.5%*	*574* *17.3%*
Canadian Solar	*-1,390* *-48.7%*	*-229* *-6.6%*	*200* *6.8%*	*206* *12.5%*
SolarEdge	*36* *7.3%*	*-* *0.1%*	*-21* *-15.6%*	*-25* *-31.2%*
SunPower	*-623* *-24.3%*	*-1,065* *-67.5%*	*-159* *-5.2%*	*10* *0.39%*
Jinko Solar	*-588* *-18.2%*	*64* *2.7%*	*-48* *-3.3%*	*22* *2.1%*
SMA Solar	*137* *12.2%*	*64* *5.5%*	*-121* *-12.8%*	*-66* *-6.0%*

Table 8. Free Cash Flow, FCF/Sales%

Financial Health

It is important to ascertain the financial health of the company, which forms the foundation on which it may falter, survive or flourish. Among the first few things we must check the company's total debt, specifically the interest-bearing debt. Usually, when the business is good a company can be profitable after covering the fixed costs and any additional sales fall straight to the bottom line. However, when the business suffers, cost of debt pushes earnings even lower. This is not a concern in case of First Solar, which had a low financial leverage ratio of 1.32 and a debt-to-equity of 3% in 2016 as noted earlier. Further, it had total liabilities of 24% in relation to total assets and a low long-term debt of of $188 million (2.3% of total assets and 9.7% of total liabilities) as of 2016.

Although company suffered a hit to its operating income due to restructurings in 2016, this is not alarming since it is unusual. This is because it hints that the interest on its debt is not covered well by its earnings, but this has a one-time basis in 2016 as significant restructuring initiatives are almost complete. Further, with an already low debt and significant capital resources (cash, marketable securities etc.), payment of interest expense shoud not be an issue even due to a loss in a single year. A look at the past three years reveal that not only the company turned a profit but had small interest expense due to its low debt structure. This is evident from the high interest coverage ratio in those years (-22% in 2016, 76% in 2015, 219% in 2014, 202% in 2013), which means for instance, that the company could have paid interest on its debt 76 times in 2015. This also implies that in case of another unprofitable year, the low interest costs will not pose a serious threat. This is further corroborated by other metrics as discussed below.

First Solar has a sound balance sheet, which highlights its strengths to meet the short and long-term obligations. First Solar had a high current ratio of 4.2 as of 2016 (predominantly in cash, marketable securities and receivables and improving each year), which means that it could meet its short-term oligations without trouble. Current ratio informs on the liquidity of the firm, which has been consistently high over the years in the case of First Solar. Generally, a ratio of 1.5 is suitable, although it can only be well-assessed based on industry norms. Also, a low ratio could

be problematic and may eventually require companies to seek outside financing or divert operating income to pay off liabilities.

It is also interesting to note First Solar's current assets of $3.8 Billion against its total liabilities of $1.7 Billion, which could provide the company enough control on its balance sheet to survive a downturn (which may be probable in this relatively young and volatile sector). The current and quick ratios for First Solar (and peer companies) given below indicate on its relative financial strength.

Current Ratio *Quick Ratio*	***2016***	***2015***	***2014***	***2013***
First Solar	*4.21* *2.74*	*3.48* *2.49*	*3.18* *2.21*	*2.39* *1.53*
Canadian Solar	*1.02* *0.27*	*0.85* *0.43*	*1.19* *0.50*	*0.97* *0.31*
SolarEdge	*3.55* *2.57*	*2.75* *1.71*	*0.95* *0.55*	*1.08* *0.66*
SunPower	*1.76* *0.68*	*2.51* *1.24*	*2.13* *1.54*	*1.32* *0.70*
Jinko Solar	*1.07* *0.77*	*0.95* *0.67*	*0.98* *0.72*	*0.74* *0.48*
SMA Solar	*2.36* *1.71*	*2.22* *1.67*	*2.01* *1.38*	*2.82* *2.03*

Table 9. Current & Quick Ratio

Management Review & Additional Notes

The company's relatively new management seems competent and appears to have the necessary background in education and experience to carry the company forward. The substantial investment banking experience of the company's Chief Financial Officer could be particularly useful in the competitive renewable energy financing markets.

The employee morale, however, could be affected due to recent layoffs and the restructurings, which appear to be relatively more than usual.

A look at a company's recent proxy statement reveals executive compensation to be generally performance-based and mainly comprised base salary, cash incentive compensation and equity-based compensation. The cash incentive compensation primarily consisted of an annual bonus program which was linked to achievements in various performance metrics such as adjusted income before tax, cost per watt, operating expenditures and sales. The equity-based compensation mainly composed of time-based restricted stock units with longer vesting schedules and performance-based stock. The former aimed at aligning the long-term interest of executives and stockholders and retaining qualified executives, while the later intended to incentivize performance over a long performance period.

Some positives for the company include balance sheet health and operational flexibility to compete in terms of cost, cell efficiency and necessary project investments. Additionally, the increasing efficiency of CdTe modules, and the current Series-6 which is expected to keep the company competitive ahead, at least for a while. Also, general support mechanisms to aid the industry.

Some risks include competition which is quickly catching up and entering various stages of value chain. Additionally, an assumed overcapacity which is creating a price war. Further, some concerns could be the eventual maturing/decrease of the general support policies and also perhaps, the possible commoditization of modules.

8. Assumptions & Forecasts

8.1. Introduction

This section conducts a valuation analysis of First Solar Ltd. as per available data in annual reports up to 2016, their most recent fiscal year. The section may also use additional data or any useful and relevant information from other sources as required or deemed necessary.

The valuation process begins with forecasting the financials for First Solar for the next five years and later employs certain methods to gauge its value. A five-year forecasting period is considered appropriate in the case of First Solar, which operates in a relatively volatile sector and a rapidly changing environment, and considering the uncertainty far ahead. This pertains to the time in future it would be possible for us to make reliable estimates for the firm. Given the segment volatility, increasing competition and technological advances, the industry landscape and business dynamics could change significantly beyond the five-year period, which could lead to weak projections. Additionally, this forecast period should be sufficient for the company to reach a steady state.

Although the company's value could be different with changes in the projected future of the company, the report aims to incorporate significant rationale in forecasting and valuation in order to form a reasonable estimate for First Solar.

8.2. Income Statement

First Solar's income statement is similar to conventional statements and fairly informative. Line items, especially costs are self-explanatory although some items such as restructurings and impairments get clearer as we go through the notes and discussions in the annual report. Overall, however, notes as well as relevant information in the report come in handy as we move towards obtaining a complete picture.

Revenue

The growth in revenues for First Solar is estimated to be around 2% for the next year (2017), which is not impressive. The company's sales decreased by 18% in 2016 mainly due to completion of work on different solar projects, as well as on its plan to revamp its existing manufacturing lines to an upgraded technology (Series-6), thereby resulting in a decision to manufacture a reduced volume of Series-4 solar panels. The latter came as part of the restructuring initiatives of the company where it aims to accelerate to a new technology by 2018.

With a 2% growth estimate for revenues in 2017, First Solar is expected to at least restore its sales to the $3 billion mark of 2015. This is because while the manufacturing volume and average selling price per watt is expected to decline, the revenue from the project segment is likely to pick up as the company begins construction on several new projects, as well as recognizes revenue on the ones sold or under contract ($0.8 billion expected in 2017) and others in pipeline (with higher expectations of new projects being sold). It is important to recall that a major portion of First Solar's revenue comes from its Systems segment, which is increasing capacity and adding new contracts to its Engineering and Maintenance services, respectively, especially as the company continues to make additional bookings and complete new projects. Further, that expansion of this segment also improves sales in the component segment, which includes modules used as part of the solar systems.

The above expectations are also rationalized after considering certain quantitative metrics. Although historic data may not be predictive of future sales, it may help understand business dynamics and together with relevant information enable rational assumptions for future growth. A five-year arithmetic average of First Solar sales growth computes to 2.1%, while a compounded annual growth rate (CAGR)[1] of 1.3% is computed for the same period. A three-year arithmetic average prior to 2016 also amount to 2.1%, which aims to view performance during the normal course of business and without significant shifts in strategy or restructurings. Further, the estimate is also moderated to 2% after noting analysts' improved average estimate of $3.1 billion in sales for First Solar for 2017 on Yahoo Finance. A similar rate is maintained for 2018, as the company prepares for its Series-6 launch while conducting business as usual. However, by then market sentiment for First Solar is expected to improve considerably as sales recover and

the anticipation of Series-6 builds up. Further, a growth rate of 7% in revenue is considered for the next three years as the company markets its superior technology product and expands its project-base. It is expected to sustain during this period, post which it may slow down. The estimate for 2021 is however, moderated to 5% to account for uncertainty associated with forecasting in the future, which is particularly high in solar sector due to rapidly changing landscape and growing competition.

First Solar expects its major cash through the end of 2018 and the rate seems legitimate in view of a 5.5% growth after the Series-4 launch in 2015. The Series-6 and project pipeline are expected to be much more impactful in near future considering significant investments and increasing demand for renewables and competitive technologies. The opportunities, however, will also bring new challenges in the form of new entrants, competing technologies, diverse energy portfolios, pressure on margins etc., and the success of First Solar will rely on its ability to stay ahead of competition and leverage its strengths to tap new markets and sustain existing ones.

Cost of Sales

Cost of Sales is almost directly linked to revenue and gives a correlation coefficient of 99%, considering the past five years. Also, cost of sales has been around 74% to 76% of revenue in these years and this relation is expected to hold in the future as it seems to be in a reliably stable range. A five-year historic average of 75% is therefore used for future estimation.

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Cost of Sales	2,564,709	2,659,728	2,247,349	75.4%	74.9%	75.0%
% of Revenue	75.6%	74.3%	76.1%			

Table 10. Cost of Sales

Operating Expenses

The income statement of First Solar lists three key items in its operating expenses, which include: Research & Development (R&D), Sales, General & Administrative (SG&A) and Restructurings & Asset Impairments. For 2016, it is observed that its last key item presents the biggest charge of $819 million, which is due to the company's decision to accelerate its transition to Series-6 modules (and thus a one-time large expense).

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
R&D	143,969	130,593	124,762	4.0%	4.0%	4.0%
% of Revenue	4.2%	3.6%	4.2%			

Table 11. R&D Expense

Both R&D and SG&A are consistent as % of revenue in the past five years and therefore an arithmetic average of these years is deemed appropriate for the projections. This also implies that these expenses are generally expected to grow with the growth in revenues. For the Restructurings and Impairments, the company expects to incur additional charges of $50 million and $30 million on its module production lines in the next two years, respectively (as indicated in their annual report) and therefore this information has been incorporated for forecasting. The projections for the remaining years, as well as impairments related to power systems are adjusted considering historical data and are based on assumption that there will be no heavy structuring in the next five years.

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
SG&A	258,973	272,010	263,015	8.0%	8.2%	8.2%
% of Revenue	7.6%	7.6%	8.9%			

Table 12. SG&A Expense

Interest Expense

The company's interest expense is mainly derived from its calculated cost of debt (discussed later) and the assumed interest-bearing liabilities for projected years. Minor adjustments have been made for other financing liabilities/capital leases considering its scheduled interest (and principal) payments, as well as for settlements and changes in fair value of interest rate and cross currency swap contracts[21], considering past data.

An alternate method to address this would be by considering current expense and previous year's debt balances to compute a constant rate for projections[22]. However, as in the case of First Solar and considering the past, these percentages could vary substantially as the company capitalizes interest costs and could use and retire the debt in the same year (such as using project-based borrowings under revolving credit), which does not reflect in book values - as in 2016. Therefore, current cost of debt is assumed to be the appropriate applicable rate.

Income Taxes

Although provisions for income taxes may be usually straight-forward, this is not true for First Solar which has a complex and an unconventional tax structure. Although the statutory federal corporate income tax in the United States is 35%, the effective tax rate for First Solar in 2016 was only 12.3% which was due to tax benefits from restructurings as well as reversal of an uncertain tax position on a foreign subsidiary income (on confirmation of residency status in the jurisdiction). The effective rate was even lower for 2015 (1.2% benefit) and 2014 (7.2%), where in the case of former it was impacted by the effects of a long-term tax holiday in Malaysia up to 2027 and receipt of a ruling pertaining to the timing of deductions (after the expiration of holiday).

For the thesis, a first pick is the most recent effective tax-rate of 12.3%, which is low relative to the general corporate tax rates, yet still higher compared to the firm's own past rates. However,

[21]These contracts are used to mitigate exposure to interest rate fluctuations associated with certain debt instruments, in contrast to speculative or trading purposes

[22]There is circularity issue with respect to estimating interest expense and the method is suggested by McKinsey & Co.

the rate may not be sustainable in the long-haul and the tax benefits will shrink, especially as the firm and industry mature and due to change in political and economic landscape. This has implications in valuation since a significant portion of the firm value or equity could be contained in the perpetual value and using this low rate would imply that the relative tax advantage is permanent, which seems unrealistic. On the other hand, however, using a higher rate or the one close to statutory or marginal rate would unfairly depress the tax advantage and earnings benefits that the firm is currently receiving or is expected receive in the near future. Therefore, in light of these arguments and considering valuation mission, one way to address this is to pick an intermediate rate of, say 25% which seems reasonable, and is also in-line with company's expectation of future effective tax rate to be between 10% and 35% as indicated in its annual report. As an alternate this can also dealt by gradually increasing the effective rate (12%) towards the marginal rate (of 30% - discussed later) over the forecasting period. This also serves well, since it preserves tax advantage yet does not erroneously assume it to be permanent. This approach is also suggested by Damodaran besides the use of marginal tax rate and has been used for the thesis.

Effective Tax Rate	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
%	12%	15%	20%	25%	30%

Table 13. Effective Tax Rate

8.3. Balance Sheet

Although changes in cash and equivalents and retained earnings flow from the statement of cash flow and the income statement, respectively, assumption for marketable securities has been made considering its movement with revenues in the past years, after adjusting for any noticeable trends in growth and the values derived from Excel's own forecast functions. For various other items, projections are made as discussed below.

Receivables & Other Current Assets

Net receivables have a close relationship with revenues and are expected to maintain an average ratio to it over the forecasted period. As an alternate driver, we can predict receivables considering the ratios of day sales outstanding (DSO) and turnover assuming them to be constant, at least in the short term. This could be applicable to First Solar which had a DSO of 58 days in 2016 (close to its five-year average of 63) and a receivable turnover of 5.7 (close to its five-year average of 6.1). A constant average, however, would still imply that they grow with the revenues as in the initial case.

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Receivables, Net	212,405	559,800	472,217	12.6%	17.2%	16.0%
% of Revenue	6.3%	15.6%	16.0%			

Table 14. Net Receivables

Other current assets primarily include deferred project costs, which represents costs pertaining to solar power projects that have contracted a definitive sales agreement and their completion of sale and the meeting of all revenue recognition criteria is expected within the next year. Other current assets are projected based on a constant average to revenues after looking at this metric for the past years. This average is, however, adjusted after looking at the Excel's forecast[23] for the same metric. A suitable alternate driver for this item could be cost of sales, however, this should not produce significant variation from the current values since it is highly correlated with sales and is already maintained a constant ratio to it, considering historic trend.

Inventories and Prepaid Expenses

Inventories and prepaid expenses are forecasted considering their percentages with respect to the cost of sales. Although there is no observable trend for these individual variables, getting their ratio with respect to COS presents a better picture. In case of inventories this metric seems

[23] FORECAST.ETS function uses exponential smoothing algorithm to predict values and is suitable for time series data with no trend or seasonal pattern

relatively stable and a five-year average is used, which is also close to percentage for the most recent year. For prepaid expenses the percentages are small but close and show an increasing trend. An average has been used for this item; however, this has been slightly moderated after obtaining a predictive value from the Excel function to account for the upward trend.

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Inventories	505,088	380,424	363,219	16.7%	16.7%	16.7%
% of COS	19.7%	14.3%	16.2%			

Table 15. Inventories

Property, Plant & Equipment (PP&E)

Property, Plant & Equipment (PP&E) comprise land, buildings and improvements, machinery and equipment, leasehold improvements, construction in progress, office equipment and furniture, and stored assets.

PP&E for the next period are calculated using the formula below.

$$PP\&E_t = PP\&E_{t-1} - Depreciation_t - Impairments_t + Purchases_t$$

In the forecasted period, PP&E are generally expected to increase at the historic investment rate with respect to revenues. Observing past data reveals that investments in PP&E as a percentage of revenue vary in a small range of values as shown below.

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Investment in PP&E	257,549	166,438	229,452	6.7%	8.0%	7.0%
% of Revenue	7.6%	4.7%	7.8%			

Table 16. Investment in PP&E

A normalized value of 7% is deemed appropriate in this case (which is slightly above the past 3-year average). However, this value is applied for years post 2018 (inclusive), as the company expects its capital expenditures to be significantly higher for 2017 ($525 to 625 million) due to the transitions related to Series-6 technology, as indicated in annual report 2016. This information is used in projection for 2017. Further, the investments are assumed to stabilize to current levels (current 3-year average) by the final year and stabilize or reduce further as the firm matures, as well considering the reduced cost of manufacturing and overall systems due to improved technologies[24].

PP&E are depreciated at a rate of 16.8% per year of the previous year's book value, in line with the historic average rate which has been relatively stable.

USD 'Mn	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Depreciation	245	246	211	17.1%	16.3%	16.8%
% of Prior Book Value	17.7%	17.3%	16.4%			

Table 17. Depreciation of PP&E

Intangibles

Intangibles are computed in a similar manner as PP&E (formula above), and are amortized at 10% of previous year book value. The latter is rationalized considering past data, a rate of 9.2% in previous year and the company's estimated future amortization expense of $8.3 million for next year which computes to 9.4% of current year's book value.

Acquisitions in the case of First Solar primarily pertain to acquisitions of technology and R&D processes. Since firms seldom make acquisitions every year with each having a different price tag, the argument on normalization applies more strongly to this item (Damodaran). A normalized value with respect to revenue was considered, close to a 3-year average (this is

[24] First Solar will eventually enter a mature phase with more focus on optimizing and maintaining existing plants. Additionally, the expected general decrease in costs per watt is likely to be reflected in future expenditures

consistent with a 5-year average after excluding acquisitions of the divested crystalline-silicon technology and mainly considering only investments in the core CdTe technology intangibles). Additionally, this was assumed for beyond 2017.

Equity & Other Investments

These primarily include equity method investments in unconsolidated affiliates and joint-ventures, as well as restricted cash and investments. These have been projected considering historic averages to revenue.

Accounts Payable & Other Liabilities

Payables are adjusted considering revenues and are approximated at 3-year average ratio to revenues of 6.9%, which is lower than the five-year average of 7.8% but higher than the recent ratio of 5.0% (2016).

USD '000	2014	2015	2016	3-yr avg.	5-yr avg.	Norm. ratio
Accounts Payable	214,656	337,668	148,730	6.9%	7.8%	6.9%
% of Rev.	6.3%	9.4%	5.0%			

Table 18. Accounts Payable

Payables could be expected to grow with cost of sales as the company makes new purchases for components as well as construction on solar projects (revenue and cost of sales lead to similar projections due to stable ratios and correlation). They could also be approximated based on payable days, which has a slight uptrend since past three years in the case of First Solar, but may nevertheless provide decent approximations based on its average.

Accrued expenses are approximated using cost of sales and primarily pertain to expenses accrued in relation to compensations, project costs and warranty liabilities.

Other current liabilities were approximated with revenue. Also, past data and growth were considered in making the approximations.

Long-term Debt

First Solar has a history of maintaining low-debt levels and making frequent repayments. This is usually made possible due to its significant capital resources in the form of cash, marketable securities, cash flow from operations, revolving credit facility etc. and access to capital markets, which could sufficiently cover short-term requirements for working capital, systems projects and capital expenditures. The company intends to maintain appropriate debt levels based on cash flow expectations, overall cost of capital, and expected cash requirements for operations, capital expenditures, and strategic discretionary spending (Annual Report 2016).

In the past First Solar has increased its debt primarily through borrowing under project-based credit facilities and this is expected to continue in the future as it takes on new projects. For 2017, the company is expected to increase its long-term debt, specifically due to new loan arrangements under Ishikawa Credit Agreement (Dec 2016), Hindupur Credit Facility (Nov 2016), Manildra Credit Facility (Mar 2017) for the commencement of construction on related power projects, as well as continuation work on multiple projects across United States and India.

Going forward, reasonable levels of debt are projected assuming a steady flow of additional undertakings offset by repayments, an ongoing commitment to low debt and stable ratios for leverage close to the current levels.

Accrued Liabilities

These refer to accrued solar module collection and recycling liabilities based on the company initiative to collect and recycle modules sold and covered once they complete their useful lives. The company records these liabilities considering factors such as expected timings of collection, expected economic conditions, experience etc., based on which it expects an increase to this liability by $37.5 million against a 1% increase in the annual inflation rate (decrease by $31 million against 1% decrease). This information, is therefore included during projections based on

inflation forecasts, and used in conjunction with historic growth averages with respect to revenues *(Incorporating this information would be more precise than revenue-based averages or growth-tied-to-revenues alone, since not all modules sold are covered in this program and the percentages vary).*

Other Liabilities

This consisted of a large portion in product warranties and other liabilities and are projected based on average historic growth. It also includes financing liability pertaining to sale-leaseback of a project which is expected to decrease over time as the company makes regular payments.

Operating Leases

Firms often choose to lease long-term assets rather than buy them which creates a similar obligation as interest payments on debt, and therefore have to be viewed in a similar light.

It is assumed that operating leases follow historic growth. Further, the historic average length of the lease is 11 years, therefore a 10-year treasury yield (at 2.3%) is used with a spread of 2% for cost of lease, which is close to the company's assumed cost of debt. This rate is also used for discounting and in the calculation for implied interest.

In $ '000	2017E	2018E	2019E	2020E	2021E
PV Lease Comm.	138,865.02	144,551.03	151,411.92	160,901.56	169,164.85

Table 19. PV of Lease Commitments

Section Note: It is assumed that the company will not issue any new equity in the forecasted period. Further, it is expected to retain majority of its earnings (considering past data) and will also not pay any dividends as in the past[25].

[25]First Solar does not pay any dividends and according to its recent annual report, it does not intend to pay any dividends in the foreseeable future

8.4. Cash Flow Statement

The cash flow statement is mainly derived from the balance sheet and income statement. The net income is adjusted for non-cash items such as depreciation etc., and along with the changes in working capital provides the cash flow from operating activities.

The cash flow from investing activities mainly comprise investments in property, plant and equipment along with investments in intangibles, short-term investments etc. and other items such as restricted cash changes etc.

The cash flow from financing activities mainly comprises estimations of debt issue and repayment considering target levels and past company practices. Further, it is assumed that the company will not issue or repurchase stock in the forecasted period and will not be paying any dividends as in past.

8.5. Key Valuation Metrics

EBIT

The Earnings before Interest & Taxes (EBIT) obtained from the projected statements are presented below and will be utilized for the Free Cash Flow to Firm (DCF) valuation. The EBIT's are adjusted for leases at the assumed rates (as discussed earlier).

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
EBIT	326,992	354,665	402,057	431,366	453,766
Implied Interest	5,971	6,216	6,511	6,919	7,274
Adj. EBIT	332,963	360,881	408,567	438,285	461,041
Tax (T%)	*12%*	*15%*	*20%*	*25%*	*30%*
Adj. EBIT (1-T)	**293,008**	**306,748**	**326,854**	**328,713**	**322,728**

Table 20. EBIT & Adjusted EBIT (1-T)

Working Capital[26]

Traditionally working capital is defined as current assets minus current liabilities. In most contexts of valuation cash and short-term investments are excluded from this definition. Although operating cash could be included, companies seldom disclose this amount as in the case of First Solar. As a rule of thumb, 2 to 5% of revenues is usually considered as operating[27], although this is an approximation and companies may carry varied proportions based on operating needs. Additionally, this would also vary with the type of industry and one study found that companies in industries with higher cash flow volatility usually hold higher cash balances. Considering higher industry volatility in case of renewables, operating cash at 10% to revenue is assumed in the thesis. This cash is likely to be a drain on the cash flows and the overall valuation. More on cash and variants etc. is discussed in a later section. Working capital projections for First Solar are presented below.

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Operating Cash	300,990	307,010	328,500	351,495	369,070
Receivables net	481,584	491,215	525,601	562,393	590,512
Inventories	376,197	383,721	410,582	439,322	461,288
Prepaid expenses	86,517	88,248	94,425	101,035	106,087
Other current assets	600,625	614,019	657,001	702,991	691,268
Current Assets (Less Ex. Cash & Marketable Securities)	**1,845,913**	**1,884,213**	**2,016,108**	**2,157,236**	**2,218,226**
Accounts payable	208,714	212,889	227,791	243,736	255,923
Taxes payable	(14,196)	(720)	26,411	53,417	81,211
Accrued liabilities	264,251	269,536	288,404	308,592	324,022
Deferred revenues	9,067	9,248	9,896	10,588	11,118
Other current liabilities	291,247	297,072	317,867	340,118	357,124
Current Liabilities (Less short-term debt)	**759,084**	**788,026**	**870,369**	**956,452**	**1,029,397**

[26]This is essentially non-cash working capital

[27]In a study of S&P 500 non-financial companies by McKinsey & Co., it was found that between 1993 and 2000 companies with the smallest cash balances held cash just below 2% of sales

Working Capital	**1,086,829**	**1,096,187**	**1,145,740**	**1,200,783**	**1,188,828**
Δ Working Capital	**(168,037)**	**9,358**	**49,552**	**55,044**	**(11,955)**

Table 21. Working Capital

Capital Expenditure

The capital expenditures in the case of First Solar are mainly driven by investments in property, plant and equipment. The acquisition of intangibles may or may not be included, however, since the company is expected to receive benefits from acquired intangibles, the cost paid for them would be considered.

Additionally, Damodaran emphasizes the increases in present value of lease commitments to be accounted in capital expenditures. Although not a celebrated concept, these have been included to form a conservative estimate for equity value.

The approximation for Capital Expenditure derives from the assumptions and is presented below.

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Investments in PP&E	550,000	214,907	229,950	246,047	217,814
Acquisitions	-	5,242	5,643	6,073	6,377
Increase in PV Operating Lease Comm.	3,450	5,686	6,861	9,490	8,263
Capital Expenditure	**553,450**	**225,835**	**242,454**	**261,610**	**232,454**

Table 22. Capital Expenditure

Non-Cash Charges

The non-cash charges include depreciation, amortization, restructuring and impairments and other non-charges such as deferred taxes etc. The expected non-cash charges are presented below.

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**

Depreciation	120,024	186,836	189,831	198,399	208,417
Amortization	8,797	7,895	7,698	7,570	7,506
Impairments	56,646	36,646	16,646	16,646	16,646
Depreciation & Amortization	128,821	194,730	197,529	205,968	215,922
Depreciation, Amortization & Impairments	**185,467**	**231,377**	**214,175**	**222,615**	**232,569**
Other non-cash charges	7,130	15,161	11,653	16,480	7,152
Net Non-Cash Charges	**192,598**	**246,538**	**225,829**	**239,094**	**239,721**

Table 23. Net Non-Cash Charges

Free Cash Flow to Firm (FCFF)

With the required metrics and assumptions in place, we can now estimate the free cash flow to firm as following.

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Adj. EBIT (1-T)	293,008	306,748	326,854	328,713	322,728
+ Net Non-Cash Charges	192,598	246,538	225,829	239,094	239,721
- CAPEX	553,450	225,835	242,454	261,610	232,454
- Δ Working Capital	(168,037)	9,358	49,552	55,044	(11,955)
Free Cash Flow to Firm (FCFF)	**100,192**	**318,093**	**260,676**	**251,154**	**341,950**

Table 24. Free Cash Flow to Firm (FCFF)

EBITA

EBITA and adjusted EBITA are obtained using the variables above, and are presented below.

In $ '000	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Adj. EBIT	332,963	360,881	408,567	438,285	461,041
Amortization	8,797	7,895	7,698	7,570	7,506

Adj. EBITA	341,760	368,775	416,265	445,854	468,546
Tax %	12%	15%	20%	25%	30%
Adj. EBITA (1 - T)	**300,749**	**313,459**	**333,012**	**334,391**	**327,982**

Table 25. Adjusted EBITA (1-T)

Invested Capital

Traditionally, Invested Capital includes working capital and net fixed assets such as property, plant and equipment. In the context of this valuation this definition has been extended to also include other long-term operating assets and liabilities[28], which as the name implies are relevant in the ongoing operating activity. Also, as discussed previously excess cash is not included in working capital, which by definition is unnecessary for core operations. These follow logically and based on recommendation by McKinsey & Co.

The other long-term operating assets include intangibles, capitalized leases and other relevant long-term assets. The other long-term operating liabilities comprise accrued module collection and recycling liability and other liabilities that include warranties, taxes payable etc.

In $ '000	**2016**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Working Capital	1,254,866	1,086,829	1,096,187	1,145,740	1,200,783	1,188,828
PP&E	629,142	1,023,707	1,037,055	1,083,209	1,137,725	1,154,872
Intangibles	87,970	78,946	76,980	75,695	75,058	74,881
PV Lease	135,415	138,865	144,551	151,412	160,902	169,165
Other LT Operating Assets	681,926	710,866	747,186	791,938	840,921	891,257
Less: Accrued Module Coll. & Rec. Liability	166,277	185,687	189,388	199,656	195,781	210,487
Less: Other LT Operating Liabilities	428,120	443,503	459,438	475,946	493,048	510,763

[28] Net other long-term operating assets

Invested Capital	**2,194,922**	**2,410,023**	**2,453,133**	**2,572,391**	**2,726,561**	**2,757,754**

Table 26. Invested Capital

Terminal Growth

The terminal growth is assumed to be at 2.5%. The average rate of long-term GDP growth in the United States is roughly above 3%, which can be a good proxy. Growth above this rate may not be very realistic since only firms with strong competitive advantages and low-capital needs may be able to sustain it in the long run. Further, even though renewables are a growing industry and have great potential going forward, a 3% growth rate may be too optimistic given the volatility in industry and the uncertainty in projecting for the same in the long-run. Therefore, a lower estimate of 2.5% has been used in the thesis.

Additionally, it is important to note that relying on forecasts for this metric for long term in the future may not be prudent as it carries a lot of uncertainty, and a historic number may be more relevant.

Normalized Earnings

First Solar had the latest year (2016) in significant restructurings and normalized earnings will be required to form reasonable assumptions for analysis and valuation purposes.

I) Norm. EBIT

The company reported an operating loss of $503 million, which occurred due to a one-time restructuring and impairment charge of $819 million which primarily had basis in the company's transitioning to its Series-6 product. Of this $663 million related to accelerating the transition to Series-6 manufacturing and restructuring operations, while $88 million pertained to the end of company's crystalline silicon manufacturing as a decision to focus on core CdTe technology. While these items are considered relevant, the additional $69 million related to other goodwill

impairments related to systems reporting unit (as part of annual impairment testing) has been ignored.

The two items together result in a total amount of $750 million charge. With this method, a simplified estimate for normalized operating income (EBIT) has been made at $247 million. This is lower than the company's own evaluation of normalized EBIT at $316 million on its website and would thus form a conservative estimate.

Additionally, it is noted that the above figure may perhaps form a low estimate. One normalization procedure involves the simple averaging of past figures, possibly for as long as considered appropriate. It can also be achieved using average operating margins over the past years (3, 5, 7 and 10-year averages were considered in each case). Both these approximations result in a higher EBIT than calculated in the initial method, which is however still retained due to direct relevance with the company's recent workings.

II) Norm. EBITA

The normalized EBITA (2016) has been calculated using amortization expense for 2016 (for simplicity) and the normalized EBIT from above. This gives a normalized EBITA of $257 million.

III) Norm. Income

In the section above, an estimate for normalized EBIT was formed at $247 million. Going forward to earnings involves the estimation of interest expense, taxes, other income as well as equity in earnings in the case of First Solar, which is not as straightforward as earlier in EBIT. Since we are assuming business activity in a 'normal' year, the business dynamics and decisions pertaining to it would be different (such as debt levels etc.), as well as other items such as tax and tax benefits. In order to simplify for analysis an average prior to 2016 has been used for the above items (3 and 5-year averages yields minor deviations). Equity in earnings of affiliates is, however, adjusted considering both the current earnings and past average. In the former case it is manually adjusted to disregard a heavy one-time gain of $125 million from the corresponding

earnings of $172 million. This gain resulted from the sale of the company's residual interest in a project and, therefore, has been discarded, however, equity in earnings realized on it prior to sale has been retained. A similar adjustment has been made for taxes where the current rate and prior 3-year average have been considered.

The above methodology gives an estimate for earnings at $266 million. A quick look at the average of income and the average of net margin from previous years (3, 5, 7 and 10-year averages) gives estimates in the range of ($232 to $432 million) and ($197 to $450 million), respectively. The company evaluates its normalized earnings at $174 on its website, and therefore the above estimate is moderated to an average of $220 million, which forms a regular estimate.

Before we could get to valuation methods, we must also establish certain metrics as discussed below.

9. Cost of Capital

9.1. Cost of Equity

Cost of equity is the return that equity holders require for their investment in the company. The standard method to estimate the cost of equity is the Capital Asset Pricing Model (CAPM). Other methods include the Fama-French three-factor model and the Arbitrage Pricing Model. For the thesis, it is assumed that CAPM holds and therefore, cost of equity is calculated as follows.

$$k_e = r_f + \beta * (r_m - r_f)$$

where,

r_f is the risk-free rate,

β is the firm's Beta and,

$r_m - r_f$ represents the market risk premium

The above three components of the cost of equity are discussed below.

9.1.1. Risk-Free Rate

In the most general form, the risk-free rate is defined as the return on a security (or portfolio) that has no covariance with the market - represented by a CAPM Beta of 0 (Koller, Geodhart and Wessels, 2012). It represents the theoretical rate of return of an investment with zero risk. In other words, an asset is considered risk-free if the expected return can be known with certainty.

The risk-free rate essentially represents the interest we could expect from a completely risk-free investment over a specified period. In practice, however, the risk-free rate does not exist because even the safest investments may carry a very small amount of risk. To estimate the risk-free rate, we typically look at the government default-free bonds. The government bonds of financially stable countries (US, western Europe etc.) are usually treated as risk-free and are assumed to carry negligible risk, since these governments are highly unlikely to default on them (they can raise taxes, print money etc.). Although there are examples in history of government defaults on

debt (Greece 2009, Russia 1998), government bonds are generally considered safe and come closest to a default-free security.

Ideally, each cash flow should be discounted using a government bond with the same maturity. However, most practitioners use a single yield that best matches the entire cash flow streams being valued. For the thesis, the 10-year Treasury note is used as a proxy, which is currently trading at a yield of 2.3% per annum. Many practitioners prefer the 10-year government STRIPS[29] which is another high credit quality U.S. security, and a common proxy.

9.1.2. Beta

Beta is a measure of systematic risk of a security or portfolio in comparison to the market as a whole. It is non-diversifiable in nature and generally has two basic characteristics when concerning models of risk in finance. First, they represent the added risk to a diversified portfolio (rather the total risk) and second, they measure the relative risk of a security and are thus standardized around one (Damodaran).

Beta is formally measured using the following expression.

$$\beta = \frac{\mathrm{Cov}\,(r_s, r_m)}{\sigma_m^2}$$

where,
the numerator is the covariance of security with market portfolio
the denominator is the variance of market portfolio
covariance measures the extent to which the variables move together

The market's beta coefficient is 1. Any security with a beta greater than 1 is expected to move in the same direction as the market, with a higher magnitude and is relatively more sensitive to news and information. A beta between 0 and 1 also signifies movement in the same direction but

[29]STRIPS are zero-coupon debt-instruments which are backed by US Treasury and are considered to have zero reinvestment risk. These are recommended over longer-dated bonds such as 30-year Treasury as their illiquidity means that their prices and yield premiums may not reflect their current value (Koller, Geodhart and Wessels, 2012)

with less volatility. Generally, a high beta denotes high risk but also the possibility of high returns and such securities or portfolios are usually favored by risky investors or when the market is rising steadily. In contrast, low beta securities or portfolios are generally favored by risk-averse investors or when the market is volatile or during downturns.

There are multiple methods to estimate the beta for a security. One of the most common and widely used is based on historical returns. In this approach, beta for a security is estimated by regressing the returns on any asset against returns on an index representing the market portfolio (over a time-period). The slope of the regression is then the beta. Regressions of First Solar returns against the Nasdaq Global Select Composite on which it is listed give raw betas of 1.37 *(5-yr monthly)* and 1.35 *(3-yr weekly)*.

While First Solar is listed in the Nasdaq Global Select tier, its select index is much more exclusive since it only includes companies based on stringent financial, liquidity and corporate governance standards. A better proxy could be the Nasdaq Composite, which is an index of the common stocks (and similar securities) listed on the Nasdaq stock market, and is another majorly followed index in the United States alongside S&P 500 and the Dow Jones Average. The Nasdaq Composite also includes the First Solar stock. A drawback of Nasdaq Composite, however, is its relatively high composition in technology stocks, which could bias the beta estimates based on sensitivity to the technology sector. Regressing monthly stock returns against Nasdaq Composite returns provided raw betas of 1.29 *(5-yr monthly)* and 1.39 *(3-yr weekly)*.

Another widely used index is the S&P 500, which includes stocks of the 500 largest companies listed on the NYSE or NASDAQ. S&P is a common benchmark index and is generally considered a representative of the US stock market. Regression against the S&P 500 as market proxy provided raw betas of 1.88 *(5-yr monthly)* and 1.76 *(3-yr weekly)*.

A common issue when using regression is the choice of index for market proxy. In CAPM theory, the market portfolio includes all asset classes and is globally diversified (Damodaran). In reality this market portfolio is unobservable and a proxy is necessary (Koller, Geodhart & Wessels 2015), and in practice, stock market indexes serve as market proxies. Additionally,

market-value weighted indexes are assumed to provide better estimates. Although both Nasdaq and S&P 500 are market-value weighted, S&P 500 is preferred in the thesis. This is mainly since it is generally considered representative of the entire market as it includes a significant portion of its total value. Further, that Nasdaq is generally regarded for technology stocks.

Another issue that can affect beta estimates is the return interval and usually varies from daily, weekly, monthly, quarterly and annually in practice. Using shorter return intervals increases the number of observations, but may cause systematic biases such as due to non-trading problems etc.[30] The results from a variety of empirical tests and following of market characteristics provide guiding conclusion for the use of monthly returns (Koller, Geodhart &Wessels, 2015). A monthly interval will be preferred as per recommendation; however, weekly returns will also be used alongside for reference.

A final issue that concerns regression is the time-period used to estimate betas. Periods ranging from two to five years are common, but may provide varying results. While shorter time-periods may provide less observations, going back further in time may deviate from true values as the company changes in terms of business mix, leverage etc. As per Koller, Geodhart &Wessels (2015), a minimum of 60 observations are recommended. Considering these arguments, a 3-year period will be preferred since changes may be more apparent in the solar energy sector (as evident from recent restructurings and high uncertainty). However, using monthly returns over the 3 years will not provide enough observations, therefore, a 5-year monthly data will be employed and the 3-year weekly period will be used as a reference.

Results of regressions are given below.

5-year monthly S&P 500	***Raw β: 1.88, SE: 16%, R^2: 9%***
3-year weekly S&P 500	*Raw β: 1.76, SE: 6%, R^2: 20%*

Table 27. Regression Results

[30]Non-continuous trading may affect correlation with market index. For instance, illiquid firms would have many returns equal to zero due to non-trading causing them to report lower betas. This, however, should not be an issue in the case of First Solar, which seems well-traded considering the average daily trading volumes (50-day average daily volume of 2.7 million: NASDAQ)

The above results indicate that the First Solar stock is theoretically at least 76% more volatile than the market. A SE of 16% in the first case for instance, indicates a moderate variability of predictions and a true beta in the range (1.88 ± 0.16x2) with 95% confidence. An R^2 of 9% *(although not necessarily indicative of model's adequacy)*, suggests a 9% risk in the company attributable to market sources, while the rest comes from firm-specific components. Overall, the 3-year weekly regression provides better results with a constrained range of values and a relatively better R^2, which is however, still quite low.

The regression betas reported are clearly affected by estimation choices (time period, return interval and the index). Generally, these betas can vary widely depending upon how the regression is set up and may provide a range of estimates. In order to improve the beta estimate, betas are adjusted using the Bloomberg method (below), which is a simple smoothing technique that pushes regression estimates towards one. This follows the reasoning of several empirical studies which indicate that overtime betas tend to move towards the average of one as companies survive the market, increase their size, get more diversified etc.

$$Adj.\ \beta = 1/3 + Raw\ \beta * 2/3$$

Using the Bloomberg method adjusted betas of 1.59 *(5-year monthly)* and 1.51 *(3-year weekly)* are computed for First Solar.

Other techniques to improve beta exist as well and, therefore, could provide some insight. These will provide basis for any adjustments, if necessary. According to Koller, Geodhart & Wessels (2015) the objective is to form an estimate of future beta through the use of judgement rather than purely mechanical approaches.

An additional technique to improve the estimate involves a look at service betas from credible agencies, which may guide in the process. Many services provide their estimate of betas which usually adjust their regression betas to reflect what they feel are better estimates of future risk. For instance, Morningstar provides an estimate of 1.57 which was recently updated from 1.38, while Reuters provide a beta estimate of 2.03.

Another technique involves the use of industry-based betas, which has basis in the argument that companies in the same industry face similar operating risk and so should have similar operating betas. In this method, an average unlevered beta is obtained by unlevering the average beta across the industry using the average debt-to-equity ratio. The average unlevered beta is then relevered to the company's target debt-to-equity ratio (using current level as proxies). As a quick test industry values were obtained from Reuters (online)[31] and employed in the process, which provided a beta estimate close to one. Although the industry may be defined differently (possible broadly), the value possibly hints at a downward adjustment and provides a sense of direction towards the lower ends. Additionally, the 3-year weekly estimate[32] with low standard error and a lower adjusted beta of 1.51 corroborates this.

The initial beta estimate of 1.59 is used in the thesis. However, in the light of results and discussion from above values in the range 1.51 – 1.59 are considered plausible.

9.1.3. Market Risk Premium

Market risk premium is defined as the excess return over the risk-free rate of return, as evident in the CAPM equation. It basically represents the additional return an investor expects from a risky market portfolio compared to what he can get from a risk-free asset. Although no model has gained universal acceptance for the estimation of the market risk premium, some methods include the use of historical risk premium and the implied equity premium.

In the historic approach, previous market returns are compared with returns on a reasonable proxy (such as long-term bonds) over an appropriate time-period and the resulting excess returns are averaged. Usually longer-periods and arithmetic averages of longer-dated intervals are preferred, but has limitations in the changing risk aversions during the period and higher averages (over geometric) during volatile returns.

[31]Industry beta: 1.10; Average debt-to-equity: 25%; β_u= 0.88. FSLR debt-to-equity: 6%; β_e= 0.93. *(Note: a basic version is used without taxes)*

[32]Appears relatively stable within the range

Another approach is the use of implied equity premiums and assumes that the market is correctly priced. It is essentially reverse-engineering the market's expected return using models such as the constant dividend growth model or cash-flow based models where the relevant known parameters[33] can be used to derive the implied expected return (and finally the implied equity risk premium). This approach is recommended over the historic method as it is market driven and current and can be used to estimate equity premium in any market; It is, however, bounded by the reliability of the valuation model and its inputs (Damodaran).

While Damodaran lists an implied equity premium of 5.69% for the United States (Jan 2017), Koller, Geodhart and Wessels (Mckinsey & Co.), suggest the range of 4.5% to 5.5% in which it continually varies considering evidence from multiple models. A market risk premium of 5.5% is thus used for the thesis.

9.2. Cost of debt

Cost of debt refers to the return required by the lenders in the firm and consists of three components: i) the risk-free rate, ii) company's default risk (translates to default spread), and iii) tax-shield on debt. One method to estimate the cost of debt involves looking at the interests (and spreads) on the recent borrowings of the firm. According to Damodaran, cost of debt is the current cost of borrowing funds to finance projects and the recent history of the same can give a sense of interests and spreads charged. Using this method, the cost of debt for First Solar is computed at 4.42% as illustrated below.[34].

[33]These models could use current levels of the market indexes such as S&P 500 etc. and other relevant parameters such as the expected dividend yield (or expected cash flows on the index), expected growth in earnings and dividends to reverse-engineer the process

[34]The method provides similar results for 2015 data and average data for past two years

Ideally, for investment grade firms (debt BBB or higher), it can be estimated from the YTM of its long-term bonds or indirectly through credit ratings for companies with short-term or rarely traded bonds. In the latter case, credit rating on long-term debt may be used to find average YTM on similar-rated portfolios of long-term debt or through average corporate yield spreads over 10-year government bonds, for instance based on ratings. Information in these regards, however, is not available for First Solar

Loan Agreement	Balance Outstanding as of 2016 ($ '000)	Rate 2016	Weight	%
Revolving Credit Facility	-	3.02%	-	-
Luz del Norte Credit Facilities: *Fixed*	125,264	4.25%	55.2%	2.34%
Variable	42,036	4.25%	18.5%	0.79%
VAT	13,700	4.55%	6.0%	0.27%
Japan Credit Facility	9,500	0.63%	4.2%	0.03%
India Credit Facilities	6,300	8.60%	2.8%	0.24%
Malaysian Ringgit Facility Agreement	-	5.54%	0.0%	0.00%
Malaysian Euro Facility Agreement	-	0.92%	0.0%	0.00%
Malaysian Facility Agreement	-	2.50%	0.0%	0.00%
Capital Lease Obligations	562	3.44%	0.2%	0.01%
Financing Liability – Sale-leaseback (Maryland Solar)	38,533	4.35%	17.0%	0.74%
Ishikawa Credit Agreement	-	-	-	-
Hindupur Credit Facility	-	-	-	-
Total (net of unamortized discount and issuance costs)	**227,030**			4.42%

Table 28. Cost of Debt Calculation

The general level of spreads for the facilities over the base/bank rate are low, and the spreads in the case of new debt are also suggestive of a low default risk[35]. The influence of such rates, however, will be more apparent as per their contributing weights of borrowing under these facilities (in the above method), as well as other factors such as foreign exposure, taxes, tenure etc.

Another method involves deriving a synthetic rating for the firm based on certain financial data such as ratios etc. One such metric in this regard is the interest coverage ratio, which can be used to derive a firm's synthetic rating on debt and the associated default risk (spread), which can then be added to the risk-free rate. This has limitation in the fact that firms may experience situations (a bad year, restructurings etc.) which may only depress this ratio in a particular year but may not necessarily indicate non-solvency. For instance, in the case of First Solar, a negative coverage ratio is observed in 2016 (-22) due to negative earnings[36] and this method would imply a significantly high spread in reference to the Damodaran synthetic rating chart. Yet just a year ago, this ratio was significantly high (+76) and it would shift the spreads to the opposite end of spectrum to significantly low. Even higher 3-year (and 5-year) averages, would point to low default spreads in case of First Solar. This is consistent with the low spreads as evident in its borrowing history.

Another quick method that can be employed to comprehend the default risk can be using the Altman Z score. The original standard Z-scores is an easy-to-calculate measure to predict corporate default, and the likelihood of firm's bankruptcy within the next two years. It is a linear measure based on a combination of certain income and balance sheet values of the firm. The median value for this score is 1.81 and is regarded equivalent to a credit rating of B. Firms below this value are considered be in the distress zone. An Altman score of 3.5 (3.8)[37] was calculated

[35]The table also lists additional facilities which have not yet been utilized. The default spreads on such debt (Ishikawa Credit Senior loan at 6-month TIBOR plus 0,5%, Hindupur Facility at bank rate plus 1% etc.) suggest low spreads

[36]This has basis in a turnaround year with a shift in focus that is also impacting other areas of business, such as less volume of modules (in GW), low project bookings etc.

[37]$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5$ for public manufacturing firms where, X_1 = working capital / total assets, X_2 = retained earnings / total assets, X_3 = EBIT / total assets, X_4 = market value of equity / total liabilities, X_5 = sales / total assets. $Z = 1.2(3387/7055) + 1.4(2730/7055) + 3.3(-543/7055) + 0.6(6430/1542) +$

for First Solar based on the 2016 (recent) financials, which indicates it to be in the safe zone at least for the next two years (and suggests a credit rating of at least BB for First Solar; interestingly, default spreads for these ratings are 3.0% or lower as per the Damodaran synthetic rating table shown in Appendix C).

Although the above methods of synthetic ratings do not provide a direct value for default risk (in the case of First Solar), they do hint at relative low values of 2-3%, based on which cost of debt computed through borrowing history (4.42%) may be a legitimate estimate (given a risk-free rate of 2.3%). Additionally, considering a spread of 2-3%, a range of 4.42% to 5.3% is considered a feasible set of values.

Although assumed to be the true for the thesis, the overall cost of current and future borrowing may be impacted by various market and firm-related factors, as well as exposure to foreign markets.

9.2.1. Tax

An essential element in the estimation of cost of capital is the tax shield, which requires a tax rate in conjunction with the cost of debt. Various texts recommend the use of marginal tax rate[38] for which the company's statutory tax rate could be used. This may, however, need some adjustment for First Solar, which has a complex tax structure as it operates in different countries, and also receives tax benefits in some of them. The company had an effective tax rate of 12.3% in 2016, which was still higher than its 3-year average of 6.1%, despite a statutory tax rate of 35% in the United States which constitutes majority of its operations and revenue.

In order to pick a marginal rate, we can simply assume that all the income generated by the company will be domestic to it and use the associated corporate statutory rate (or adjusted for local/state taxes). Since majority of income is generated in the United States, we can use its

0.999(2980/7055) = 3.8, using most recent quarter/trailing twelve-month data and working capital inclusive of total cash (a value of 3.3 is observed without cash, which is still a safe zone

[38]Marginal rate refers to the rate applied to the last dollar of a company's taxable income

statutory tax rate of 35%. Research by Graham and Mills (2009), however, indicates that the marginal rate on average is 5% below the statutory rate.

Using an alternate approach, we may compute the revenue-weighted average for the relevant marginal rates as shown below. In the case of First Solar, an average marginal tax rate of 33.3% is computed.

Region	Revenue (Mn)	% Revenue	Statutory Tax Rate	Value
United States	2,449	83%	35.0%	29.0%
India	158	5%	30.0%	1.6%
Spain	141	5%	25.0%	1.2%
Jordan	120	4%	20.0%	0.8%
Germany	15	0%	15.0%	0.1%
Australia	10	0%	30.0%	0.1%
Others[39]	59	2%	25.0%	0.5%
Total	**2,951**	**100%**	**Avg. Marginal Rate**	**33.3%**

Table 29. Average Marginal Tax-Rate Calculation

Considering the above two rationales, an average marginal rate of 30% is used for the thesis (the above rate is moderated to incorporate the research cited earlier and adjusted downward).

9.3. Target Capital

The final step in the calculation of WACC is to weigh its component elements. The cost of capital is expected to rely on target weights rather than current weights, which may not prevail over the life of the business. In order to estimate it, we must look at the current market-based capital structure rather than book values. Although the market value of equity is simply the

[39] Considering recent projects in Chile, Malaysia etc.

market capitalization, the market value of debt may be difficult to obtain as the company debt's may not be readily traded, or due to lack of access to information. In such cases, however, relatively stable book values could provide for reasonable approximations.

The market value of equity based on market capitalization is $6.43 billion (Nov 2017), while the market value of debt as approximated by its book value is $226.92 million[40]. This gives a debt weight of 3.4% and an equity-weight of 96.6%.

First Solar's debt-to-value generally remains stable at low values and the company seems to manage it with a steady balance in borrowings and repayments. Although the above ratios can be used as approximations, a few things must be noted. First, while market capitalization value was used for equity (Nov 2017), this value increased substantially from year-end values and will deviate the debt-to-value down from the latest fiscal year ratio. Additionally, the debt levels may have changed accordingly and may possibly reduce (or even increase) the deviation, however, this is not visible. In order to gauge the general level of these ratios, it was noted that it has lower than Dec 2017 value (6.1%), as well as values of Dec 2015 (4.7%) and Dec 2014 (4.8%). In such a case an upward approximation may seem appropriate and possibly the average of these past values could be used. Another way could be the use of forecasted debt levels as approximations. Realistically, however, these may embed errors associated with predetermining these levels.

For the study, however, the initial values will be employed. These, though, will be dealt in real-time using the Excel Solver function, which will minimize errors and uncertainty related to these changes. The weights, however, are still not finalized as the operating leases need to be accounted for as well. Since the debt levels are low and our assumed cost of lease is close to the pre-tax cost of debt for the firm, the operating leases are used directly with the conventional debt to estimate a new debt-weight[41].

[40]Includes sale-leaseback financing in other long-term debt. Further, an average of its debt for the past two years gives a debt-weight of 4.2%

[41]In a more precise computation of cost of capital, the three components (debt, equity and operating lease) will contribute based on individual weights and costs. However, considering the assumption leases have been 'embedded' with the conventional debt

In $ '000	
Interest-bearing Debt	227,030
PV of Operating Lease	135,415
Total Debt[42]*	362,445
Market Capitalization	6,430,000
D/V	**5.3%**
E/V	**94.7%**

Table 30. Target Capital Structure

9.4. Results

Using the variables established earlier in the section, the cost of equity is computed as:

Risk-free Rate	2.3%
Beta	1.59
Market Premium	5.5%
$\mathbf{k_e}$	11.05%

Table 31. Cost of Equity

9.4.1. WACC

Most firms, such as First Solar are typically financed using sources such as equity and debt, which require different rates of return. The Weighted Average Cost of Capital (WACC) blends such returns and represents the overall cost of capital for all funding sources in a company. In its simplest form, the cost of capital is given by,

$$WACC = \frac{D}{V} k_d (1 - T_m) + \frac{E}{V} k_e$$

where,

[42] Debt variables as of 2016

D/V represents the target debt-weight

E/V represents the target equity-weight,

k_d is the cost of debt

k_e is the cost of equity?

T_m is the marginal-tax rate

Considering that First Solar does not have securities such as preferred shares and having established the required variables, the WACC for First Solar is computed as below.

D/V	5.3%
E/V	94.7%
$\mathbf{k_d}$	4.42%
$\mathbf{k_e}$	11.05%
T_m	30%
WACC[43]	**10.62%**

Table 32. WACC

(Note: The potential errors due to changes in capital structure are further minimized using Solver program).

9.4.2. Unlevered Cost of Equity

The unlevered cost of equity, is what the cost of equity would have been if the firm was debt-less. Unlevered beta for the firm can be computed using the current equity beta as shown below, which can then be used to derive the unlevered cost of equity using CAPM.

$$\beta_u = \frac{\beta_e}{\left[1 + (1-t) * \frac{D}{E}\right]}$$

[43] WACC = 0.053* 4.42%* (1-0.3) + 0.947 * 11.05%

β_u= 1.59 / [1+(1-0.3) * 0.056] = 1.53
k_u = 2.3% + 1.53 * 5.5% = 10.71%

Table 33. Unlevered Cost of Equity

10. Valuation

10.1. FCFF

Using the assumptions and derived valuation metrics, First Solar is valued using the discounted cash flow method as follows[44].

In $ '000					
	2017E	**2018E**	**2019E**	**2020E**	**2021E**
FCFF	100,192	318,093	260,676	251,154	341,950
Terminal Value					4,316,095
Discount Factor	0.904	0.817	0.739	0.668	0.604

Enterprise Value[45]	**3,522,849**
Excess Cash & Mkt. Sec	1,660,013
Adj. Debt	362,445
Value of Equity	4,820,417
Shares Outstanding	104,035
Share Price $	**46.3**
Share Price $ (Optimized)	**46.9**

Table 34. Valuation: Free Cash Flow to Firm (Enterprise DCF)

The free cash flows to firm were established in the section on valuation metrics and going forward these along with terminal value are discounted at the computed company's WACC of 10.62%. The terminal value is found using the free cash flow in the final year together with the assumption of terminal growth at 2.5% and the company's WACC. The present value of these cash flow gives the Enterprise Value of the firm.

[44] $\text{Value} = \sum_{t=1}^{T=5} \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_T*(1+g)}{WACC-g} * \frac{1}{(1+WACC)^T}$

[45] Sum of PV of FCFFs first five years (917,246) and PV of Terminal Value (2,605,604) *[In$'000]*

The Enterprise Value of the firm is defined as the market value of equity added to the market value of debt less of excess cash and related short-term investments. In order to arrive at the Value of Equity, adjusted debt (inclusive of lease)[46] is subtracted from the Enterprise value, while the value of excess cash and marketable securities is added back. The resulting value of equity is finally divided by the number of shares outstanding to arrive at the company's price per share.

The value is further optimized using the Solver function[47], which gives an improved estimate or the company's price at $46.9 per share.

A Note on Cash & Enterprise Value

I) First Solar has huge reserves of total cash on its balance sheet (cash and marketable securities), which have generally increased over the years. These assets along with other non-operating assets must be valued appropriately to arrive at a fair value for the firm. According to Damodaran the simplest way to deal with cash and marketable securities is to keep it out of valuation. Once the firm is valued these are added back to the derived value and debt and related claims are subtracted out. In this way total cash is valued separately and the current levels form a proxy for its market value.

Some practitioners differentiate between operating cash and excess as is used in this case. The operating cash, if not disclosed, is usually based on rules or thumb or industry averages and is assumed to be required for operations. This cash is included in working capital and acts as a drain on the cash flows. Any cash beyond it is then excess cash, which is added to the DCF value. A brief discussion with respect to rules of thumb was made in the section of working capital. Additionally, with regard to industry averages, one way to approximate it, as suggested by McKinsey & Co. is to look for a minimum clustering of cash to revenue across the industry which would hint at the minimum cash needed to support operations.

[46]Assumed market value of debt

[47]The Solver changes the debt and equity weight in real time to minimize errors in due to changing capital structure. In this case, the debt-weight improves to 6.9% from 5.3% and the equity-weight reduces to 93.1% from 94.7%. Consequently, the WACC changes to 10.5%

As discussed before, a 10%-of-revenue approximation was used in the thesis. First Solar reported revenues of $2.95 billion in 2016 and a 10% of this figure amounts to $295 million in operating cash. This was deducted from First Solar's cash and equivalents value of $1.35 billion in 2016 ($1.05 billion) and together with the value of marketable securities of $0.61 billion in 2016 (total $1.66 billion) was added to the DCF value.

A study by Opler, Pinkowitz, Stulz & Williamson on corporate cash holdings provides some insight with respect to this case. According to the authors findings firms with strong growth opportunities, firms with riskier activities, and small firms hold relatively more cash, while firms with the greatest access to capital market, such as large firms and those with credit ratings tend to hold less cash. According to authors the results are consistent with the view that firms hold liquid assets to be able to continue investing when the funds are expensive or the cash flows are too low[48]. Additionally, the authors comment that the management accumulates excess cash if it can and the motivation appears to strongly precautionary. Further that there is a substantial persistence in excess cash and firms that experience large increases usually tend to keep it.

II) Another issue concerning discounted cash flows (FCFF) relates to the Enterprise Value. Technically, as in the case above we are really valuing the operating assets of the firm (or value of operations). Many practitioners use this concept where the sum of discounted cash flows represents the value of operating assets of the firm, to which value of non-operating assets such as cash, short-term investments etc. are added to arrive at the firm's value. From this, relevant claims such as debt, minority interests etc. are subtracted to arrive at the value of equity. The non-operating assets are usually valued separately and kept out of the main DCF valuation. This makes even more sense when using the operating income for valuation using FCFF, which keeps any cash flows[49] pertaining to such assets out of the equation.

Additionally, this methodology is generally consistent with the case above which adds the value of non-operating assets such as excess cash and short-term investments as part of the definition

[48]Other reason to hold excess cash not cited could be mere speculation to capitalize on potential opportunities as they arise

[49]Equity in earnings of affiliates, other income etc.

for Enterprise Value. However, concerning this we may also add other non-operating assets such as investment in nonconsolidated affiliates etc. as in the case of First Solar, which will increase the value of its equity.

10.2. Adjusted Present Value

The expected changes in debt-to-value of a company can be addressed using the APV approach, in which case it is a suitable alternative to WACC model. In the section on target capital structure, the variability in this ratio was discussed as well as the concerns in approximating a 'correct' value. The APV method could come in handy in such a case.

A simple illustration of this model is presented below. The free cash flows are discounted using the unlevered cost of equity at 10.71%, and the present value of tax shield is computed using the marginal tax-rate at 30% and the total adjusted debt of $362.4 million. *(Note: the method uses the slightly different approach as discussed in the FCFF valuation).*

In $ '000					
	2017E	**2018E**	**2019E**	**2020E**	**2021E**
FCFF	100,192	318,093	260,676	251,154	341,950
Terminal Value					4,267,586
Discount Factor	0.903	0.816	0.737	0.666	0.601

Unlevered Firm Value[50]	3,480,434
PV Tax Shield	108,734
Value of Operating Assets	3,589,168
+ Excess Cash &	1,660,013

[50]Sum of PV of FCFFs first five years (914,838) and PV of Terminal Value (2,565,596) *[In$'000]*

Short-Term Sec.[51]	
Less Adj. Debt:	362,445
Value of Equity	**4,886,736**
Shares Outstanding	104,035
Share Price '$	**47.0**

Table 35. Valuation: Adjusted Present Value

While the above method gets us through the first two steps, a final step involves adjusting for the expected bankruptcy costs. The estimation in this regard is not a simple one. In the section on cost of debt it was discussed on the company being in a 'safe zone'. While the average interest coverage ratio may suggest a higher credit rating, Altman score suggests a rating of 'BB' or higher which indicates a spread of 3.0% or lower according to Damodaran synthetic ratings table (in Appendix C) – in line with the estimation of 2% (to 3%) default spread for First Solar. Alternately, we can reverse-engineer the default spread estimate to get a credit rating from the same table, which gives us a BB+ rating.

If this is true, synthetic rating from above can be used to make an approximation for the company's probability of default with some accuracy. According to S&P report on global cumulative corporate default rates (2015), the probability of default for lowest investment grade rating BBB- was 3.4% over a five-year period. Considering the assumption from earlier to hold, the assumed bond rating of BB+ will possibly have a slightly higher default probability than 3.4%. Additionally, the average cumulative default on the investment grade rating was 1.1%, while the average for the speculative grade was 16.3%. The average for all rated securities was 6.4% and this has been used as a reasonable approximation (the average for the investment and speculative average default above can form a conservative estimate at 8.7%)[52].

[51] Non-operating assets

[52] This could be made more precise considering default probabilities (on similar rated companies) within the United States and/or solar/energy sector

The above probability is used with the assumption of cost of bankruptcy at 20% of the unlevered firm value to calculate the expected bankruptcy costs as given below.

In '$000	
Probability of Default (1)	6.4%
Cost of Bankruptcy (2)	20%
Unlevered Firm Value (3)	3,480,434
Expected Bankruptcy Costs (1x2x3)	44,550

Table 36. Expected Bankruptcy Costs

The estimate for the company's value of operating assets from earlier (or alternately the value of equity) can now be adjusted for the expected bankruptcy cost, to obtain a $46.5 price per share.

In '$000	
Value of Operating Assets	**3,589,168**
Expected Bankruptcy Costs	44,550
Adj. Value of Operating Assets	3,544,618
Less Adj. Debt:	362,445
+ Excess Cash & Short-Term Sec.	1,660,013
Adj. Value of Equity	**4,842,186**
Shares Outstanding	104,035
Share Price '$	**46.5**

Table 37. Adjusted Price per Share: APV

10.3. Economic Value Added

Before proceeding with the valuation using economic profit a few things must be noted. First is the use of EBITA (and not EBIT) for net operating profit in valuation[53]. Additionally, the capital invested has been defined in a different light to incorporate other long-term assets and liabilities, which has been discussed in the section for valuation metrics. Further, the return on invested capital is computed using the beginning of the year invested capital. All these follow from recommendation by Mckinsey & Co. (Koller, Geodhart and Wessels, 2012) in an equivalent economic profit model. Lastly, the valuation involves the use of normalized EBITA (conservative) for 2016, which was estimated previously in the section for valuation metrics[54].

The EVA is calculated as per the definition below and using WACC of 10.62% as computed earlier.

NOPLAT - (Invested Capital x Cost of Capital)

Where,

NOPLAT = Adj. EBITA (1 – T), which is EBITA adjusted for operating lease and taxes

The valuation for First Solar employs the formula as presented below.

$$[55]Value = Invested\ Capital_0 + \sum_{t=1}^{5} \frac{NOPLAT_t - (Invested\ Capital_{t-1} * WACC)}{(1+WACC)^t} + \frac{Invested\ Capital_5 * \left(\frac{Avg.ROIC - WACC}{WACC - g}\right)}{(1+WACC)^5}$$

[53]The use of EBITA avoids double-counting the amortization expense in the form of amortization and reinvestment. When acquired intangible loses value and is replaced through further investment, the reinvestment is expensed and the company is penalized twice (Koller, Geodhart and Wessels, 2012). *This is for illustration purpose, though a general consistency may be appropriate.*

[54]For ROIC and avg. ROIC

[55]$Value = Invested\ Capital_0 + \sum_{t=1}^{5} \frac{EVA_t}{(1+WACC)^t} + \frac{Invested\ Capital_5 * \left(\frac{Avg.ROIC-g}{WACC-g} - 1\right)}{(1+WACC)^5}$

Where the second component represents the continuity value, which is calculated using average of Return on Invested Capital over the forecasted and historic period (3-year[56]).

In $ '000					
	2017E	**2018E**	**2019E**	**2020E**	**2021E**
Adj. EBITA	300,749	313,459	333,012	334,391	327,982
Invested Capital[57]	2,194,922	2,410,023	2,453,133	2,572,391	2,726,561
EVA	67,632	57,497	72,472	61,184	38,402
Continuity Value					1,660,796[58]
Discount Factor	0.904	0.817	0.739	0.668	0.604

PV of EVA[59]	1,228,318
Invested Capital in 2016	2,194,922
Value of Operations	3,423,240
Less: Adj. Debt	362,445
Add: Excess Cash & ST Sec	1,660,013
Value of Equity	4,720,808
Shares Outstanding	104,035
Share Price ($)	**45.4**
Share Price (Optimized)	**46.0**

Table 38. Valuation: Economic Value Added

[56]A 5-year average is avoided and may require a normalization in earnings for 2012 which carries a substantial restructuring and impairment charge. A 4-year average results in a higher value

[57]Invested Capital is measured at the beginning of the year

[58]Using Invested Capital in 2021E [$2,757,754 *(in '000)*]

[59]PV of all EVA i.e. Sum of PV of EVA first five years and PV of Continuity Value

Note:

I) Invested Capital is measured at the beginning of the year

II) The average of ROIC results in a high value of 15.5% primarily due to the high historic returns (2014, 2015), which may not be sustainable in the long-run

10.4. Relative Valuation

Considering the Enterprise DCF as the primary approach, firm value earnings multiple enterprise value to EBITDA is selected for relative valuation. Additionally, considering its attributes as discussed in chapter 3[60], it is also regarded as a good fit for the utility-scale solar industry.

Obtaining comparable companies to First Solar is not straightforward. Although the renewables sector is large (solar, wind, water, geothermal etc.), companies in the solar sector offering similar range of services as First Solar are limited. While many have exited the market due to high uncertainty and competitive profitability in recent years, several others have been privatized, acquired or remain at the brink of bankruptcy. Nevertheless, the most comparable firms available are assumed to be Canadian Solar, JA Solar, Jinko Solar, Hanwha Q-Cells, Solar Edge, and SMA Solar[61]. While the initial four are close in function to First Solar, Solar Edge and SMA Solar are solar energy equipment and management providers for photovoltaic arrays.

The relative valuation in the thesis is based on current trading multiples obtained from Yahoo Finance (Oct 21-25, 2017) and is presented below.

[60]It overcomes the problem of accounting differences as well as varying levels of leverage across the firms. Also suits a larger number of peers than other multiples such as P/E since fewer firms have negative EBIDTA than negative earnings. Also, widely used in the capital-intensive firms etc.

[61]SunPower is another comparable firm but has been ousted due to significant outliers (and negative multiples). Others such as Vivint Solar etc. have not been considered due to varied business models (service-based residential etc.) and/or negative multiples

In $ 'Mn							
	First Solar	Canadian Solar	Jinko Solar	Hanwha Q-Cells	JA Solar	Solar Edge	SMA Solar
EV	3,280	2,980	2,350	1,300	800	1,120	1,058
EBITDA[62]	296.6	150.2	204.4	200.3	250.8	66.7	102.2
EV/EBITDA	**11.1**	**19.8**	**11.5**	**6.5**	**3.2**	**16.8**	**10.4**

Average[63]	**11.32**
Median	11.1
EV	3,357
Debt	433
Total Cash	2,230
Value of Equity	5,154
Shares Outstanding	104.4
Share Price ($)	**49.4**

Table 39. Relative Valuation

Compared to its peers, First Solar is close to the average and median multiple values. The price per share from the average EV/EBITDA of comparable companies yields an estimate of USD 49, which was close to the trading price of $47.4 (Oct 25, 2017) and does not significantly deviate from the fundamental valuation as well. However, there are a few important concerns that must be noted in the above case.

[62]EBITDA is provided by Capital IQ and may differ from other sources or company's own reporting. A detailed calculation using Morningstar values is shown in Appendix C. EBITDA and certain variables differ to provide a higher average of 12.5. However, this has little effect on the final estimate of value ($49.6) due to lower EBITDA

[63]The average is comparable to the Damodaran industry averages for enterprise multiple (as of Jan 2017), which lists it at 12.35 for Green & Renewable Energy, 11.88 for Semiconductors, 12.08 for Semiconductor Equipment etc. Although these are broad categories, they can hint at the general levels for companies in the industries

First and the foremost, that the Enterprise Value for First Solar above is $3,280 million and is based on the market capitalization during Oct 2017 when the price was trading at average levels of $48 per share. The company announced quarterly results on Oct 26, 2017 that highlighted higher than expected earnings and bookings, post which the company's price shot up by $10 the next day and had crossed the $60 mark by the end of the month. This reflects the theory that the market swiftly causes stock prices to incorporate and reflect all available information, and perhaps it is impossible to earn excess returns based on market information.

Additionally, since the market cap rose substantially it is highly likely that so did the enterprise value (assuming other variables do not vary much). Since earnings have increased it implies that EBITDA increased as well. Assuming that enterprise value and EBITDA increase in a proportion such that the original multiple value (EV/EBITDA of 11.1 above) is retained and the other comparable firm multiple values don't change much (thus the average is retained). In such a case the price per share of First Solar would increase substantially and the new results would indicate prices close to market prices beyond $60 per share, since while the average is retained the EBITDA has increased and the resulting EV will be higher[64]. This is confirmed using updated values which give estimates close to new prices.

The results hint at the influence of market moods and perception on stock prices in relative valuations, as a news of positive quarterly results was met with immediate market response. Similar news or events, for instance a bad quarter, change of management, success of competing firms, economic policies etc. could cause the stock price to move up or down substantially, while the underlying fundamentals may perhaps indicate different. Although some events could be rightfully impactful, the relative valuation in this regard appears prone to estimation errors, as well as indicates the necessity of a more reliable intrinsic valuation.

[64]The price had moved another $10 from general levels of $60 to $70 (Dec 10) in a few days after analyst meeting, which would give even new higher EV and share price. Additionally, First Solar also reports higher cash balances in the new quarter

Although general stock trend in 2017 is on the upside, it is noted that fluctuations in the price of First Solar may not be uncommon over comparatively longer periods. For instance, considering prices in the past year shows that the stock was at a low level of $27 in April 2017 and had smoothly declined from a high level of $72 in March 2016. Similarly, it had moved to this level from a share price of $43 in Sep 2015.

Additional Notes & Discussion

Relying solely on relative valuation may be easy, but may cause neglect of the underlying fundamentals, as well as ignore the issues and realities concerning business plans, industry and other important variables. While some theorists believe the market to be all-knowing, many others think it could be just as irrational. For fundamental analysts there are always opportunities to find undervalued or overvalued stocks and benefit from the disparity in prices.

According to Goedhart, M., Koller, T., and Wessels, D. (2005) at McKinsey & Co., based on their experience managers dedicated to maximizing shareholder value tend to gravitate towards DCF analysis as the most accurate and flexible method. Additionally, the multiples can be useful in informing on the DCF valuations, as well as to stress-test its cash flow forecasts and initiate discussions on the key factors creating value in the industry (and the company's strategic positioning in this regard). Apart from the issue concerning comparable companies the authors also comment on the conflicting conclusions that different multiples can provide. For instance, First Solar has a recent book value per share of $52.8 and with the average P/B (higher than First Solar) using the companies above would easily justify its current high levels and even beyond ($82 per share). However, considering the P/S ratio (trailing twelve month) similarly would give a much lower price of $32 per share. Also, considering normalized earnings given by the company (for 2016 quarter) the trailing twelve-month earnings per share of $0.63 would inflate the P/E ratio at significantly high levels of above 100, while its peer companies trade at a much lower average. This would imply that the company is overvalued at current levels (even though its earnings have improved over the quarters)[65].

[65]If for instance, the company has a very good year ahead and posts higher earnings per share, its P/E ratio would be much lower and may reflect its true value

Of a few recommendations, the above authors recommend the use of forward looking multiples, which according to empirical evidence could be more accurate predictors of value. For instance, as quoted, in one study researchers compared the attributes and performance of historical and forward industry multiple for a subset of companies on various U.S. exchanges, and found the dispersion of historical E/P ratios to be almost twice that of one-year forward E/P when they compared individual companies against their industry mean[66]. Similarly other research also point in support for forward multiples. Considering this, the forward P/E average for First Solar and the companies above is found to be 32.04. Further, using the analysts' average earnings forecasts for First Solar available at Yahoo Finance for next year (2018) at $1.47, the company's price per share computes to $47.1.

[66]They also found that the forward multiples promoted greater accuracy in pricing (median pricing error was 23% for historical multiples, 18% for one-year forecasted earnings and 16% for two-year forecasts)

11. Sensitivity Analysis

The estimation of a company's intrinsic worth entails several assumptions regarding the company's future. In order to evaluate the impact of these assumptions on the estimated price of First Solar a sensitivity analysis is conducted, primarily with respect to changes in terminal growth and WACC. Additionally, the impact of changes in average Return on invested capital (used as approximation for continuity value) is also assessed in valuation using EVA.

FCFF		**WACC**						
		10.00%	**10.20%**	**10.40%**	**10.62%**	**10.80%**	**11.00%**	**11.20%**
Growth	**1.90%**	47.1	46.2	45.4	44.5	43.8	43.0	42.3
	2.10%	47.8	46.9	46.0	45.1	44.3	43.6	42.8
	2.30%	48.6	47.6	46.7	45.7	44.9	44.1	43.4
	2.50%	49.3	48.3	47.3	**46.3**	45.6	44.7	43.9
	2.70%	50.2	49.1	48.1	47.0	46.2	45.3	44.5
	2.00%	47.5	46.6	45.7	44.8	44.1	43.3	42.6
	3.10%	51.9	50.8	49.7	48.5	47.6	46.7	45.8

Table 40. SA FCFF 1

FCFF	**Beta**			
	1.20	1.40	1.59	1.80
	58.5	51.4	46.3	42.0

Table 411. SA FCFF 2

APV		**Unlevered Cost of Equity**						
		10.0%	10.3%	10.5%	10.7%	11.0%	11.2%	11.5%
Growth	1.8%	47.4	46.1	45.3	44.5	43.4	42.7	41.7
	2.0%	48.1	46.7	45.9	45.0	43.9	43.2	42.2
	2.2%	48.8	47.4	46.5	45.6	44.5	43.7	42.6
	2.5%	50.0	48.4	47.5	46.6	45.3	44.5	43.4
	2.7%	50.8	49.2	48.2	47.2	45.9	45.1	43.9

	2.9%	51.6	50.0	48.9	47.9	46.6	45.7	44.5
	3.1%	52.6	50.8	49.7	48.7	47.3	46.4	45.1

Table 422. SA APV

EVA		**WACC**						
		10.00%	**10.20%**	**10.40%**	**10.62%**	**10.80%**	**11.00%**	**11.20%**
Growth	**1.90%**	47.5	46.6	45.7	44.7	44.0	43.2	42.4
	2.10%	47.8	46.8	45.9	44.9	44.2	43.4	42.6
	2.30%	48.1	47.1	46.1	45.1	44.4	43.5	42.8
	2.50%	48.4	47.4	46.4	45.4	44.6	43.7	42.9
	2.70%	48.8	47.7	46.7	45.6	44.8	43.9	43.1
	2.90%	49.1	48.0	47.0	45.9	45.0	44.2	43.3
	3.10%	49.5	48.3	47.3	46.1	45.3	44.4	43.5

Table 433. SA EVA 1

EVA		**WACC**						
		10.0%	**10.2%**	**10.4%**	**10.6%**	**10.8%**	**11.0%**	**11.2%**
Avg. ROIC	**11.0%**	38.5	37.8	37.2	36.5	36.0	35.4	34.9
	11.5%	39.6	38.9	38.2	37.5	36.9	36.3	35.7
	12.0%	40.7	39.9	39.2	38.5	37.9	37.2	36.6
	12.5%	41.8	41.0	40.2	39.4	38.8	38.2	37.5
	13.0%	42.9	42.1	41.3	40.4	39.8	39.1	38.4
	13.5%	44.0	43.1	42.3	41.4	40.7	40.0	39.3
	14.0%	45.1	44.2	43.3	42.4	41.7	40.9	40.2
	14.5%	46.2	45.2	44.3	43.4	42.7	41.9	41.1
	15.0%	47.3	46.3	45.4	44.4	43.6	42.8	42.0
	15.5%	48.4	47.4	46.4	45.4	44.6	43.7	42.9

Table 444. SA EVA 2

12. Conclusion

First Solar is in the right time to capitalize on the growing popularity and potential of the solar and other renewable energy markets. With sound experiences and capabilities, it has a reasonable advantage to establish and sustain as a prominent renewable energy company. The key question in this regard is how well the company manages to stay ahead of the growing competition, and whether its shareholders can expect to benefit from its participation in the 'contest' for renewables.

First Solar will have to think beyond cost and module-efficiency to focus on long-term sustainability strategy. While the former are essential for competitiveness, the company is already facing stiff competition in maintaining cost-advantage, especially from Chinese manufacturers. Additionally, the industry is assumed to be in a price war due to over-capacity and competing technologies are already catching up in terms of module efficiency. Moreover, despite sound project development and management capabilities, First Solar is not unique in this business and is expected to face added competition from larger firms with better financial resources, and possibly looking to diversify their energy portfolios into conventional as well as renewable energy.

First Solar may have to make quality investments to maintain its technology edge while minimizing costs, which may decrease shareholder returns at times. Additionally, First Solar may have to further improve and market its bankability, enter new markets and territories, focus on relationship management, as well as partner with other solar or renewable firms to compete successfully. The new management in this regard looks competitive but may have a challenging task ahead.

Going forward, it would be interesting to see the future impact on margins and the profitability of sales across the industry, especially as the competition rises. The renewable industry overall and especially solar show sound prospects, and met with support mechanisms that are expected to stay for a while are likely to establish it as a prominent resource alongside conventional fuels.

The company's DCF valuation considering its business, financials, and relevant factors in environment etc. give a price per share of $47. The company trading at the current level of $70 (Dec 10) in this regard is overvalued. The current inflated price of the stock appears to be an emotional buying spree. Investors should avoid purchasing at such a high price and a general sell consideration is suitable. Long-term shareholders with an inclination or belief in the renewable segments could hold to the stock, which may be a decent addition to a diversified portfolio.

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APPENDIX A

FIRST SOLAR INC. (FSLR)
CONSOLIDATED BALANCE SHEET

USD in thousands except share data	2014	2015	2016	2017E	2018E	2019E	2020E	2021E
Assets								
Current Assets								
Cash								
Cash and cash equivalents	1,482,054	1,126,826	1,347,155	1,516,672	1,741,895	1,962,301	2,177,747	2,510,338
Operating Cash	*339,181*	*357,900*	*295,133*	*300,990*	*307,010*	*328,500*	*351,495*	*369,070*
Excess Cash	*1,142,873*	*768,927*	*1,052,022*	*1,215,682*	*1,434,885*	*1,633,800*	*1,826,252*	*2,141,267*
Marketable Securities	509,032	703,454	607,991	697,546	729,857	780,947	835,613	877,394
Total cash	1,991,086	1,830,280	1,955,146	2,214,218	2,471,752	2,743,248	3,013,360	3,387,732
Receivables net	212,405	559,800	472,217	481,584	491,215	525,601	562,393	590,512
Inventories	505,088	380,424	363,219	376,197	383,721	410,582	439,322	461,288
Deferred income taxes	91,565							
Prepaid expenses	42,193	74,990	77,343	86,517	88,248	94,425	101,035	106,087
Other current assets	348,129	500,092	918,695	600,625	614,019	657,001	702,991	691,268
Total Current Assets	**3,190,466**	**3,345,586**	**3,786,620**	**3,759,141**	**4,048,956**	**4,430,855**	**4,819,101**	**5,236,887**
Non-Current Assets								
Property, plant and equipment, net	1,402,304	1,284,136	629,142	1,023,707	1,037,055	1,083,209	1,137,725	1,154,872
PV solar power systems	46,393	93,741	448,601	470,650	492,856	517,323	544,187	572,639
Equity and other investments	662,082	733,683	613,668	610,133	622,336	665,899	712,512	748,138
Goodwill	84,985	84,985	14,462	14,462	14,462	14,462	14,462	14,462
Intangible assets	119,236	110,002	87,970	78,946	76,980	75,695	75,058	74,881
Deferred income taxes	222,326	357,693	252,655	265,513	270,721	274,841	271,154	274,005
Other long-term assets	996,647	1,306,505	1,034,095	1,076,304	1,048,132	1,030,318	994,924	972,677
Total Non-Current Assets	**3,533,973**	**3,970,745**	**3,080,593**	**3,539,714**	**3,562,541**	**3,661,747**	**3,750,023**	**3,811,675**
Total Assets	**6,724,439**	**7,316,331**	**6,867,213**	**7,298,855**	**7,611,497**	**8,092,602**	**8,569,124**	**9,048,562**
Liabilities and Stockholders' Equity								
Liabilities								
Current Liabilities								
Short-term debt - current portion LTD	51,918	38,090	27,966	20,807	20,807	20,807	20,807	20,807
Accounts payable	214,656	337,668	148,730	208,714	212,889	227,791	243,736	255,923
Taxes payable	1,727	1,330	5,288	(14,196)	(720)	26,411	53,417	81,211
Accrued liabilities	388,156	409,452	262,977	264,251	269,536	288,404	308,592	324,022
Deferred revenues	21,879	17,957	7,742	9,067	9,248	9,896	10,588	11,118
Other current liabilities	322,760	156,303	447,004	291,247	297,072	317,867	340,118	357,124
Total Current Liabilities	**1,001,096**	**960,800**	**899,707**	**779,892**	**808,833**	**891,176**	**977,260**	**1,050,205**
Non-Current Liabilities								
Long-term debt	165,003	251,325	160,422	345,709	275,748	289,535	304,012	319,213
Accrued liabilities	246,307	163,407	166,277	185,687	189,388	199,656	195,781	210,487
Other long-term liabilities	284,546	392,312	428,120	443,503	459,438	475,946	493,048	510,763
Total Non-Current Liabilities	**695,856**	**807,044**	**754,819**	**974,899**	**924,574**	**965,138**	**992,841**	**1,040,463**
Total Liabilities	**1,696,952**	**1,767,844**	**1,654,526**	**1,754,790**	**1,733,407**	**1,856,314**	**1,970,101**	**2,090,668**
Stockholders' Equity								
Common stock	100	102	104	104	104	104	104	104
Additional paid-in capital	2,697,558	2,742,795	2,759,211	2,759,211	2,759,211	2,759,211	2,759,211	2,759,211
Retained earnings	2,279,689	2,790,110	2,463,279	2,784,749	3,118,774	3,476,973	3,839,708	4,198,579
Accumulated other comprehensive income	50,140	15,480	(9,907)	-	-	-	-	-
Total Stockholders' Equity	**5,027,487**	**5,548,487**	**5,212,687**	**5,544,064**	**5,878,089**	**6,236,288**	**6,599,023**	**6,957,894**
Total Liabilities and Stockholders' Equity	**6,724,439**	**7,316,331**	**6,867,213**	**7,298,855**	**7,611,497**	**8,092,602**	**8,569,124**	**9,048,562**

FIRST SOLAR INC (FSLR)
CONSOLIDATED INCOME STATEMENT

USD in thousands	2014	2015	2016	2017E	2018E	2019E	2020E	2021E
Revenue	**3,391,814**	**3,578,995**	**2,951,328**	**3,009,898**	**3,070,096**	**3,285,003**	**3,514,953**	**3,690,701**
Cost of Revenue	**2,564,709**	**2,659,728**	**2,247,349**	**2,258,559**	**2,303,730**	**2,464,991**	**2,637,541**	**2,769,418**
Gross Profit	**827,105**	**919,267**	**703,979**	**751,340**	**766,366**	**820,012**	**877,413**	**921,283**
Operating Expenses								
Research and development	143,969	130,593	124,762	121,068	123,490	132,134	141,383	148,453
Sales, General and administrative	258,973	272,010	263,015	246,633	251,565	269,175	288,017	302,418
Restructuring & Asset impairments	-	-	818,792	56,646	36,646	16,646	16,646	16,646
Total Operating Expenses	**402,942**	**402,603**	**1,206,569**	**424,347**	**411,701**	**417,955**	**446,047**	**467,517**
Operating Income	**424,163**	**516,664**	**(502,590)**	**326,992**	**354,665**	**402,057**	**431,366**	**453,766**
Interest Expense	1,982	6,975	20,538	15,070	17,461	16,219	16,844	17,500
Other income (expense)	9,810	10,146	51,438	10,872	10,872	10,872	10,872	10,872
Income Before Taxes	**431,991**	**519,835**	**(471,690)**	**322,794**	**348,076**	**396,709**	**425,394**	**447,139**
Provision for income taxes	30,124	(6,156)	58,219	38,735	52,211	79,342	106,348	134,142
Other income (Equity in Earnings)	(4,949)	20,430	171,945	37,412	38,160	40,831	43,689	45,874
Net income from continuing operations	396,918	546,421	(357,964)	321,470	334,025	358,199	362,735	358,871
Net Income	**396,918**	**546,421**	**(357,964)**	**321,470**	**334,025**	**358,199**	**362,735**	**358,871**

APPENDIX B

Projects Sold/Under Contract

(Includes uncompleted sold projects, projects under sales contracts subject to conditions precedent, and EPC agreements including partner developed projects that we will be or are constructing.)

Project/Location	Project Size in MW AC(1)	PPA Contracted Partner	EPC Contract/Partner Developed Project	Expected Year Revenue Recognition Will Be Completed By	As of December 31, 2016	
					Percentage Complete	Percentage of Revenue Recognized
Moapa, Nevada	250	LADWP	(2)	2017	99%	—%
Helios, Honduras	25	ENEE(3)	Grupo Terra	2017	7%	7%
Total	275					

Projects with Executed PPA Not Sold/Not Contracted

Project/Location	Project Size in MW AC(1)	Fully Permitted	PPA Contracted Partner	Expected or Actual Substantial Completion Year	Percentage Complete as of December 31, 2016
California Flats, California	280	No	PG&E/Apple Inc.(4)	2018	45%
India (multiple locations)	250	No	(5)	2016/2017	69%
Rosamond, California	150	Yes	SCE	2018	11%
Sun Streams, Arizona	150	Yes	SCE	2019	4%
Luz del Norte, Chile	141	Yes	(6)	2016	100%
American Kings Solar, California	126	No	SCE	2020	5%
Willow Springs, California	100	Yes	SCE	2018	16%
Sunshine Valley, Nevada	100	Yes	SCE	2019	2%
Switch Station 1, Nevada	100	Yes	Nevada Power Company	2017	45%
Switch Station 2, Nevada	79	Yes	Nevada Power Company / Sierra Pacific Power Company	2017	6%
Ishikawa, Japan	59	Yes	Hokuriku Electric Power Company	2018	13%
Manildra, Australia	49	Yes	EnergyAustralia	2018	1%
Japan (multiple locations)	41	No	Tokyo Electric Power Company	2019/2020	7%
Little Bear, California	40	No	Marin Clean Energy(7)	2020	4%
Miyagi, Japan	40	No	Tohoku Electric Power Company	2018/2019	10%
Cuyama, California	40	Yes	PG&E	2017	30%
Total	1,745				

(1) The volume of modules installed in MW DC will be higher than the MW AC size pursuant to a DC-AC ratio typically ranging from 1.2 to 1.3; such ratio varies across different projects due to various system design factors

(2) Contracted but not specified

(3) ENEE is defined as Empresa Nacional de Energía Eléctrica

(4) PG&E 150 MW AC and Apple Energy, LLC 130 MW AC

(5) Southern Power Distribution Company of Telangana State Ltd—110 MW AC; Andhra Pradesh Southern Power Distribution Company Ltd—80 MW AC; Gulbarga Electricity Supply Co.—20 MW AC; Bengaluru Electricity Supply Co.—20 MW AC; and Chamundeshwari Electricity Supply Co.—20 MW AC

(6) PPAs executed for approximately 70 MW AC of capacity; remaining electricity to be sold on an open contract basis

(7) Expandable to 160 MW AC, subject to satisfaction of certain PPA contract conditions

Source: Annual Report 2016

APPENDIX C

I)

In 'Mn	First Solar	Canadian Solar	Jinko Solar	JA Solar	SMA Solar	SolarEdge	Hanwha Q-Cells
Currency	*USD*	*USD*	*CNY*	*CNY*	*EUR*	*USD*	*USD*
Cash	1,510	497	1,531	3,234	423	113	331
ST In.	720	-	3,261	-	9	80	-
Total Cash	2,229	497	4,792	3,234	432	194	331
ST Debt	14	2,106	10,834	4,126	3	-	701
LT Debt	307	399	468	2,051	-	-	336
Market Cap.	4,950	935	5,260	2,286	1,320	1,290	666
Minority Interest (MI)	-	25	(1)	-	-	-	
EBITA	262	114	1,309	970	97	75	112
EV	3,042	2,968	11,769	5,229	891	1,096	1,372
EV/EBITDA	10.8	26.0	9.0	5.4	9.2	14.6	12.2

Average	**12.5**
EV	3,269
Less Debt & MI	321
Add Total Cash	2,229
Equity Value	5,177
Shares Outstanding (Mn)	104.43
Share Price ($)	**49.6**

i) Data prior to Oct 26, 2017
ii) Normalized EBITDA (3Q 2016 to 2Q 2017) for First Solar is obtained from the company's website
iii) Formula for Enterprise Value uses total cash for simplicity and does not incorporate estimations for operating cash (at 10% of revenue this results in a share price of $51)

II) For large non-financial service companies with market cap > $ 5 billion

Interest Coverage Ratio >	***≤ to***	***Rating is***	***Spread is***
8.50	100000	Aaa/AAA	0.60%
6.5	8.499999	Aa2/AA	0.80%
5.5	6.499999	A1/A+	1.00%
4.25	5.499999	A2/A	1.10%
3	4.249999	A3/A-	1.25%
2.5	2.999999	Baa2/BBB	1.60%
2.25	2.49999	Ba1/BB+	2.50%
2	2.2499999	Ba2/BB	3.00%
1.75	1.999999	B1/B+	3.75%
1.5	1.749999	B2/B	4.50%
1.25	1.499999	B3/B-	5.50%
0.8	1.249999	Caa/CCC	6.50%
0.65	0.799999	Ca2/CC	8.00%
0.2	0.649999	C2/C	10.50%
-100000	0.199999	D2/D	14.00%

**As of January 2017, Damodaran Online*

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