"Valuation of Scatec Solar ASA"

Master's Thesis

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Preface

This thesis completes our Master of Science in Economics & Business Administration at Copenhagen Business School. The purpose is to utilize knowledge we have acquired during our two-year Finance and Investments program.

We believe that our genuine interest for courses like Corporate Finance, Financial Statement Analysis, and Valuation have provided us with an adequate base and the necessary skills to perform a complete company valuation.

Our motivation for the chosen topic is to apply some of the acquired knowledge on an interesting and highly current topic. Climate change and renewable energy have become a widely discussed issues worldwide, and solar energy has emerged as one of the most exciting renewable energy sources. By performing a valuation of Scatec Solar ASA we are able to learn more about the solar energy industry and to apply our financial and economic knowledge to value the company. As the authors both originate from a country usually associated with the petroleum industry, we thought it would be interesting to value one of the very few Norwegian solar energy companies.

Finally, there are some people who deserve to be mentioned. First and foremost, we would like to express our gratitude to our supervisor, Jens Borges, for meaningful discussions, feedback, and advice during the process. We would also like to give special thanks to Terje Osmundsen, SVP of Business Development, and Julie Hamre, Senior Advisor, in Scatec Solar for valuable insight and access to market reports and company material.

Copenhagen, May 15, 2017

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1. Executive Summary

Scatec Solar ASA is a fully integrated independent solar power producer. The company was officially founded in 2007 and listed on the Oslo Stock Exchange in 2014. Scatec Solar is present in all stages of the value chain except for the production of solar panels. Through their integrated business model, the company is able to collect a piece of the revenue in every stage of the power generation process. Currently the company has 12 solar plants in five countries, with a capacity of 322 megawatts. With an ambition of having 1.3-1.5 gigawatts in capacity by 2018, Scatec Solar is hoping to become a significant player in the solar energy industry.

This industry has experienced exceptional growth in the last 15 years. Between 2001 and 2016 the global installed capacity has increased from being virtually zero to 300 gigawatts, a result of cost reductions and government initiatives. Between now and 2020, it is expected that the total capacity could double, much due to the increased focus on renewable energy and the resulting Paris Agreement of 2016. In recent years, solar energy has become more cost competitive, and it is expected that it will obtain a larger share of the global energy sector.

The purpose of the thesis is to estimate an intrinsic value of Scatec Solar's common equity as of March 31, 2017. This is done through the use of two approaches to the discounted cash flow model, where the initial valuation is meant to estimate a core value using a FCFF model, supplemented by a sensitivity analysis. Further, a sum-of-the-parts approach (SOTP) is used to incorporate the company's focus on its segments' cash flows to equity, and used in both the sensitivity analysis and a separate scenario analysis, implementing the FCFE model. As the analysis revealed some uncertainty regarding the future of Scatec Solar's project portfolio, the combination of the two approaches is meant to provide an estimated interval of the company's share price.

The result of the core valuation was a share price NOK 48.92 as of March 31, 2017. This estimate proved to be highly sensitive to both profit margin and pre-tax cost of debt, with the latter explained by the company's high financial leverage. The scenario analysis included both a potential upside and downside, resulting in a range between NOK 31.61 and NOK 63.45. Based on the results from the different approaches, and the findings from the strategic and financial analysis, the estimated interval of Scatec Solar's share was estimated to be between NOK 33.23 and NOK 51.14. As of March 31, 2017, the company's share traded at NOK 38.30.

Contents

3. Introduction

3.1 Background and Motivation

As we are writing this thesis, we are a finishing the two-year MSc program Finance and Investments at Copenhagen Business School. This is a program with a specific focus on the analysis of companies and investments. We, therefore, find it interesting to use this acquired knowledge through performing a valuation, which incorporates all aspects of a company, both in terms of accounting and finance.

Our motivation for valuing Scatec Solar ASA has much to do with the industry in which the company operates. The solar energy industry is not a new industry, but it is only as of recent that it has gained serious traction as a result of lower cost and, consequently, increased competitiveness. Much of the increasing focus on solar power is due to climate change and the need for energy sources that are more environmental friendly. According to NASA (2017), 2016 was the warmest year ever recorded on Earth, which have given rise to questions regarding how the world should address this issue. There have been many attempts from governments to limit emissions in the past, with the Kyoto Protocol being one of the more known. However, it is only of recent, with The Paris Agreement, which was established in 2016, that the world's governments have come together to form a more binding framework with a clearly stated target.

As a result of this shift, renewable energy sources have become more relevant as replacements for fossil fuels. Among these renewables is solar power, which has now experienced a significant boost in recent years, with global installations skyrocketing in the last ten years. According to IRENA (2016a), global capacity has increased from 5 GW in 2005 to over 300 GW in 2016, a significant increase considering that solar power has often been considered to not be competitive.

A company that is seeking to take advantage of this rapid industry expansion is Scatec Solar, a Norwegian company that develops, owns, and operates solar projects in emerging markets around the world. Scatec Solar has experienced significant growth over the last four years, increasing production capacity annually by approximately 65% on average, and still setting ambitious goals for the future Scatec Solar (2017a).

The company's rapid growth and optimistic goals are the source of motivation for why we chose Scatec Solar. Traditionally, Norway, the authors' country of origin, is known for exporting oil and salmon, which is why Scatec Solar stands out. Because of this, we find it both interesting and educational to research and analyze a company that has not received much focus in the past, from neither financial analysts nor fellow scholars.

3.2 Problem Statement

The purpose of this thesis is, first and foremost, to determine an intrinsic value of Scatec Solar ASA. By using different valuation methods, and through the use of both pre-exisiting and newly acquired knowledge on the subject at hand, we will propose a qualified estimate of Scatec Solar's equity value as of March 31, 2017.

The specific problem statement is as follows:
What is the intrinsic value of Scatec Solar's shareholder's equity as of March 31, 2017?

To answer this question, and due to the nature of Scatec Solar's business operations, we have divided the problem statement into several subsections. Each section alone cannot give answer to the overall problem statement. This is why we seek to incorporate findings from all sections in order to answer the question at hand. The layout of the subsections is closely linked to the structure of the thesis.

Company Presentation of Scatec Solar

In order to estimate a value of Scatec Solar it is both natural and crucial to have substantial knowledge about the company itself. It is important to know how it operates and the nature of its business model. On a global scale, Scatec Solar is a relatively small company operating in an industry that has the potential to change the global energy structure.

- What is the company's strategy and business model?
- What is it that characterizes Scatec Solar compared to others in the industry?
- How is the company structured, and how does the company generate value?
- Are there competitors with similar business models?

Introduction to the Solar Power Industry

An important factor determining Scatec Solar's future success is the development of the solar power industry. In order to be profitable many solar energy companies are reliant on lower production costs, beneficial government involvement, and support mechanisms that all contribute to making the solar energy industry competitive compared to other energy sources. It is therefore important for Scatec Solar, considering that they operate in emerging markets, that these above-mentioned factors are predictable and reliable in the future.

- What are the policies and support mechanisms that are currently in place?
- How has the industry developed in recent years?
- What is the future market outlook?

Strategic Analysis

In order to understand how Scatec Solar creates value it is important to analyze the internal and external factors that enables the company to do so. The strategic analysis will address and identify the forces that affect Scatec Solar's ability to be profitable both now and in the future. Through the use of a selection of models the analysis will help provide an understanding of the non-financial factors that affect the company's operations.

- How strong is Scatec Solar's competitive position in the industry?
- Which internal and external drivers represent strengths, weaknesses, opportunities, and threats to Scatec Solar?

Financial Analysis

To be able to estimate a company's performance in the future, it is important to analyze how it has performed in the past. In order to do so, it is essential to perform a thorough financial analysis using both tools and methods that could identify key measures and trends that can be used when forecasting future performance. Typically, such analysis would require several years of data. However, considering the exponential growth of the solar energy industry in recent years, the focus should be on recent trends and developments in the financial performance.

- How has the company performed historically?
- How has the different segments performed?
- Can trends and indications from past performance help predict the future?
- Based on the segment analysis, can we predict each segment going forward?

Estimating Cost of Capital

This section will address the company's future cost of capital, including the estimation of the term structure, cost of equity, and cost of debt. These estimates are used when applying valuation models to arrive at an intrinsic equity value.

- What is the term structure of the risk free rate in the forecasting period?
- What is best estimate of a market risk premium for a company like Scatec Solar?
- What is the company's market risk?
- What is the company's cost of equity?
- What is the company's cost of debt?
- What is the appropriate tax rate?

Forecasting

The purpose of forecasting is to estimate Scatec Solar's future cash flows. Through the incorporation of findings based on historical performance, strategic analysis, and estimation of future potential, the forecast predicts future performance as a precedent for today's value of equity.

- How will factors such as historical performance, conclusions from strategic analysis, and estimates of future market conditions affect Scatec Solar's future performance?

Core Valuation and Sensitivity Analysis

In this section, the purpose is to estimate an intrinsic value of equity related to the company's core operation with projects currently in operation and backlog. As there are many factors that affect the estimation of the value of Scatec Solar's equity, we will also use this section to perform a sensitivity analysis to see how it will affect the end result.

- What is the estimated intrinsic value of equity?
- How is the estimated value affected by changes in key value drivers and variables?

Scenario Analysis

In addition to performing a sensitivity analysis, we also want to see how Scatec Solar's share price is affected by different scenarios related to the company's future growth in production capacity.

- What will be the effect on share price if Scatec Solar is not able to realize expected expansion in production capacity?
- What will be the effect on share price if Scatec Solar is able to grow more than current expectations?

Conclusion

The purpose of this section is to conclude based on the results from our valuation, and compare these findings to what is expected in the market today. It is appropriate to address what could be the cause of the gap between the expectations brought forward in this thesis, compared to the market expectation.

- What is the estimated value of Scatec Solar's share?
- Should the estimated value of Scatec Solar's share be presented as an interval?

3.3 Data Collection and Validity

The qualitative and quantitative analysis of this thesis is solely based on publicly available information. Several sources of data have been used, including Scatec Solar's own reports and presentations, market data from Bloomberg, IRENA, IEA, Ren21, SolarPower Europe, IFC, and Thomson Reuters Datastream, as well as Nordea analysts' coverage of the company. A few carefully selected articles from credible journalists and analysts on the discussed topic have also been used in the strategic analysis. Financial and economic theories applied are obtained from different academic books, papers and other literature of relevance.

It is important to be critical to the sources of both the quantitative, and qualitative information. The solar power industry is a relatively immature industry only covered extensively by a rather small selection of publishers. Many of these publishers are organizations or agencies with ties to either renewables or solar energy, and could have incentives to promote the performance and outlook of the industry. These sources have been properly cross-examined against more impartial sources, such as Bloomberg, to ensure their validity. The overall impression of the different sources is that they are both consistent and reliable.

Large parts of the quantitative analysis are based on quarterly and annual reports published by Scatec Solar, in addition to company presentations from events such as investor days. As Scatec Solar is listed on the strictly regulated Oslo Stock Exchange and audited frequently, the documents are assumed to be reliable.

3.4 Limitations and Assumptions

Certain limitations and assumptions apply throughout the entire thesis:

- The valuation is based on publicly available information up until March 31, 2017, as Scatec Solar's annual report for 2016 was published the day before. This implies that information from the Q1 2017 report published May 5, 2017 not is considered. As we had to base the valuation on 2016 figures, we will compound the estimated share price as of January 1, 2017 by the cost of equity in order to end up with a share price as of March 31.
- The intrinsic value estimated in the valuation will be presented as an interval, due to the uncertainties regarding future projects of Scatec Solar and the development of the solar power industry. Furthermore, the company will not be assessed to be undervalued or overvalued by the market given the above discussion.
- Scatec Solar's share price was NOK 38.50 by the end of 2016, and NOK 38.30 as of March 31, 2017.
- Scatec Solar was listed as late as in 2014, leading to a relatively limited set of historical data. We are aware that this might lead to estimation errors and/or forecasting biases.
- It is assumed that the reader possesses basic knowledge of financial and economical terminology.
- The thesis is based on nominal figures, meaning that inflation is not adjusted for.
- We have assumed a terminal growth of 0% as the growth of Scatec Solar is solely dependent on the acquisition of new projects, and that the potential upside related to revenues is limited due to a fixed production and price through power purchase agreements (PPA).
- We were not able to retrieve PPA prices for Scatec Solar's projects from any reliable sources. Hence, revenues for future solar projects are estimated based on historical data and assumptions.

4. Company Presentation of Scatec Solar ASA

This chapter provides a brief presentation of Scatec Solar, including the company's history, structure and operations. Certain elements of the presentation that can be related to a strategic analysis will be revisited and discussed in the analyzes in chapters 6 and 8.

4.1 Overview

Scatec Solar ASA is a fully integrated independent solar power producer headquartered in Oslo, Norway. Besides from producing solar panel components, the company is present through the entire solar power value chain. Scatec Solar's business model is to be present in the entire process of producing energy through solar power, with operations mainly in emerging markets. This means that the company is involved in project development, financing, construction, operations and ownership of solar power plants. The company currently owns and operates at solar power plants located in South Africa, Rwanda, Honduras, Jordan and the Czech Republic. The total capacity of these plants is 322 MW worth of electricity (Scatec Solar, 2017a).

4.1.1 History

Scatec Solar was established in February 2007 after acquiring a 50% stake in Solarcompetence GmbH, a German solar plant development company established back in 2001. At that time, Solarcompetence had installed the world's largest solar power plant, with a capacity of 6.3 MW (Nordea, 2016). After strictly selling Development & Construction services to third-parties Scatec Solar expanded into the Operation & Management segment by entering Czech Republic and Italy in 2008. In 2009, the company acquired the remaining 50% stake in Solarcompetence. In the following years, Scatec Solar continued their expansion through the acquisition of solar power projects in South Africa, France, and the United States. In 2012, the company underwent a strategic shift in their business model by becoming an integrated independent solar power producer (IPP), meaning that they went from performing services to third parties to owning and integrating these services at their own plants. Following the strategic shift, the company was awarded concession agreements for two additional solar plants in South Africa the same year, increasing its total capacity to 190 MW in the country. In the following years the geographical expansion continued with acquisitions of solar parks in Honduras, Rwanda, and Jordan (Scatec Solar, 2017c).

Scatec Solar was listed on the Oslo Stock Exchange in October 2014 under the name Scatec Solar ASA, with ticker SSO[1]. The company was awarded the *Norwegian Industry's*

[1]Scatec Solar ASA will be referred to as Scatec Solar, Scatec, and SSO throughout this thesis.

Climate Prize 2015 for giving more people access to affordable and renewable energy (Scatec Solar, 2017c). Since the official establishment in 2007, the company has installed solar parks with a combined capacity of 600 megawatts (MW) in addition to approximately 1.8 gigawatts (GW) in development. SSO seeks to have up to 1.5 GW in operation and under construction by the end of 2018, and only in 2016 three additional projects, with a total capacity of 309 MW, were added to the company's backlog. In December 2016, the 104 MW Red Hills plant in the United States was sold with a net gain of NOK 67 million on a consolidated basis. With operations and projects under construction in Africa, the Americas, Asia, the Middle East, and Europe, Scatec Solar can be considered a global producer of solar power (Scatec Solar, 2017d). An overview of the company's projects currently in operation, backlog and pipeline is presented in the next section.

4.2 Projects

4.2.1 Operating

Scatec Solar currently has operating solar plants in five countries spread over three different continents. Considering that the Czech portfolio consists of four plants, and EJRE and GLAE are two independent plants, the company has a total of 12 solar plants in operation. Table 4.1 presents the most essential information about each solar project, including capacity, expected production, and ownership stake.

Table 4.1: Scatec Solar's projects in operation.

Plant	Country	Ownership Stake	Capacity, MW	Expected production, MWh/year	Start of Operation	Project Owners
Czech portfolio	Czech Republic	100%	20	20,500	2011	Scatec Solar ASA
Kalkbult	South Africa	39%	75	150,000	2014	Scatec Solar ASA, Norfund, Standard Bank (RWA), Simacel, Old Mutual
Dreunberg	South Africa	39%	75	178,000	2014	Scatec Solar ASA, Norfund, KLP, Standard Bank South Africa, Simacel
Linde	South Africa	39%	40	94,000	2014	Scatec Solar ASA, Norfund, KLP, Standard Bank South Africa, Old Mutual
ASYV	Rwanda	43%	8.5	15,500	2014	Scatec Solar ASA, Norfund, GWG Cooperatief U.A
Agua Fria	Honduras	40%	60	103,000	2015	Scatec Solar ASA, Norfund-KLP, PEMSA
Oryx	Jordan	90%	10	25,000	2016	Scatec Solar ASA, Quest Energy Investment LLC
EJRE and GLAE	Jordan	50.1%	33	78,000	2016	Scatec Solar ASA, European Jordanian Renewable Energy Project, Green Land Alternative Energy Project

Source: Authors' own compilation / Scatec Solar (2017a)

From the table it can be seen that the projects differ in capacity and, consequently, expected production, with the three South African projects contributing the most to the overall production. Also the company's ownership stake varies between projects. The Czech projects are fully owned by Scatec Solar, while the other projects are partially owned with the respective partners listed in the table (Scatec Solar, 2017a).

4.2.2 Backlog and Pipeline

Table 4.2: Scatec Solar's projects in backlog and pipeline.

Backlog

Plant	Country	Ownership Stake	Capacity, MW
Upington	South Africa	42%	258
Los Prados	Honduras	70%	53
Brazil	Brazil	N/A	150
Segou	Mali	52%	33
Malaysia	Malaysia	49%	197
Mocuba	Mozambique	52.25%	40
	Total	**53%**	**731**

Pipeline

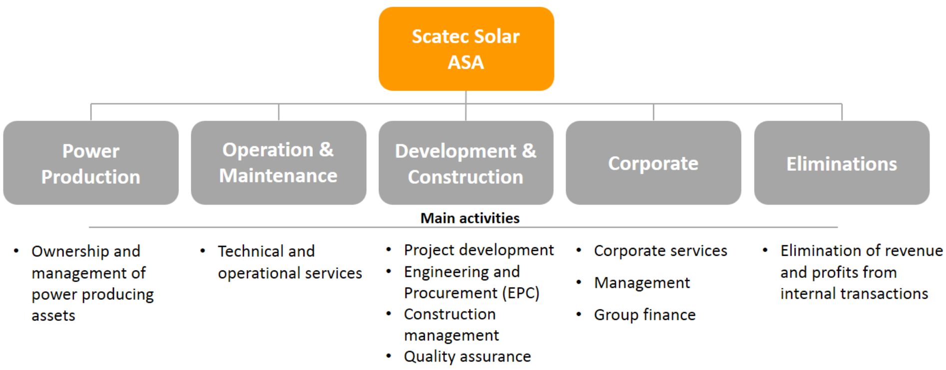
Country	Capacity, MW
South Africa	430
Egypt	340
Pakistan	150
Nigeria	100
Kenya	48
Burkina Faso	17
Total	**1,085**

Source: Authors' own compilation / Scatec Solar (2017a)

Scatec Solar (2017a) defines projects in backlog to have a 90% likelihood of being realized, while pipeline projects have a 50% probability of becoming operative. With projects in backlog and pipeline representing a total capacity of 731 MW and 1085 MW, respectively, SSO could increase its capacity significantly in the years to come. The backlog and pipeline are covered later in the thesis, and will play a key role in the valuation of the company.

4.3 Structure

Figure 4.1: Reporting structure of Scatec Solar.

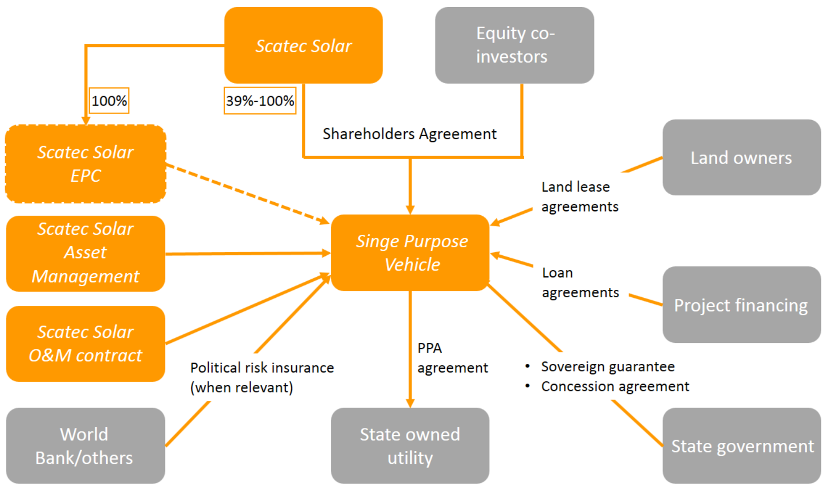


Source: Authors' own compilation / Scatec Solar (2017a)

Scatec Solar's reporting structure is shown in figure 4.1 above. The operating business segments are divided into Power Production (PP), Operation & Management (O&M), and Development & Construction (D&C), which are separated from Corporate and Eliminations. Ownership and management of power plants is covered by the Power Production segment, while O&M primarily covers the technical and operational services at the solar parks fully or partially controlled by Scatec Solar. The D&C segment makes sure that developed long-term projects in backlog and pipeline are successfully brought to life through construction management and quality assurance. The Corporate segment covers administrative services, while Eliminations is strictly related to accounting (Scatec Solar, 2017a).

Figure 4.2 presents a simplified illustration of the company structure and the main contracts installed for each solar project. The figure is divided into segments controlled by Scatec Solar (orange), as well as external stakeholders (gray).

Figure 4.2: Simplified company structure.



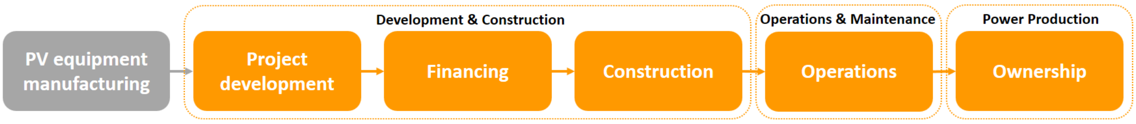
Source: Authors' own compilation / Scatec Solar (2017b)

A Single Purpose Vehicle (SPV) is established for each solar project. This is a subsidiary company where the core of the solar production is placed. The different SPVs, also called project companies, are either fully owned by Scatec Solar or partially owned in a partnership with equity co-investors. Scatec Solar currently has ownership stakes of 39-100% in the projects the company is involved in. Each partner of a project is only accountable for their stake in the SPV in regards to power purchase agreements, loan agreements, and land lease agreements. Once the SPV is established, Scatec Solar is able to fully utilize its integrated business model (Scatec Solar, 2017b). This will be explained further in the next section.

4.4 Value Chain

Being an integrated independent power producer, Scatec Solar is present through the entire value chain besides production of solar panel components. The company's value chain, shown in figure 4.3 below, is presented in the company's annual report and is divided into D&C, O&M, and Power Production.

Figure 4.3: Value chain of Scatec Solar.



Source: Authors' own compilation / Scatec Solar (2017a)

4.4.1 Project Development

The first phase of Scatec Solar's value chain is project development. This part contains the process of developing and identifying sites, system design, and permitting. In addition, the grid connection must be secured for each project. For partially owned solar projects, SSO needs to search for and coordinate with local partners. A vital part of project development is negotiation for power purchase agreements (PPA) with state owned utilities, taking part in reverse auctions/tenders, and securing feed-in tariffs (FiTs)[2]. These will be addressed further in section 5.2, and are all crucial processes as IPP companies are dependent on ensuring long-term contracts and acquisition of land. Hence, Scatec Solar faces great competition from contenders in the project development process.

4.4.2 Financing

In this phase, plant design, engineering, and component tendering are considered in detail in order to estimate the required financing for the project. The most important task is, however, to structure debt and equity optimally for each project since all SPVs have independent capital structures. Finally, due diligence is performed.

4.4.3 Construction

The third phase of the value chain is also the last phase of the D&C segment. The main processes during construction are engineering and procurement (EPC) activities. As solar power plants require substantial initial investments, it is important that each project under construction is carried out as intended. This is secured through project management, including supplier and construction monitoring as well as quality assurance. Lastly, before the plant is operational the project funding and cash flows are carefully managed by the company.

4.4.4 Operations

When the project has been through the D&C segment it goes into operations. The main focus of this phase is to maximize performance and availability of the solar power plant. Scatec Solar performs maintenance and repair on all of their projects regardless of ownership stake.

[2]Other abbreviations and definitions are presented in Appendix 1.

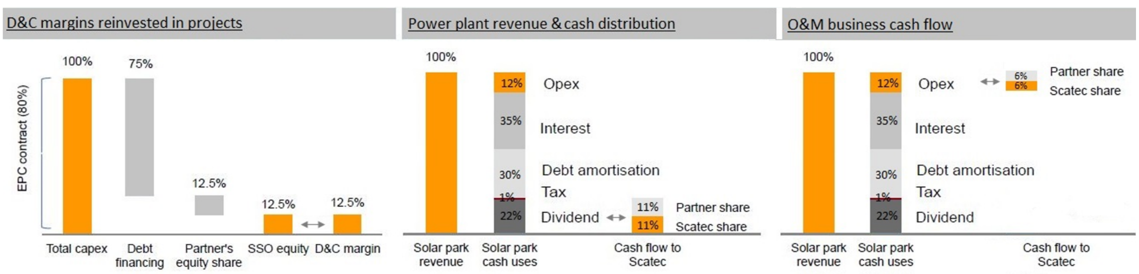
4.4.5 Ownership

The final phase of Scatec Solar's value chain is ownership and power production. Both the financial aspect and the operational aspect are optimized in order to deliver electricity as according to the PPAs and FiTs in phase one. The company has long-term ownership in all of their solar projects, so asset management is a crucial part of this phase.

4.4.6 Value Creation in the Integrated Model

As mentioned in section 4.3, the first step when developing a new project is establishing a SPV. According to Scatec Solar (2017b), these SPVs are designed to operate independently, having their own capital structure, financing costs, and taxation, depending on its location. Once the SPV has been established, the SPV contracts an engineering, procurement and construction (EPC), which is fully owned by Scatec Solar, to start the development and construction of the facility. According to Scatec Solar (2017b), the EPC contract typically make up approximately 80% of capital expenditures. The remaining 20% covers other expenses, such as development fees, interest expenses, and lender fees. Typically, the D&C segment realizes a 15% gross margin on the EPC contracts, which gives the company an opportunity to fund its share of the equity investment through the gross margin collected (Scatec Solar, 2017b).

Figure 4.4: Example of value creation in Scatec Solar.



Source: Scatec Solar (2017a) and Nordea (2016)

The example to the left in figure 4.4 above shows how the company generates value from the reinvestment of gross margins into new projects using their integrated model. In the example, the project is funded by 25% equity, where SSO has contributed with half. According to Scatec Solar (2017b), the company's equity share of 12.5% is funded by the gross margin acquired by the company when constructing the facility. Using this model, Scatec Solar claims they can fund a growth capacity of 300-400 MW per year in new projects. This does, however, depend on the amount of invested equity in the SPV. Typically, the company aim to have project leverage between 75% and 85%, meaning a total equity share of 15% to 25%, and between 7.5% and 12.5% SSO share (Scatec Solar, 2017b).

Once the solar park has been constructed it starts to produce electricity through the above-mentioned PPA and FiT agreements, which provides the company with predictable and long-term cash flows. In addition to generating cash flow through the production and sale of electricity, SSO also receives cash flow through their equity share in the form of dividends, depending on project performance. Typically, 50% of contributions from projects companies is paid out as dividend to shareholders (Scatec Solar, 2017a).

When the facility is up and running, SSO's Operation & Maintenance segment, which is fully owned by Scatec, runs and maintains the solar park. As compensation for this, the company collects a margin on operating expenses, which typically consists of fees related to the administrative and technical operation of the project companies. Based on Scatec's example above, this margin is 50%. This, again, creates cash flow to Scatec Solar and adds to total cash available (Scatec Solar, 2017b).

Through the implementation of its integrated model, Scatec Solar is able to collect some pieces of revenue through the entire value chain. Even though all revenues between the segments are eliminated during consolidation, the integrated model allows the company to generate cash flows to its equity, an important measure of value creation.

4.5 Competitors

Scatec Solar's business model is not unique in the industry, but it certainly stands out from most solar companies. This makes it challenging to find obvious competitors to the company, or peers to use in the analysis. Sonnedix is, among others, an IPP company with many of the same features as SSO, but the company is not listed on a stock exchange (Sonnedix, 2017). Unlisted companies are not ideal peers in a potential relative valuation, so the company will not be included in the thesis.

The Canadian company, Etrion is both an IPP company and listed (Etrion, 2017), and consequently probably the most comparable company we were able to find. Etrion does, however, only operate at solar plants in Chile and Japan, and are in that sense currently not a direct competitor to Scatec Solar. Due to the challenge of finding listed IPP companies with operations in the same regions as Scatec, we had to include other types of solar companies in the later analysis. FirstSolar (USA) is primarily a leading global provider of solar systems, but operates across other stages of the solar power value chain as well (FirstSolar, 2017). Furthermore, we have included two additional Canadian companies. Innergex develops and operates within hydro, wind and solar energy (Innergex, 2017). Also Algonquin operates within several renewable energy sources (Algonquin, 2017). We will proceed with these four companies throughout the thesis.

5. The Solar Energy Industry

This chapter will examine key aspects of the solar energy industry. After a brief introduction, the recent development and future outlook of the industry are highlighted. The corresponding discussion will lay a foundation for the strategic analysis and valuation performed in chapters 6 and 11, respectively.

5.1 Introduction to Industry

The solar energy industry has, in earlier years, been a small contributor to the total electricity production in the world, with a share of approximately 2% in 2016 (IRENA, 2016a). This has been due to low production efficiency, resulting in higher cost per energy unit, and low production- and storage capacity. However, in recent years, the solar energy industry has experienced significant increases in both capacity for production and storage, and in global investments. As a result of the increased production, costs have declined significantly and the interest for solar as an energy resource is on the rise (BNEF, 2016).

There are two main solar energy generation technologies; thermal and photovoltaic (PV). Thermal technology uses heat from sun rays to run a heat engine, which in turn produces energy through a generator. According to WEC (2016, p.11), PV directly converts the sunlight into energy, meaning it is dependent on daylight and climate. Contrary to PV, thermal can still generate energy in the absence of sunlight using previously stored thermal energy. In 1990, electricity production from solar thermal technology was 663 GWh, almost 40 times the production from solar PV. Ten years later the tables were turned with 718 GWh of electricity produced from solar PV, and a 20% decrease in the thermal production. Since then, there has been a significant increase in production from both technologies. However, solar PV has been the dominating force in the solar energy industry in recent years, with a total production of 172,165 GWh in 2015. This was 20 times the production from solar thermal the same year (IEA, 2016, II.48). Considering the fact that Scatec Solar only develops and operates solar PV plants, we will only focus on PV in this chapter.

The industry can also be divided into small-scale and large-scale solar projects, also called utility-scale. Small-scale is typically rooftop solar panels used to power households and office buildings. Utility-scale projects are often larger solar power parks located in remote areas, which purpose is to feed energy to large electricity grids, such as communities and cities. As discussed in chapter 4, Scatec Solar develops, constructs, operates, and owns solar PV plants, and is therefore only present in the utility-scale segment. This segment has seen significant developments within technology advancements and production capacity utilization in recent years, and is considered to be one of the largest contributors to renewable energy production in the future (IRENA, 2017b, p.69-73).

Before we look into the recent development and market outlook of the industry, we will start by addressing some of the different subsidy policies and support mechanisms that have been important for the expansion of the solar energy industry.

5.2 Subsidy Policies and Support Mechanisms

There are several factors affecting the profitability and risk of a solar PV project. Due to the relatively long lifespan and high CAPEX of solar plants, a project is dependent on having access to long-term financing as well as certainty in future electricity sales prices. This can be secured through different incentives and support mechanisms. In November 2016, The Paris Agreement entered into force. The purpose of the agreement is to keep this century's global average temperature increase below 2 degrees Celsius, and preferably as low as 1.5 degrees Celsius. So far, 144 of the 197 participants have ratified the agreement (UNFCCC, 2017). The increased global focus on climate change has resulted in tax incentives, carbon credits, and other favorable terms for renewable energy companies. Most of these policies are initiated by governments in order to reach a national target for renewable energy. This section will discuss some of the different subsidy policies and support mechanisms established or adopted to stimulate growth in the solar energy industry. These are crucial in risk management for the market players as well as for the long-term sustainability of the industry. The subsidy policies are defined in the next subsections, while selected support mechanisms are discussed in the last part of the section.

5.2.1 Subsidy Policies

5.2.1.1 Feed-in Tariffs (FiTs)

One of the most influential support mechanisms in the solar energy industry is feed-in tariffs. According to the International Finance Corporation (IFC), FiTs are contracts securing a fixed sales price of electricity, often adjusted for inflation, for a specified period of time. The duration of FiTs is typically 10 to 25 years, depending on the scope of the project. In addition to duration and the fixed price, a FiT contract often includes beneficial access to a power grid. Through the use of FiTs, a company like Scatec can protect its operations from price movements in the electricity market. This can make the long-term revenues more predictable and a project more attractive to lenders and financing. These advantages have made FiTs a vital part in stimulating growth in the solar energy industry in recent years (IFC, 2015, p.137).

According to IFC (2015), "projects must meet certain eligibility criteria and receive authorization from a government body to receive the FiT" (p.136). For utility-scale projects, the FiT is typically limited to a certain proportion of the project's total capacity. The limit is set to ensure sufficient competition, and is often related to a country's target for renewable energy production. When the solar producer, and the off-taker have agreed on the terms in the FiT, it is secured through a Power Purchase Agreement (PPA), which is a contractual agreement between the two parties (IFC, 2015, p.139). PPAs are further discussed later on.

An alternative to FiTs are feed-in premiums (FiPs). FiPs are, in many ways, similar to FiTs, but differ in the sense that a premium is added on top of the market price of electricity to make it more attractive to developers. There are different types of FiPs. China has used a constant premium independent from the electricity price, while the premium in Denmark has varied with the market price, securing a stable revenue stream for the seller. In Spain, the FiP has been fixed, though it also includes a floor and a cap price to minimize risk. FiPs and FiTs schemes have historically been adopted by several countries, with particular popularity in emerging markets (IRENA, 2012).

5.2.1.2 Tax Incentives

Tax incentives can also be used to promote solar energy. According to IFC (2015), there are several variations of tax incentives, including reduced Value-Added Tax (VAT) and corporate income tax, as well as tax credits for CAPEX. Such tax incentives vary across countries due to different taxation policies, but have been successfully implemented in developed and stable economies. The government of the United States provides owners, both persons and companies, of a solar PV project with a 30% investment tax credit (ITC) on CAPEX. ITC in the U.S. was introduced in 2006 and has reduced the uncertainty for long-term solar projects. As tax incentives, like the ITC, can lead to large transaction costs, the effect is greater for owners with high tax expenses. Thus, tax credits have a limited effect in economies with low corporate income tax. According to the authors of the report, local tax laws should always be considered by a developer to ensure that prospective tax incentives are properly exploited (IFC, 2015, p.145).

All renewable energy policies face the risk of policy expiration. According to Solar Energy Industries Association (SEIA), the ITC in the United States was initially set to expire in 2016, but the Congress extended the policy by five more years. However, it will only remain at the current 30% until 2019, before it gradually decreases until 2021 when the tax credit drops to zero and 10% for residential and utility-scale installations, respectively (SEIA, 2017b). Due to the risk of policy expiration, developers should take into account the duration and future development of tax policies when evaluating possible projects. To facilitate well-working support policies, governments should provide the solar market with transparent rules and terms for the policies.

5.2.1.3 Concessional Loans and Green Bonds

Some solar projects are granted so-called soft loans, which IFC (2015) characterizes as beneficial low-interest loans from financial intermediaries, such as development banks. Only a small fraction of projects is offered these loans, usually in the introduction of solar power in a new market. Soft loans are, in other words, typically used to build up interest for solar power in new markets. An alternative to soft loans are loans subsidized by national governments. China is one of the countries that has stimulated the solar energy industry through the issuance of so-called state-mandated concessional loans, which often have more favorable terms than market loans (IFC, 2015, p.146).

In recent years, the interest for Green bonds has increased. A Green bond works as any other bond, but its purpose is to be used as cheaper funding of renewable energy projects. The bond is usually issued by a government or a financial institution, but could also be issued by a fundraising company (EY, 2016, p.4). After issuance, the bond is valued by the market. Between January and November 2016, green bonds worth approximately $62 billion were issued, where China and India showed a particular interest for green bonds, according to the International Renewable Energy Agency (IRENA, 2017b, p.56).

5.2.2 Support Mechanisms

5.2.2.1 Market-Based Instruments

IFC (2015) defines market-based instruments as credits or certificates that are traded in the market, created to support the use of renewable energy over fossil fuel. These certificates are used together with quota requirements and other quantity-based mechanisms. There are two common types of such certificates: carbon credits and renewable energy credits (RECs). The latter rewards utilities developing or purchasing renewable energy projects by deciding a certain quota for electricity generated from renewable energy in a certain market. When a solar PV power producer is awarded RECs for its generated electricity or installed capacity, the company can trade these RECs in the market. Especially the United States and countries, such as India and Romania, have embraced the introduction of RECs (IFC, 2015, p.143-144).

Carbon credits are, according to IFC (2015), "an indirect form of support for solar energy, primarily designed to reduce greenhouse gas (GHG) emissions (p.144)." A renewable facility generating electricity is awarded carbon credits for not utilizing fossil fuels, which in turn avoids increased pollution. The carbon credits can be bought by governments and companies as a compensation for CO_2 emissions directly connected to their ongoing projects. However, the pricing of carbon has proven to be challenging. IFC (2015) argues that the carbon price is either missing or too low in many countries to be considered a driver for solar energy. Due to this issue, the carbon credits have not had a big impact on the solar energy industry so far. As a response, countries, such as South Africa and China, among others, are trying to implement suitable policies for carbon pricing. Initiatives like this might improve the effect of carbon credits in the future (IFC, 2015, p.144-145).

5.2.2.2 Reverse Auctions and Tenders

In their report, IFC (2015), defines a reverse auction, or tender, as a process where IPP companies bid for the opportunity to construct a solar PV project offered by an off-taker, typically a government. This means that the electricity sales price is determined by the company that wins the bid, and not the off-taker. Auctions are in that sense a more market-based solution initiated by governments with a desire to reduce greenhouse gas emissions. The competitive aspect of the process contributes to minimizing the tariff for each project, and typically results in lower solar PV prices, as will be illustrated in figure 5.1. The location of the project is often chosen in advance by the off-taker, but it can also be proposed by the winner of the auction (IFC, 2015, p.140). The electricity sales price is not always the only decisive factor for who wins the project. For certain projects in South Africa, price is given a 70% weight, while economic development, such as job creation in the area, accounts for the remaining 30% (Scatec Solar, 2013).

According to IFC (2015), there are two main risks for an IPP company taking part in a reverse auction or tender. The first, and most critical, is the risk of not winning the auction. The preparation of a bid of this scale could be expensive, and in order to make a bid, a developer has to invest a lot of time and resources to be able to secure the project. Therefore, IFC (2015) argues that time spent on each bid should be evaluated based on the amount of capital the project requires. In addition, developers are at risk of competing against others that can endure lower margins, resulting in the other party winning the right to develop the project. A consequence of this is that smaller developers are unable to operate under such low margins and are driven out of the market (IFC, 2015, p.140). Auctions have been adopted by a significant number of countries over the past decade, experiencing a greater growth than both FiTs and FiPs in recent years (IRENA, 2017a).

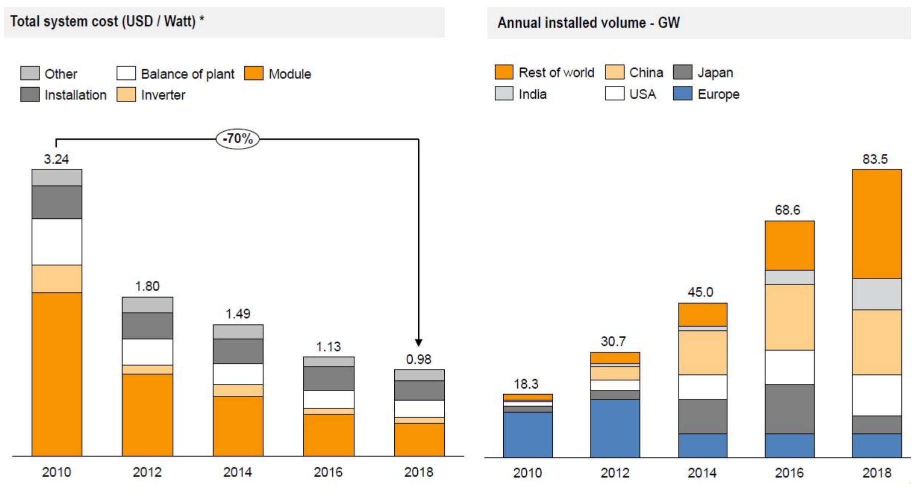
5.2.2.3 Power Purchase Agreements (PPA)

In their report IFC (2015) states that "PPAs are legally binding agreements between a power seller and power purchaser (off-taker) (p.149)." The seller in the utility-scale PV industry is an independent power producer like Scatec Solar, while the buyer (off-taker) usually is a power company, wholly or partially owned by a government. Main aspects of the PPA are duration for the agreement and a fixed electricity price, stated in the feed-in tariff (IFC, 2015, p.149-151). Solar power parks are long-term projects with durations typically ranging from 20 to 25 years, while the price is based on the costs of generating electricity from solar PV. A PPA is per definition not a support mechanism, but rather a key instrument in solar projects. It serves as one of the final procedures of a solar project and secures the agreed FiT between the two parties. Thus, PPAs play a critical role for risk management and financing in the solar energy industry.

5.3 Recent Industry Development

In the last ten years, there has been a significant decrease in the cost of solar panels. In the past, the industry was limited by technology, both in terms of capacity and efficiency, but also production costs. Solar panels have not been able to produce the same amount of energy per unit of cost as other energy sources, such as coal and gas, but also wind energy (Randall, 2016). As a consequence, solar power was only used in projects where the environmental gain from solar energy outweighed the extra cost.

Figure 5.1: Cost of solar system compared to annual installed volume, 2010-2018.



Source: Authors' own compilation / BNEF (2017b) / Scatec Solar (2017d)

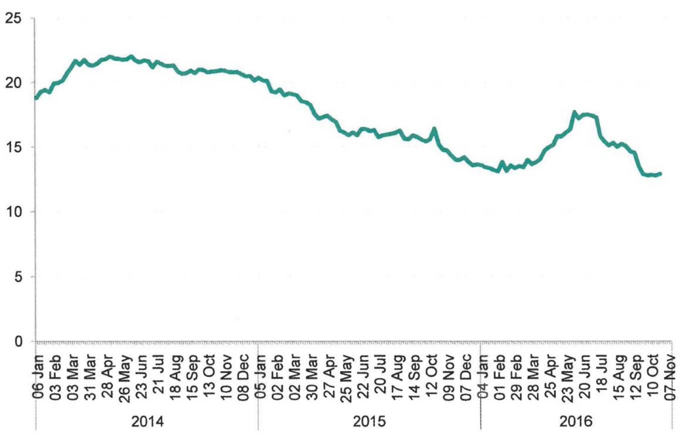
In later years, this tendency has seemed to change. As technology developed, both production capacity and efficiency increased. In figure 5.1, one can see the inverse relationship between the cost of solar panel systems and the volume installed. Companies are now able to produce solar energy at a cost that is much closer to that of coal and gas, which has resulted in increased investments in solar power on all continents.

5.3.1 Cost of Production Components

Figure 5.1 illustrates the total cost for a solar panel system has decreased 65% between 2010 and 2016. While all costs related to a solar panel system, excluding modules, have remained relatively stable, the cost of modules has decreased significantly.

The manufacturing process has become cheaper as new technology has developed. However, the total production cost is also linked to the quantity produced. China has for long been able to produce cheaper solar panel systems than the rest of the world. Lower labor cost has been thought by many to be the cause. However, according to a recent report published by Royal Society of Chemistry (2013), economies of scale and supply-chain-benefits are the main reasons why Chinese systems have been cheaper in the past.

Figure 5.2: Historical polysilicone prices ($/kg), 2014-2016.



Source: Bloomberg New Energy Finance - BNEF (2017b)

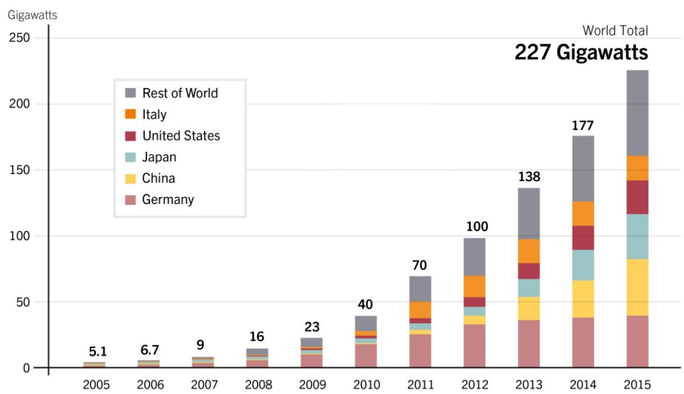
In addition to lower cost in the production process, the cost of materials has decreased. The price of poly-silicone, which is one of the main components in the production of solar cells, has decreased significantly the last 30 years (Shahan, 2014). Despite the long-term decrease, it is only in recent years that the price has dropped to a point where the cost of producing solar panels is sufficiently low for solar energy to compete with other energy sources. From figure 5.2 we can see that the price of poly-silicone dropped over 39% between mid-2014 and the end of 2016.

The drop in costs related to manufacturing and components has led to an increased optimism towards the solar energy industry. As the dollar cost per unit of energy has become more competitive compared to other energy sources, it has shown to have a significant effect on the global solar PV capacity.

5.3.2 Capacity

As a consequence of the decreased costs related to producing and installing solar panels, the installed solar PV capacity has increased quite drastically in recent years. Subsidy policies and support mechanisms have also contributed to a large extent. In year 2000, the global installed solar PV capacity was virtually zero (IRENA, 2014). Since then a lot has happened. Figure 5.3 shows that the cumulative installed PV capacity increased from 5.1 GW in 2005 to 227 GW in 2015, according to REN21 (2016).

Figure 5.3: Solar PV - global installed capacity, 2005-2015.



Source: REN21 (2016)

Germany has been one of the pioneers in terms of using solar energy. Between 2005 and 2013, the country went from producing a very small amount of electricity through solar energy to having a capacity of about 30 GW (REN21, 2016). However, between 2013 and 2015 Germany's growth in capacity stagnated and the country was passed by China as the world's largest producer. In 2016, the country installed only 1.2 GW, which was less than half of the 2.5 GW yearly goal in the German *Renewable Energy Sources Act EEG 2014 and 2017* (Fraunhofer, 2017). The cause of the stagnation was mostly due to the government tightening incentives through the above-mentioned *Renewable Energy Sources Act* (Morris, 2014).

In the United States, solar PV installations have increased steadily between 2009 and 2016. According to SEIA (2016), the country installed 385 MW of solar capacity in 2009. Between 2009 and 2015 the annual installed capacity increased almost linearly, adding 7.5 GW in 2015. In 2016, close to 15 GW were added, almost a doubling from 2015 (SEIA, 2016). Total installed capacity amounted to almost 53 GW in 2016, moving the United States past Germany as the world's third largest solar energy producer in 2016 (EIA, 2017b). The largest portion of the increase is attributable to utility-scale projects, which experienced a 145% increase due to the extension of the solar investment tax credit to 2021 (Ola, 2017a).

Japan is also a country that has invested significant amounts in recent years. From figure 5.3 it is clear that Japan is one of the world's largest in terms of solar PV capacity. The country has increased its capacity steadily since 2008 with a government incentive program introduced in July 2012, adding even more growth. In 2015, the country experienced its largest growth in capacity, adding 11.5 GW (Watanabe and Stapczynski, 2016) and reaching a total capacity of 33.3 GW (IRENA, 2017b, p.140). However, tariff cuts and difficulty securing land and grid connections have halted growth in solar PV in the country (Watanabe and Stapczynski, 2016).

After investing significant amounts over the last three years, China is the country with the largest installed capacity of solar PV. In 2015, the country had an estimated capacity of 44 GW, moving past Germany at roughly 40 GW (REN21, 2016). A sign that the industry is seeing rapid growth is the fact that China, in 2016, installed another 34.24 GW of solar PV capacity, increasing total capacity with almost 80% in 2016 alone. China's total solar PV capacity therefore reached 77.42 GW in 2016 (Hill, 2016a). According to Buckley and Nicholas (2017), "five out of the world's six largest solar-module manufacturers are located in China (p.2)", and in a time where First Solar in the United States is downsizing 25% of their staff, China National Building Materials is building a $1.6 billion solar module facility (Buckley and Nicholas, 2017). It is plausible that China's intention is to secure its position as world leading. Between 2005 and now, China has grown into the world's largest producer of solar energy. However, much of this could not have been done without substantial help from the government, both in the form of tax incentives and investments.

Globally, the total capacity increased by approximately 75 GW in 2016 (BNEF, 2017a). Although there are different numbers concerning the total global capacity, both REI21 and BNEF argue that total capacity in 2016 was about 300 GW, which is another milestone for the solar energy industry and its importance as a global source of electricity. From figure 5.3 it is evident that the solar PV industry has grown significantly in the last 10 years. Considering the fact that total capacity was only 5.1 GW in 2005, compared to 300 GW in 2016, it is clear that the global community has embraced the potential of solar power as a viable, cost reducing, and increasingly effective source of energy. Of all added power capacity in 2015, roughly 20% was attributable to solar PV (IRENA, 2016a, p.9). While the majority of this capacity is held by a handful of countries, the increase seen in the rest of the world has been just as significant, as seen in figure 5.3

5.3.3 Government Involvement

As mentioned in the previous section, government involvement in China seems to have helped the country's solar panel manufacturers to become world leading in terms of price. By offering investments and incentives, such as tax credits, the government enabled Chinese manufacturers to move world prices more than 80% in less than 10 years (Fialka, 2016). It is through incentives, such as tax credits, soft loans, and Fits that governments can help induce the use of renewable energy.

In China, the government solar PV companies have been backed by the Chinese Development Bank (CDB) for many years. This has resulted in better financing terms and lower risks, which has enabled them to take on larger projects (Lacey, 2011). According to the article, *Why China Is Dominating the Solar Industry*, the Chinese government has invested as much as $47 billion to help build its solar plants and factories (Fialka, 2016).

While China is investing significant resources in solar PV, Germany has halted its use of incentives. After the country introduced the *Renewable Energy Sources Act* in 2000, which introduced the use of FiTs, solar PV capacity boomed, making the Germany one of the world's largest solar power producers (Morris, 2014), as can be seen in figure 5.3. However, due to the large cost of the FiTs for the government, the tariff rates decreased with each amendment of the *Renewable Energy Sources Act*. In the 2014 amendment, the government also put a cap on installed capacity of 52 GW, stating that all new projects above the cap would not receive funding (Appunn, 2014). As of recent, Germany has decided to move away from FiTs and over to auctions in order to boost developments once again (Appunn, 2016). Meanwhile, the development of solar PV in Germany was halting, leading to China becoming the largest solar PV producer.

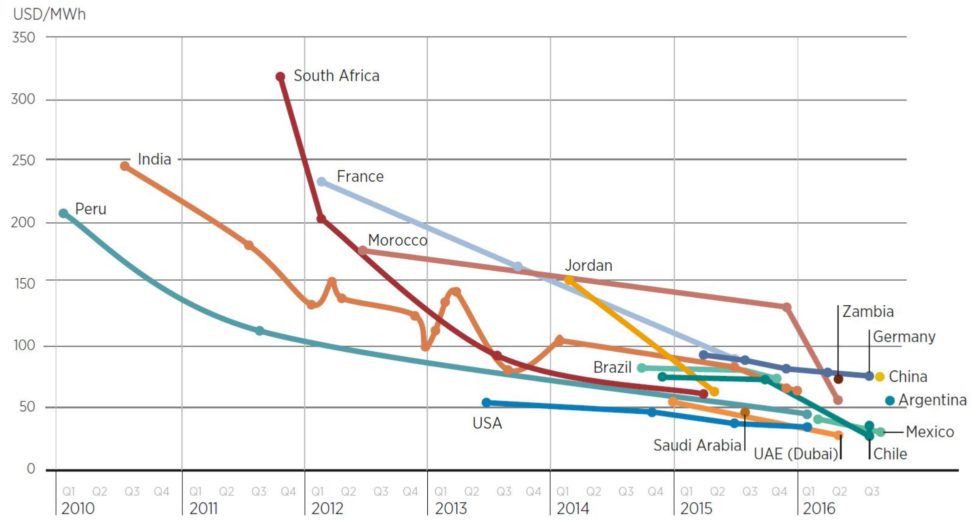
In Japan, the government has been trying to alter its power structure after the Fukushima nuclear plant accident. The country has shut down its nuclear plants and taken steps to force its electricity utilities to acquire electricity from renewable sources, such as solar PV. In order to do so, the country introduced FiT schemes for several renewable energy sources, creating a boom in installed solar PV capacity (Edgar Hahn, 2014). However, in recent years, subsidies have halted through decreasing FiT rates, causing a discussion in Japan regarding the value of FiTs (Junko Movellan, 2015). According to Watanabe and Stapczynski (2016), Japan's solar PV producers have already started to seek other opportunities within solar PV, namely storage of solar energy in residential systems, making the average residential user self-sufficient.

In the United States, the Solar Investment Tax Credit (ITC) has been one of the most influential tools in terms of promoting renewable energy and solar PV. It offers a 30% tax credit on both residential and commercial scale projects as an incentive to chose solar PV. It was first introduced in 2006 and has been extended several times, as it has proven to be one of the most important policy mechanisms to promote the use of solar energy in the United States (SEIA, 2017b). According to SEIA (2017b), ITC has been one of the main causes to why annual solar installations have grown over 1,600% since it was implemented in 2006. In recent years, the country has started exploring the use of FiTs, although this has been on a very moderate level compared to Germany and Japan (EIA, 2017a).

5.3.4 Reverse Auction Prices

The willingness of governments to support renewable energy projects has had a massive impact on the growth that the solar energy industry has experienced over the past decade. Through the use of favorable subsidies and support mechanisms, such as FiTs, governments have managed to stimulate the investments in solar PV projects. Also the decreasing cost of components due to technological development has contributed to the positive trend in the industry. The effect of these factors is highly visible if we take a look at the development in solar PV auction prices around the world. Figure 5.4 below illustrates the average auction prices for the leading solar PV countries from 2010 to 2016.

Figure 5.4: Global historical solar PV auction prices, 2010-2016.



Source: International Renewable Energy Agency - IRENA (2017a)

From the figure we see that the auction prices have decreased significantly, from a global average price of approximately $250/MWh in 2010 to $50/MWh in 2016 (IRENA, 2017a, p.9). Peru, India, and South Africa have seen the largest decreases in auction prices as they were the first countries to implement reverse auctions for solar PV projects. In 2011, South Africa replaced its REFIT program with the auction-based Renewable Energy Independent Power Producer Procurement Program (REIPPPP). Instead of providing FiTs, the government rolled-out several utility-scale PV projects in the market through the REIPPPP (IRENA, 2016d). When South Africa launched its first auction in 2011, the price was almost $345/MWh, more than five times as high as the average price of $64/MWh in 2015 (IRENA, 2017a, p.9).

During 2016, several record-low auction prices were registered globally. In June, United Arab Emirates received a bid of \$29.9/MWh, before breaking their own record with a winning bid of \$24.2/MWh a couple of months later (IRENA, 2017a). Chile and the United States also obtained auction prices below \$30/MWh in 2016. As earlier discussed, the ITC scheme is the main reason behind the historically low prices of U.S. solar PV auctions. Chile, on the other hand, has managed to achieve low auction prices without any forms of government subsidies. There are two reasons for this. First, project costs are lower in emerging markets than in developed countries, as lower cost of land, labor, and other factors reduce the installation and operation costs of solar power parks. The second reason is the relatively high capacity factor of solar projects in Chile. Capacity factor is defined as

$$\text{Capacity factor} = \frac{\text{Actual output of a power plant}}{\text{Theoretical output of plant running at full capacity}} \tag{5.1}$$

for a specific period of time. The main drivers of the ratio are available solar resources and condition of the technology at the plant (IRENA, 2017a). Between 2010 and 2015, the global weighted average capacity factor increased from 14% to 17% (IRENA, 2016b). Chile managed to obtain an average capacity factor of 29% in 2016. In comparison, German solar projects have an average capacity factor of only 11%, despite being a developed country and the leading solar power producer in Europe. This is reflected in the country's relatively high average auction price of \$80/MWh in 2016. The differentiating factor between the two countries is access to solar resources. Germany is highly competitive on technology, but lacks the available solar resources of Chile. With solar resources producing a capacity factor of 25% the German auction price would be halved according to estimates from IRENA (2017a, p.13).

In general, the significant decline in auction prices is good news for the sustainability of the solar power industry. The recent price development has made solar PV competitive against electricity prices from other energy sources. As long as the auction policy is not squeezing margins of power producers into unfavorable levels along the way, the development looks promising.

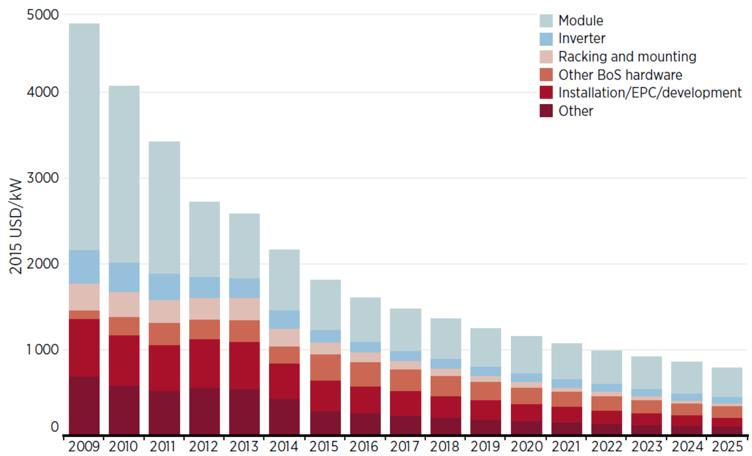
5.4 Market Outlook

The previous section covered the recent development in the solar energy industry. Even though the industry has seen positive development in costs, technology, and electricity prices, it is still far from mature compared to most of the other energy sources. Therefore, the promising trend needs to continue in the future. This section will examine the future outlook of the value drivers we find most important for the industry. These include capacity, subsidy policies, and costs and technology. We will begin with the latter.

5.4.1 Costs & Technology

The costs of utility-scale solar PV systems plunged during the last decade, driven by technological development and the cost of components. A breakdown of the global weighted average total system costs for utility-scale solar PV systems from 2009 to 2025 is presented in figure 5.5 below. The costs are divided into the main cost drivers of the system, and the potential future evolution is based on 2015 figures.

Figure 5.5: Global weighted average utility-scale solar PV system costs breakdown, 2009-2025.



Source: International Renewable Energy Agency - IRENA (2016b)

Since 2009, total systems costs have dropped with about two-thirds, from almost \$5000/kW to approximately \$1700/kW in 2016. As the solar PV technology is becoming more mature, a further cost reduction potential is lower than before, illustrated by a relatively flatter decrease over the last few years. The cost of modules has had the steepest decline and contributed the most to the total cost reduction. An average solar project with capacity of 50 MW will typically contain 160,000 modules (Scatec Solar, 2017a, p.17). According to IRENA (2016b), module costs are expected to continue to decline in the future, possibly reducing PV module prices by more than 30% during the forecasting period. The predicted reduction in module costs is mainly due to decreases in polysilicon prices and lower costs in the cell-to-module manufacturing process. Lower electricity and gas consumption, higher module efficiency, and improved manufacturing processes are expected to halve polysilicon costs by 2025. Higher module efficiency will mainly reduce land use and material costs. Furthermore, costs associated with the process of transforming cells into modules could fall by one-third due to innovations improving efficiency and reducing material use (IRENA, 2016b).

A solar inverter is an important balance of system (BoS) component that converts direct current (DC) output from a PV solar panel to alternating current (AC) and feeds it into a grid. About 20 inverters are necessary for a 50 MW plant (Scatec Solar, 2017a)[1]. According to IRENA (2016b, p.47), technological development and economies of scale are expected to drive the costs of inverters down by 33-39% by 2025, depending on the type of inverter. Other BoS hardware costs are also expected to decrease, but the extent of the decline depends on the cost structure, i.e. efficiency, of the market. In 2015, China had BoS costs of $0.5M/MW for solar PV utility-scale while the BoS costs of United States were $1.5M/MW due to a less competitive cost structure. The BoS cost reduction potential is higher in markets, such as the U.S. compared to more efficient markets. Therefore, the expected decline differs quite significantly between efficient and less efficient markets, with decline potentials of 31% and 69%, respectively (IRENA, 2016b, p.42).

In general, increased competition as the industry matures further will lead to lower margins in the supply chain, driving down most costs of solar PV projects. Also, the worldwide adoption of reverse auctions and the decreasing auction prices are forcing down the costs in the industry. Future improved efficiency is expected to make racking, mounting, and installation cheaper as material and labor costs are reduced (IRENA, 2016b). This contributes to lower upfront costs when building a solar PV plant. IRENA (2016a, p.10) predicts that the global average upfront costs for a utility-scale solar project will decline from $1.8M/MW in 2015 to $0.79M/MW in 2025. In comparison, the corresponding costs were $3M/MW for coal-fired power plants and between $1M and $1.3M/MW for natural gas plants in 2015. Further, the report states that the global weighted average levelized cost of electricity (LCOE) for utility-scale solar projects was $130/MWh in 2015, compared to $50-100/MWh for coal and gas. LCOE is a metric for the total system cost of generating electricity. While the LCOE for coal and gas are expected to stay within the same range, IRENA (2016a) argues that it could fall by almost 60% for solar PV by 2025 if the correct policies are implemented. In that case, solar power would become the cheapest kind of power generation in several markets. Solar energy is in other words already competitive on costs, and is expected to become even cheaper (IRENA, 2016a).

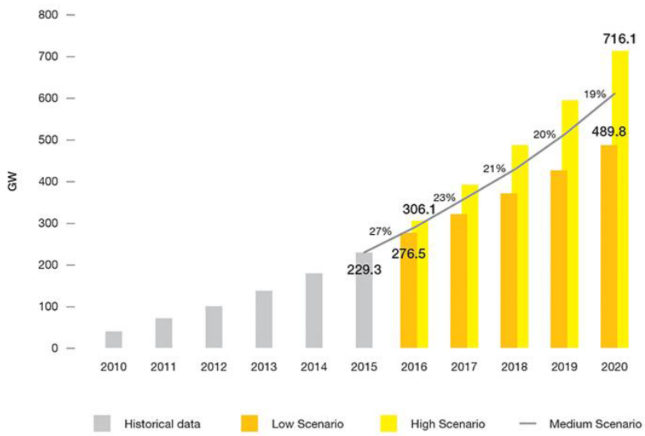
5.4.2 Capacity

There exist several published market outlooks for the solar energy industry. The annual *Global Market Outlook for Solar Power* published by SolarPower Europe is considered as the most authoritative global report on the topic. SolarPower Europe (SPE) is the European Photovoltaic Industry Association which represents organizations along the whole value chain. In their report from 2016, three scenarios for the global installed capacity until 2020 are outlined, as presented in figure 5.6. The high scenario is based on solid per-

[1] The necessary components of converting solar power into electricity is illustrated in Appendix 2

formance from the global financial markets and continued government support to the solar energy industry. On the contrary, the low scenario represents a more pessimistic outlook with a less favorable market environment. The report also presents a medium scenario representing the most probable outcome forecasted (SolarPower Europe, 2016).

Figure 5.6: Global installed capacity scenarios until 2020.



Source: SolarPower Europe (2016)

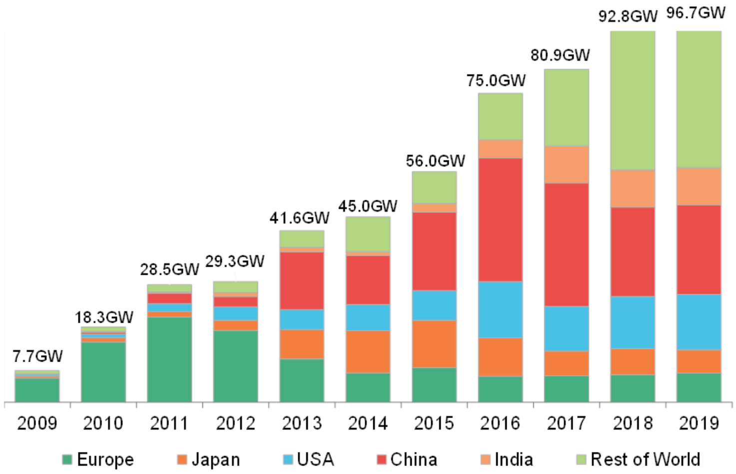
Global installed capacity will continue the rise from previous years according to SPE. The growth rate has a decreasing trend, but will remain above 20% points until 2019. Compared to the installed capacity in 2015 the cumulative capacity will more than triple by 2020 given the high scenario, and more than double under the low scenario. For the medium scenario the increase is approximately 260%. Looking at the corresponding SPE report for 2015, the market outlook is revised upwards in the 2016 report, indicating a more positive development in the solar industry than previously predicted by the analysts. These findings are in line with other credible reports on the topic. SPE predicted an annual added capacity between 47 GW and 76 GW in 2016, and a medium scenario of 62 GW. This coincides with the actual added capacity of 75 GW last year, which in fact is very close to the high scenario forecast (SolarPower Europe, 2016).

The International Renewable Energy Agency (IRENA) has estimated that an average annual growth of 15% would bring the total installed solar PV capacity up to 1,760 GW by 2030 (IRENA, 2017b, p.73). Comparing this estimate to the SPE report, such a growth rate seems feasible for the given period.

Bloomberg New Energy Finance (BNEF) operates with a conservative and an optimistic scenario forecast in their Global PV Market Outlook (GPMO) report. In the Q4 2016 report, both the conservative and the optimistic scenario exceeds the medium scenario growth levels forecasted by SPE. It should be noted that the BNEF report had access to more recent information as it was published half a year later than the SPE report.

However, the most recently published Q1 2017 report is even more optimistic about the levels of added capacity in the years to come. Continuous upward revisions are signs of steeper growth in the solar energy industry than what was expected by analysts. As the actual added capacity repeatedly has exceeded the conservative forecast, the optimistic scenario forecast from the BNEF GPMO Q1 2017 report is presented in figure 5.7. The figure shows the actual annual PV new built from 2009 to 2016 and the forecasted levels until 2019, in addition to the annual contributions from the leading solar power markets and regions. Bloomberg predicts that the added capacity will continue to increase, despite a stagnant growth rate in 2019 (BNEF, 2017a).

Figure 5.7: Global annual added capacity until 2019, optimistic forecast.



Source: Bloomberg New Energy Finance - BNEF (2017a)

In addition to increased capacity, it is interesting to observe the development in the annual capacity contributions around the world. Europe, driven by Germany, was the leading contributor to solar PV capacity until 2012. Since then China has experienced significant growth in PV new built as renewable energy has become a priority for the Chinese government. The BNEF report predicts that China's leading position only will last for a couple of years. In fact, the Chinese solar power market will decrease in 2017 due to stricter government regulation of government subsidies (BNEF, 2017a). Also, as discussed in section 5.3, USA has turned into one of the major players in the solar power market, indicating that the implementation of the investment tax credit has had a positive effect on solar PV installments. Because the ITC initially was set to expire in 2016, pipelines were filled during the year in order to make projects qualify for the tax credit. This is the reason behind the substantial increase in U.S. added capacity during 2016. As the tax credit is not decreasing before 2019, we expect that the PV new built levels will remain relatively stable in the nearest future. While the Japanese market is slowing down due to insufficient grid-capacity and decreasing FiT rates, India's increased focus on renewable energy has rapidly accelerated the investments in solar PV. In fact, no other country has held as many solar auctions as India since 2010, with a total number of 47 auctions (IRENA, 2017a). From 2018, the new leading contributor is, however, expected to be the rest of the world segment. Emerging markets, such as Latin America, sub-Saharan Africa, and the Middle East, represent a large share of the segment (BNEF, 2017b).

To conclude, the future of the solar PV industry looks promising. Global installed capacity is expected to grow annually by approximately 20% until 2020, and most market outlook reports are revised upwards from quarter to quarter. The continuing added capacity is due to contribution from new regions taking part and increasing their investments in renewable energy projects. China and USA will still be the two single leading contributors, but emerging markets will contribute to a higher degree than earlier, which could provide growth potential for Scatec.

5.4.3 Subsidy Policies

5.4.3.1 FiTs & FiPs

As we have addressed earlier, feed-in tariffs and feed-in premiums have been widely used by governments to stimulate growth in the global solar power market. Even though FiTs and FiPs are expected to play a role also in the future, there seems to be a gradual shift towards reverse auctions in several markets. In 2015, Germany initiated an auctioning program to replace solar FiTs. The program has gained a lot of interest from bidders and contributed to a 20% decrease in German solar PV prices after its establishment (IRENA, 2017a, p.6). As FiTs are being phased out in Germany, reverse auctions will mainly be accompanied by FiPs in the near future (IRENA, 2016a).

Auctions have, to a large extent, replaced FiTs in most Latin American countries as well. FiT schemes have earlier been implemented in countries, such as Argentina, Brazil, and Honduras without any particular success. The FiTs did not result in desirable development in these countries for different reasons. According to IRENA (2016c, p.72), Argentina struggled to reach sufficient levels, while a legal framework and official regulation was missing in Ecuador. Today, the FiT policies are inactive and replaced by auctions in all of the mentioned countries. Peru and Honduras are some of the countries still using FiTs and/or FiPs, but auctions are by far the most popular renewable energy promoting tool in Latin America (IRENA, 2016c). As previously mentioned, Chile has managed to achieve very low solar PV prices through the use of auctions. Therefore, auctions are expected to maintain its role as the preferred policy in Latin America in the immediate future.

In South-East Asia, Japan has been known for its generous feed-in tariff scheme. This has contributed to making Japan one of the leading solar markets on the planet. Nevertheless, the FiT was once again amended in 2016 in order to reduce the costs of the public. The main changes in the scheme included stricter authorization of solar PV projects, as well as decreased FiT rates. In five years, the government purchase price of electricity from solar power dropped from JPY 40/kWh to JPY 24/kWh (IEA, 2016)[2]. This is one of the reasons behind the recent slowdown of annual added capacity in the country. As the FiT has been amended every year since it was established in 2012, the development in the Japan solar market and economy will impact the terms of the scheme in the future. However, the situation is quite similar to what happened in Germany, with frequent amendments and decreasing FiT rates. Thus, the Japanese FiT scheme might be replaced by auctions in the future, like the above examples. In fact, the government has already planned to hold its first auction in October, 2017 according to BNEF (2017b). The outcome of the auction will most likely affect the future of subsidy policies in the Japanese solar power market.

To sum up, there seems to be a clear shift towards a more market-based solution in the solar industry, as FiTs are replaced by reverse auctions in several markets. The main reason for this development is the decreased need for such subsidies as solar is becoming increasingly competitive compared to other energy sources. Government subsidies are also costly for the public. In certain countries, FiT and/or FiP design elements will still accompany the auction framework, but for how long is questionable. In addition, even though reverse auctions can be considered to be market-based, it is important to acknowledge the fact that they are initiated by governments. Auctions could therefore become obsolete in different markets in the future, should solar become the cheapest energy source. Solar PV projects would then compete with alternative energy sources in a true market environment, without any government subsidies or initiatives.

5.4.3.2 Tax Incentives

Even though tax incentives, such as tax credits, are an effective tool for stimulating the solar industry, it is mainly used in the United States. As previously mentioned, the ITC scheme is about to become less favorable for the U.S. solar market in the future. The current investment tax credit of 30% drops to 26% in 2020 and 22% in 2021. After that, it will stabilize at 10% for commercial and utility-scale projects. However, solar projects will still qualify for the 30, 26, and 22% ITC as long as they are in construction before the end of 2021 and in operation before December 31, 2023 (SEIA, 2017b). This allows the U.S. solar companies to adjust to a more market-based competitive environment in the future.

[2]International Energy Agency

After the election of U.S. President, Donald Trump, there has been some uncertainty related to whether or not the ITC will be maintained until 2021 by the Trump administration. During his campaign, Trump questioned the existence of man-made global warming and indicated that the renewable energy industry should expect less government support than under the Obama administration. At the end of March 2017, Trump ended Obama's *Clean Power Plan*. The repealing is not expected to have any particular effect on the solar industry, but is rather a symbolic sign of Trump's conception according to Ryan (2017) in Bloomberg. Until now, President Trump has not explicitly commented on his plans for the ITC policy, so the future of the tax credit is unclear. Nevertheless, finance experts are confident that the ITC will be carried out as intended because of the already planned drops of the tax credit after 2019 (Ola, 2017c). Others believe that the ITC is redundant as renewables now can compete with more conventional energy sources in terms of electricity prices.

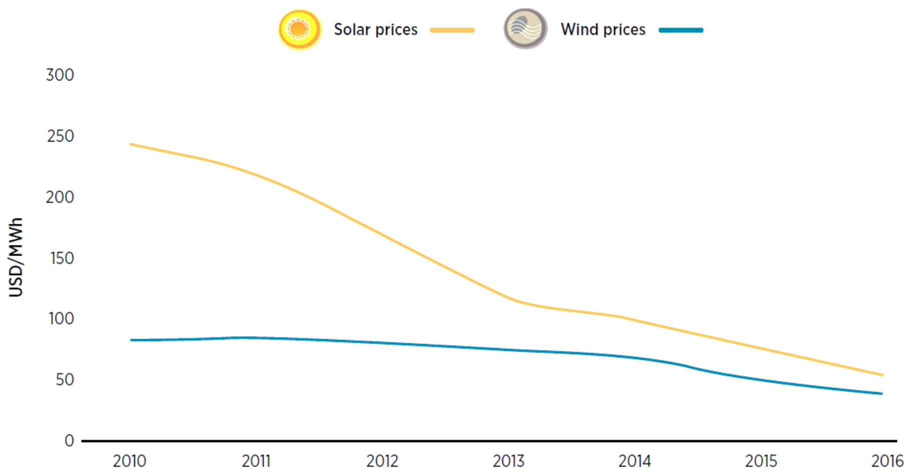
As with FiTs and FiPs, tax incentives are expected to contribute in a lesser extent to the future solar industry. Solar energy is becoming so competitive compared to other energy sources that government subsidies are no longer an absolute necessity for profitability.

5.5 Future Development in the Energy Sector

Before we conclude on the solar energy industry we will take a brief look on the development in the energy sector as a whole. Even though there is a promising trend in the solar industry, it is important to compare it to the development in other energy industries, especially in terms of future competition. The increased focus on climate change is likely to change the future energy distribution in the world. Renewables are expected to lead this change while traditional energy sources are getting a smaller share of the energy market.

In 2015, renewable energy sources represented 61% of the total 252 GW capacity added globally. Wind and solar power were by far the two most popular sectors among investors, receiving almost 90% of the investments in renewables (IRENA, 2017b, p.51). Both industries have experienced declines in auction prices in recent years. The average auctions prices for wind and solar power from 2010 to 2016 are presented in figure 5.8.

Figure 5.8: Recent development in wind and solar auction prices.



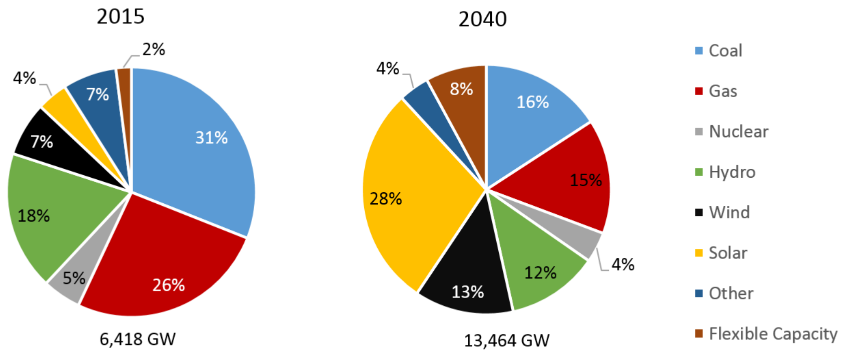
Source: International Renewable Energy Agency - IRENA (2017a)

While solar auction prices have fallen by almost 80% from the global average of close to 250$/MWh in 2010, wind prices have seen a more modest decline during the period. The main reason for this is that wind technology was more mature than solar technology back in 2010 (IRENA, 2017a). The auction prices are strongly correlated with the development in costs for wind turbines and solar PV modules. When looking at the mentioned costs between 2009 and 2015 there is a similar trend as in the auction prices. The cost of solar PV modules has fallen by 80%, as seen in figure 5.5, compared to a 30% decline in the cost of wind turbines during the period. The decreasing costs have made solar and wind power competitive with electricity generated from coal, nuclear, and natural gas in several countries (IRENA, 2017b). Given that these trends continue, solar power will become cheaper than wind power in the future. However, it can be seen from figure 5.8 that the decline in solar auction prices has slowed and approached the level of wind since 2013. This might be an indication of solar technology maturing.

Nevertheless, solar projects are expected to receive 30% of the predicted $11,400 billion investments in energy towards 2040. While other energy sources, such as coal and gas, are to receive 44%, wind will get 26% of the investments according to the *New Energy Outlook* report by BNEF (2016). This means that wind and solar power are expected to receive more than 55% of the total energy investments in the next 24 years. Half of these investments are expected to come from investors in the Asia-Pacific region, followed by the Americas (15%), MENA (13%), and Europe (11%).

The considerable investments in renewable energy sources will change the distribution of installed capacity in the years to come. In 2015, more than 60% of the 6,418 GW global installed capacity came from coal, gas, and nuclear, while wind and solar combined only accounted for 11%. Of the renewable energy sources hydropower was, by far, the largest contributor to installed capacity representing almost a fifth of the total. Increased focus on mitigating global warming and declining prices of renewables are going to drastically change the capacity distribution, according to BNEF's report. Global installed capacity by technology for 2015 and 2040 is presented in figure 5.9 below.

Figure 5.9: Global installed capacity by energy source in 2015 and 2040.



Source: Authors' own compilation / BNEF (2016)

The *other* segment includes energy sources like tidal, wave, and biomass, while power storage, demand response, and other potential resources are covered by the *flexible capacity* segment. From the figure, we see that the evolution between the two pie charts is quite visible. First, coal and gas will no longer be the leading contributors to global installed capacity. In fact, their share from 2015 is almost halved in 2040. Given that the predictions of BNEF are reliable, renewable energy is going to account for more than 50% of the 13,464 GW installed capacity by 2040. While the share of wind power will increase from 7% to 13%, solar power is expected to become the leading contributor, increasing its share from 4% to 28%. Utility-scale PV projects make up two-thirds of the added solar capacity. The significant increase in utility-scale installations will mainly be driven by China, Europe, USA, and Africa from 2025, before India takes over in 2030 (BNEF, 2016).

Furthermore, global electricity demand could increase by more than 50% from 2015 to 2030, according to IRENA (2016a). Emerging markets will account for 95% of this growth, and solar PV is expected to become a key source of electricity in these markets. As previously mentioned, solar PV only accounts for 2% of global power generation today. This share is expected to grow considerable the next decades. The IRENA report predicts that solar PV will produce 8-13% of world electricity by 2030. By 2040, solar PV could supply 15% of the global electricity demand (BNEF, 2016).

5.6 Section Conclusion

Technological development has led to lower costs and higher efficiency through the entire solar power value chain the last decade. This has made solar PV competitive on costs compared to the traditional energy sources. In addition, the increased focus on climate change has resulted in government subsidies and support mechanisms with great impact on the solar industry. These are the main reasons behind the substantial growth of solar power since the millennium, which has resulted in an installed capacity increase of 300 GW during the period.

Despite the positive effect of government subsidies, tax credits and FiTs are about to be replaced by reverse auctions in several regions. Subsidies are costly for the public and less needed in the industry as solar now is competitive on both costs and electricity prices. Reverse auctions seem to be the main pricing mechanisms in the nearest future, and has been well implemented in several countries. This has resulted in a significant decrease in prices of electricity generated from solar PV. United Arab Emirates, USA, and Chile all received auction bids below $30/MWh during 2016. Chile even achieved the milestone without any forms of government support. Low labor costs and a high capacity factor, due to the availability of solar resources, were the most important drivers behind the achievement. In the long run, solar energy is expected to be competitive in the market without any forms of subsidies and government initiatives.

Europe has traditionally been the leading region in the solar industry. Superpowers like USA, China, and Japan have, however, captured considerable market shares the last few of years. These countries are also, alongside India, expected to be the leading market players in the future. Emerging markets, such as Latin America, sub-Saharan Africa, and the Middle East are also expected to follow the solar movement during the next years.

In 2015, solar power accounted for only 4% of the global installed capacity. This share could increase to 28% by 2040, according to BNEF (2016). That would make solar the largest global energy source in regards to installed capacity. Reports predict that solar PV could produce up to 15% of world electricity demand by 2040.

To conclude, there are several promising trends and predictions for the solar power industry. Even though the industry can expect less government support than before, the future looks bright for solar energy and other renewables.

6. Strategic Analysis of Scatec Solar ASA

Chapter 4 and 5 covered SSO's source of value creation and the development in the solar power industry. This chapter will discuss the internal and external strategic drivers which are expected to affect the performance of Scatec Solar and the solar PV industry in the future. Elements of the two previous chapters will be revisited and discussed as strategic drivers in both the internal and external analysis. We will start by looking at the external strategic drivers specifically influencing the industry, before we cover the company-specific drivers.

There exist several approaches suitable for an industry analysis, but Porter's Five Forces and the PESTEL model are considered to be the most common approaches. We have chosen not to use the PESTEL model as we believe that the Porter's Five Forces framework will give a better and more precise analysis of the solar PV industry. The political and environmental factors of the PESTEL approach have also been thoroughly examined in chapter 5. In order to avoid too much repetition, we have chosen to leave out the PESTEL model from the strategic analysis. The next section will therefore be based on Porter's Five Forces. In addition, as we believe that the SWOT framework provides a good coverage of the strategic position of Scatec Solar, we will conclude the chapter by performing an in-depth SWOT analysis covering the company-specific strategic drivers, rather than using the model as a summary of other models.

6.1 Porter's Five Forces

The performance of a company is highly dependent on the industry it operates in. Some industries are in a growth phase, while other industries are experiencing a declining trend due to maturing or substitutes. An industry becomes more attractive when there is a possibility of earning returns equal to, or above, the cost of capital. According to Petersen and Plenborg (2012) a more competitive environment is inversely related to abnormal returns within an industry. In the 1930s, Edward Mason developed the structure-conduct-performance (SCP) framework. According to Mason, "(...) the structure of an industry influences the conduct of the competitors, which in turn drives the performance of the companies in the industry" (Koller et al., 2010, p.60). Of the numerous extensions based on the SCP framework, Porter's Five Forces (1979) has arguably gained the most universal acceptance in the strategy literature. Porter found that the profitability of an industry is affected by five competitive forces: threat of new entry, threat of substitutes, bargaining power of suppliers, bargaining power of buyers, and competitive rivalry.

In the following sections, these forces are discussed in regards to the utility-scale solar PV industry. Each of the five forces will be rated according to what extent we believe they affect the industry. The ratings are divided into *very low*, *low*, *neutral*, *high* and *very high*. When all of the five forces are examined we will present our overall conclusion of the profitability and competition in the solar energy industry based on the ratings.

6.1.1 Threat of New Entry

With new entrants comes added capacity and increased competition for market shares in the industry. The degree of this threat depends on the entry barriers and how the existing competitors react to the entry. According to Porter (1979), there are six main sources to entry barriers: economies of scale, product differentiation, capital requirements, cost disadvantage independent of size, access to distribution channels, and government policy. For the utility-scale solar PV industry we believe that government policy and capital requirements are the most relevant sources.

Capital requirements represent an entry barrier when large financial resources are needed in order to compete. The high capital requirements of building a solar PV plant is a major barrier for new entrants. In 2015, the global average upfront costs of utility-scale solar PV systems were $1.8 million/MW according to IRENA (2016a). This is equivalent to an initial investment of $90M for an average solar PV project with a capacity of 50 MW. There is, however, a declining trend in the required upfront costs, which have fallen steeply in recent years. In fact, as late as in 2010 the cost was more than $4M/MW on average. Nevertheless, lower capital requirements are not enough to attract new entrants to the industry, even if the promising outlooks for solar power from section 5.5 are reliable predictions of the future.

The wide implementation of reverse auctions has made solar power competitive to other energy sources, but also put pressure on margins in the industry. New entrants with less experience might not get as favorable and as much external financing as the existing market participants. This could make it challenging to win auctions against competitors with lower financing costs. As previously discussed, it can be costly to participate in reverse auctions. A power producer must expend substantial time and resources in the preparation process even though there is no certainty of winning the bid. Thus, entering the solar energy industry is not necessarily a profitable journey for a company without the sufficient experience and financing in place. The solar energy industry is a relatively complex industry to enter. In addition to the high capital requirements there are several other aspects to consider before a solar PV plant is fully operational.

Governments can limit entry to industries with license requirements and other regulations. A utility-scale project is subject to strict permitting and licensing requirements, usually set by a government. These requirements vary between countries, and sometimes even within regions. Some of the key requirements include land lease agreements, building permits, grid connection application, and power generation licenses. An IPP company supported by a FiT or other support schemes may also have to register as a *qualified renewable energy generator* to receive support. All of these time consuming procedures might represent a barrier for new entrants with little experience from the process (IFC, 2015).

Even though there exist some obvious entry barriers, the different subsidy policies and support mechanisms of the solar energy industry may attract new entrants. FiTs, tax incentives, and concessional loans are all instruments that have been used to attract investments and new entrants to the industry. These subsidies have played a crucial role in the industry's growth, and have perhaps even been too generous in some cases. As the costs and prices of electricity generated from solar power have declined significantly in recent years, the need for such incentives is more limited than before. In addition, these incentives represent considerable public costs in the countries they are implemented. This is why they now are being phased out and replaced by reverse auctions in several markets.

In general, we believe that the threat of new entry is present, but limited in the future. Therefore, we rank the threat of this force to be *low*, as illustrated below.

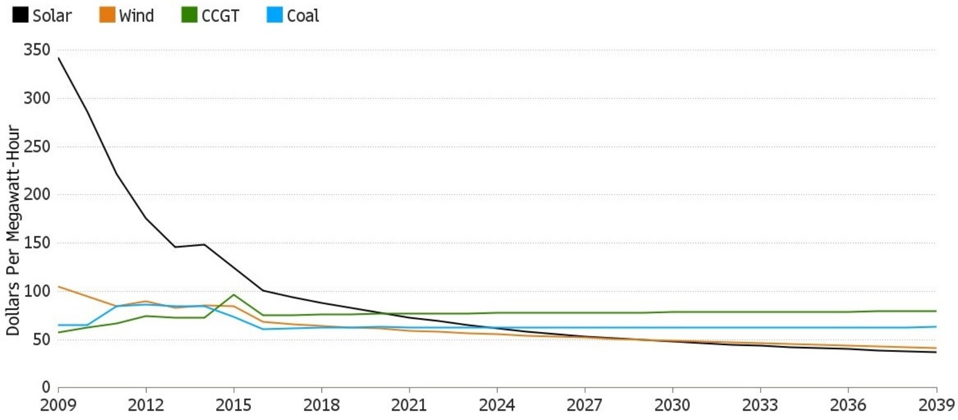
6.1.2 Threat of Substitutes

In addition to the threats of new entry, Scatec Solar is also facing threats of substitutes. This relates to the fact that there are several alternative energy sources. Traditional energy sources, such as coal and natural gas, and renewables, such as wind and hydropower, all pose the potential threat of being a replacement for solar power. As the number of substitutes increases, the production price of each MWh produced is starting to become a deciding factor on which energy source to choose. Although other factors, such as location, transportation costs, and availability, play a role in the decision, the main comparison variable is the cost of producing each unit of energy.

In addition to alternative energy sources, there are substitutes within solar power that can make utility-scale solar PV parks obsolete in the future. As new and enhanced technology related to storing electricity in households has been developed, the need for utility-scale parks could be threatened. It is therefore important to consider the development of both existing energy sources and the future need for large scale solar parks.

6.1.2.1 Threat of Substitution by Other Energy Sources

Figure 6.1: Development in costs of solar, wind, CCGT and coal, 2009-2039.



Source: Bloomberg New Energy Finance - BNEF (2016)

Figure 6.1 shows a comparison between the cost of solar PV, wind, gas (CCGT), and coal. By comparing the average global cost of the different energy sources is clear that utility-scale solar PV has experienced a significant reduction in the cost per unit of energy produced. According to BNEF (2016), the average global cost of producing electricity through solar PV was almost $350 per MWh in 2009. Since then, costs have dropped 62%, making solar PV close in on gas and coal prices. BNEF further estimates that, in 2025, solar PV will become cheaper than coal and other traditional energy sources, however, slightly more costly than wind power (BNEF, 2017b). These estimates from BNEF are also in line with forecasts from institutions like GTM Research, IRENA, and IEA, indicating that the future cost of solar PV is falling each year, making solar power more competitive. It is therefore likely that the threat of substitution from other energy sources move in the same direction as the price. Also, considering the only recent focus on solar energy, we believe that it is more likely that more countries will move away from traditional sources over to renewables, rather than the other way around.

If we ignore the cost element, however, there is the notion of convenience and availability. Solar power is only efficient where the sun is shining. Other energy sources, such as coal and gas, are not reliant on the sun to produce electricity. The same can be said about wind and hydropower, although the efficiency of these sources are affected by weather conditions as well. It is inevitable that not all countries are located in an area where conditions for solar power are optimal. This increases the risk of substitutes, due to the fact that some countries may be unable to adopt solar energy.

When considering the threat of substitution from other energy sources, it is important to evaluate which factors will be relevant in the future. As mentioned above, not all countries are located in parts of the world where solar power production is optimal. It is therefore evident that the threat of substitution is dependent on the location. In a certain part of the world, the threat of substitution can be quite high where traditional energy sources are more convenient and efficient than solar power. In another part of the world, it could be optimal for solar power production both in terms of climate and availability of land areas. The latter can be seen with Scatec Solar, which has most of their plants where sun conditions are ideal. However, considering the fact there is a push for renewable energy through The Paris Agreement, we believe that the only real threat of substitution, going forward, is the one posed by other renewable sources, particularly wind- and hydropower. Compared to the sunlight, wind and water are consistent elements that are not dependent on the time of day.

6.1.2.2 Substitutes within Solar Power

In addition to the threat of substitution from other energy sources, solar power could face competition from within the industry. As we briefly mentioned in section 5.1, the solar energy industry can be divided into small scale and utility-scale. While large scale solar parks are expected to hold the greatest potential, some countries are experiencing a change that could alter the need for utility-scale projects.

In Japan, among other countries, it has become more and more popular to invest in residential power storage systems in combination with solar panels to store the excess power that is generated throughout the day. Until now, Japanese residents have been able to partake in a government incentive program that enables them to sell back excess power to the grid. This incentive plan is now coming to an end, making storage systems more attractive (Watanabe, 2017). Although residential solar PV systems currently are a small part of total capacity, it could have the potential to become a substitute for utility-scale solar parks. If the developments in technology and the lowering of costs continue in the sector, it could open a door for residential systems where every household produces and stores its own electricity. Today, this is only done on a small scale, with Japan being one of the examples. However, if costs fall and capacity and solar panel efficiency go up, it could lead to utility-scale solar parks becoming obsolete. Our reasoning for this is that once a household is able to become self-sufficient, they have no need for a utility-scale PV plant to produce electricity for them. Considering that residential systems is able to generate electricity wherever utility-scale PV plants generate electricity, it is just a matter of whether it is possible to fit a solar panel system on the roof of each household, making solar parks obsolete. However, the industry would have to experience a dramatic change from focusing on utility-scale to residential development, which is not likely at the moment.

As mentioned in section 5.1, there are two main types of technology related to solar power; solar thermal and solar PV. Solar thermal's specific use is to heat up water, while solar PV can be used for more general electricity generation. The future of solar thermal, and the threat of substitution, therefore depends on the expected demand in the future. According to IEA (2016), the heating of water "(...) accounts for 12% of buildings energy demand worldwide and will be a leading source of energy demand growth in developing countries to 2040 (p.481)." Solar thermal could therefore become a potential substitute for solar PV. However, considering the fact the remaining 88% of buildings energy demand worldwide is related to electricity generation in general, we believe that the threat of substitution from solar thermal is small as it only covers one specific need.

Very low	**Low**	Neutral	High	Very high

6.1.3 Bargaining Power of Suppliers

When estimating the power of suppliers, it is important to evaluate the impact an individual supplier have on the market. According to Porter (1979), a supplier group is powerful if there are few companies, and if there are many buyers for each supplier. Also, Porter argues that a supplier group is powerful if the products they are selling are unique, or that there are few substitutes. If these assumptions are true, the supplier group has the power to affect the market through limiting production and controlling prices (Porter, 1979).

In the solar energy industry, the suppliers are mainly the manufacturers of solar panel modules and inverters. Typically, the solar PV technology has been divided between thin-film and crystalline silicone, both with their own advantages and disadvantages. Manufacturers of both technologies compete for the same buyers, and the fact that there are only two types of technologies decreases the bargaining power of the suppliers. As they are not likely to differentiate their products significantly from competitors, individual suppliers have less power over the market as buyers can go elsewhere to acquire a very similar product. In addition to the products being almost identical, there are numerous manufacturers of solar PV in the world, where the top ten accounted for 53% of total market share in 2015, with share among them spread evenly (Mints, 2016).

The same can be said about the market for inverters, where there are few technologies available. According an article in Zipp (2016), one type of inverter is becoming the preferred technology, potentially decreasing the power of suppliers as several suppliers offer a similar product. Contrary to the reduced bargaining power of suppliers from providing similar products, an article published by Hill (2016b) claims that the top 10 suppliers in the world account for 80% of total market share, and top 5 holding approximately 50%.

In terms of solar panel modules, the combination of few alternative technologies and a less concentrated group of suppliers are indications of limited supplier power within the segment. From figure 5.5, it is clear that cost of modules compared to total system cost decreased between 2009 and 2015. This could be an indication that the bargaining power of the suppliers has become lower and lower as more manufacturers were introduced to the market. Similar to the solar panel module segment, the inverter segment is seeing few technologies on the market. However, the supplier group is much more concentrated with a bigger portion being controlled by the top ten. This could potentially indicate bargaining power of suppliers in this segment, however, referring to figure 5.5, the cost as a percentage of the total is small and has decreased between 2009 and 2015. Based on these findings, we argue that the bargain power of suppliers in the solar PV industry is low due to recent developments.

6.1.4 Bargaining Power of Buyers

While suppliers can drive prices up, buyers are able to force prices down. They can also request higher product quality or set competitors up against each other. All of these actions have a negative influence on the profit of an industry. There are several industry characteristics determining the bargaining power of a buyer according to Porter (1979). Some of them are more applicable to more traditional industries, but a few are relevant for the solar energy industry as well.

Unlike more traditional industries the buyers (off-takers) in the utility-scale solar energy industry are usually utility companies owned by a government. Hence, the number of electricity purchasers is relatively limited, resulting in strong competition among the competitors in winning reverse auctions and obtaining FiT agreements for solar PV projects. This means that the power of off-takers is high, as there are relatively few projects available in the market at any given time. The bargaining power of buyers is strengthened further by the fact that electricity is a standardized product with several alternative suppliers. Electricity produced from more traditional energy sources and other renewable energy sources are all adequate alternatives to solar power. In general, an off-taker would choose the energy source that generates the lowest electricity prices. However, the increasing focus on climate change has led to a favoring of electricity generated from renewables in many countries. As electricity prices from wind and solar are becoming competitive, these energy sources might be preferred over coal and natural gas in an increasing number of countries. Thus, the extent of bargaining power of buyers is likely to differ between markets.

Another threat to the utility-scale industry is backward integration. Considering the stable revenue streams and promising market outlook for solar power, private and public utilities might install their own solar PV plants for electricity generation. An investor-owned utility (IOU) will enter the IPP industry if it is profitable, while a publicly-owned utility (POU) might also do it as a step to reach a national target for renewable energy. The entry barriers discussed in section 6.1.1 could, however, prevent such actions.

There are two reasons for not ranking the bargaining power of buyers as *very high*. First, PPAs secure stable long-term electricity prices, making it difficult for off-takers to force down the prices once the agreement is signed. The other reason is the impossibility of requesting a higher electricity quality as it is a standardized product. Nevertheless, even though the product itself is standardized, the stability of electricity supply might differ in certain geographical areas. Unstable electricity supply from solar energy due to solar irradiation could make a buyer choose electricity from a different climate-independent energy source. Based on the discussion above, we rank the bargaining power of buyers as *high*.

6.1.5 Competitive Rivalry

In his article, *How Competitive Forces Shape Strategy*, Porter (1979) mentions the notion of "jockeying for position among current competitors". In more common terms, it describes the rivalry between competitors and which factors that should be present for it to become a rivalry. Among these factors are the numbers aspect, where the number of competitors, or the size compared to each other, are important for it to be a rivalry. Also, Porter argues that rivalry will present itself if the industry lacks growth or the products sold are not distinguishable from each other.

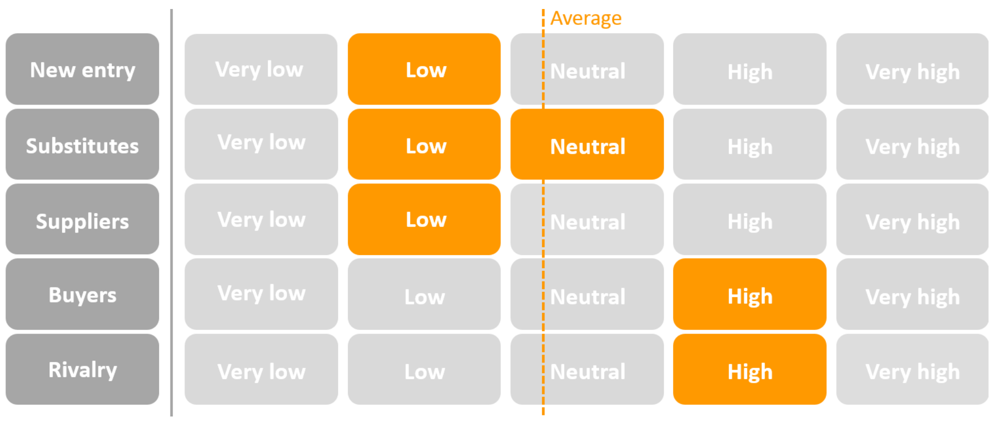
If we try to relate Porter's recipe for rivalry to the solar PV industry we find that it contains some of the factors mentioned, but not all. Focusing first on the factor related to the number of competitors, it could be a matter of segmenting and determining which companies are in fact rivals. As mentioned in chapter 5, the industry is typically divided into companies that manufacture and sell either modules or inverters, and companies that purchase components to develop, operate, and maintain solar parks. Scatec Solar belongs to the latter segment. Therefore, focusing on the segment in which SSO operates, rivalry typically becomes a factor when bidding for new projects through auctions mentioned in earlier sections of the thesis. Since the project is awarded to the lowest bidder, it becomes a competition on who is able to raise the funds to invest, given the large initial investment, and on who is able to operate at the lowest fixed price of electricity. Although the size of the companies differs significantly, the maximum capacity of a project forces companies of all sizes to compete with each other as long as they deem the project profitable.

Many of the factors Porter mentions are relatable to solar PV, however, the industry does not lack growth. As we have earlier discussed in this thesis, solar PV has experienced significant growth and it is expected to continue into the future. Therefore, it is not relevant to relate it to Porter's example of a fight for market share. For those companies that are in the IPP-segment, rivalry is only present in terms of acquiring new projects through auctions. Considering the fact that we are only focusing on the IPP segment, we estimate the level of rivalry to be *high* given the increased use of reverse auctions.

6.1.6 Overview of The Five Forces

Our overall assessment on how Porter's Five Forces affect the solar PV industry is presented in figure 6.2. The risk of new entry, substitutes, and suppliers are all considered to be low, while the risks of rivalry and bargaining power of buyers are rated as high.

Figure 6.2: Overall rating of Porter's Five Forces.



Source: Owner's own compilation.

It should be mentioned that Porter's model only serves as a framework for identifying the forces which impacts the industry. To draw a firm conclusion from the analysis is therefore an educated guess at best. In an attempt to reach some sort of a conclusion we have included an orange dotted line which represents the average ranking of the forces. All of the five forces are given the same weights due to the challenge of ranking the different forces' impact in a sensible and unbiased manner. As the line tends towards *low*, we believe that the industry shows great potential of being profitable.

6.2 SWOT Analysis

A SWOT analysis is applied to identify the key strategic drivers of a company, both internally and externally. The internal analysis covers the company's *strengths* and *weaknesses*. This is related to the resources and competencies of the company. In other words, the internal analysis gives us a better understanding of Scatec Solar's competitive advantage or disadvantage relative to its competitors. The company's business model and history were presented in chapter 4, and will be further discussed in this section. A VRIO model is often used as a framework for the internal analysis. According to Barney, J.B. & Hesterley, W.S. (2008), the model integrates both a positioning perspective and a resource-based view, and is based on four factors that determine a company's competitive potential: value, rarity, imitability and organization (Barney, J.B. & Hesterley, W.S., 2008). However, we do not find the properties of the VRIO model sufficient for a meaningful and thorough analysis of Scatec Solar. We will therefore base the internal analysis on the strategic drivers we believe are the most crucial for Scatec Solar's performance. Some of these drivers have been presented in previous chapters.

The external analysis examines the *opportunities* and *threats* of the company. These are strategic drivers Scatec Solar has no influence on, but that still could have a significant impact on the company's profitability. Some of the external strategic drivers have been discussed in chapter 5 and can be applied to most solar PV companies, while others are drivers we find relevant for Scatec Solar in particular. The strategic drivers discussed in the internal and external analysis will be summarized and presented in a SWOT matrix in the section conclusion.

6.2.1 Strengths

The strengths of a company represent the competitive advantages that the company holds compared to its competitors. The competitive advantages are company-specific and allows the company to capture premium margins.

A key strength of Scatec Solar is their characteristic business model. Through their integrated business model the company controls the entire downstream value chain for utility-scale solar projects. Once an ownership structure (SPV) is established, Scatec Solar provides EPC and O&M services to the project, as illustrated in figure 4.2. There are several benefits to this. First, it gives the company more control and flexibility across the lifetime of the project. This leads to lower costs and improved execution, as well as faster ramp-ups. In this way, the company is able to optimize operations and obtain premium margins. Secondly, it allows Scatec Solar to capture a share of the revenue in every step of the value chain (Nordea, 2016). We consider this to be a strong competitive advantage compared to several of the competitors in the industry. Although the business model is not unique, the benefits of it represents a value.

Solarcompetence Gmbh was established in 2001, at a very early stage of the solar PV's life cycle. Through the acquisition of the German company back in 2007, Scatec Solar gained valuable experience from the solar energy industry, on which they have built on since then. Thus, the company is considered to be an experienced long-time player in the industry. This result is a competitive advantage in numerous ways. As mentioned earlier, utility-scale projects are dependent on high initial investments and capital requirements. In order to enter and survive in the solar industry, access to favorable financing is of significant importance. Scatec Solar has formed a strong partnership network with multilateral development banks and commercial institutions through their long history in the industry. The company has signed partnership agreements with, among others, the International Finance Corporation (IFC), the state-owned Norwegian Investment Fund for Developing Countries (Norfund), and the Norwegian mutual insurance company, KLP. Norfund is in fact partner in five of Scatec Solar's operating projects (Scatec Solar, 2017a). All of these partners have an interest in promoting renewable energy projects. In this way the partnerships secure access to lower cost of capital, and risk mitigation. In addition, SSO has a solid track record of installing solar projects in developing countries. Their experience in these markets has resulted in a strong network, both with co-investors, but also with local suppliers and contractors. This represents a valuable competitive advantage as it reduces local risk and facilitates potential future projects in the region. In South Africa, Scatec Solar has been selected as preferred bidder under the REIPPP program for four of their solar projects. This underlines their strong position in the country.

With a total of twelve operating solar PV plants, located in five different countries, Scatec Solar is able to limit its exposure to operational risk through geographical diversification. Examples of such risks are changes in subsidy policies and long lasting varying weather conditions. An additional four countries will be added to the portfolio if all of the six projects in backlog are realized (Scatec Solar, 2017a). This will further strengthen the diversification effect.

6.2.2 Weaknesses

Contrary to the strengths, the weaknesses have a negative impact on the profitability and market position of a company. If certain weaknesses are not considered and dealt with properly a company might ultimately be forced out of the market.

As mentioned in the previous section, Scatec Solar has projects in operation and backlog spread over several countries and continents. Most of these projects are located in developing countries where the infrastructure, as well as the political and financial framework might represent sources of operational risk. We have used OECD's country risk classification to examine the risk of Scatec Solar's operation locations. The classification is based on a quantitative and a qualitative assessment of country credit risk. On their website, OECD (2017) lists payment experience, financial situation, and economic situation as the three risk indicators that are the basis of the quantitative assessment. The qualitative assessment covers political risk and other factors not covered by the quantitative part. From this a country is classified into a category from 0 to 7, where the latter represents the riskiest category (OECD, 2017). OECD classifications for the countries that are relevant for Scatec Solar's operations are presented in table 6.1. The table is divided into projects in operation and backlog. It should be mentioned that there is one project in backlog in both South Africa and Honduras, indicated by *. Furthermore, each country's contribution to expected electricity production is included in the table to illustrate the impact of the different classifications.

Table 6.1: Country risk classifications by OECD.

	Operation					Backlog			
Country	**South Africa***	**Czech Republic**	**Rwanda**	**Honduras***	**Jordan**	**Brazil**	**Mozambique**	**Mali**	**Malaysia**
% of production	49.7%	1.0%	0.7%	9.9%	4.8%	14.2%	3.6%	2.8%	13.3%
Risk classification	4	-	6	5	5	5	7	7	2

Source: Authors' own compilation / OECD (2017)

From the table it is clear that Scatec Solar mainly operates in high risk countries, with more than 85% of the projects in operation and backlog located in countries classified between 4 and 7. Czech Republic has no rating as it is classified as a High Income OECD Country. South Africa, which contributes 50% of production, is classified with a country risk of 4, while the riskiest countries represent relatively small contributions. Projects in the riskiest countries could still have a significant negative impact on the company's performance considering the amount of capital that is tied up in a solar PV plant. Projects in pipeline are not likely to improve the situation either, as the company is planning high capacity projects in Egypt and Pakistan, classified as 6 and 7, respectively. Hence, the previously mentioned diversification effects might be outweighed by the overall risk of the project portfolio. Scatec Solar's strong experience and network might, on the other hand, mitigate some of this risk.

The first quantitative risk indicator, payment experience, represents a minimal threat to Scatec Solar. This indicator reflects a country's ability to meet financial obligations. A country's risk of default on payments is crucial for a power producer like SSO, considering the fact that off-takers of PPAs are state-owned utilities. The off-taker of the solar projects in South Africa, Eskom Holdings, has a credit rating of BB- from Standard & Poor's (ESKOM, 2017). Such a poor rating would usually represent a considerable credit risk for Scatec Solar's projects in the country. Eskom's financial commitments are, however, guaranteed by the South African National Treasury. All of SSO's other projects, except the Czech portfolio, are in fact guaranteed by governments. Hence, there is little risk related to the counter-parties' ability to provide payment.

The financial and economic situation in the different high risk countries probably represent a more severe weakness. Uncertain business environments in many of the countries in the table might be a weakness for SSO's operations. Potential fluctuations in interest rates, currency, and inflation are examples of risks that could affect the performance of the company. As Scatec Solar continues its geographical expansion to new solar markets the currency risk exposure increases. For operating plants, the company has a general policy of not hedging foreign currency exposure (Scatec Solar, 2017a). This could potentially affect profitability in the future.

Furthermore, solar PV projects are dependent on several different factors and stakeholders. This might lead to delays of projects in backlog and pipeline. Project delays are a weakness in the sense that the company and shareholders misses out on expected cash flows. In order to address this, we contacted Scatec Solar to get updates on the expected timeline of projects in backlog. It appeared that several of the projects are delayed compared to what was initially expected. The 258 MW Upington project in South Africa was expected to be in construction during 2017, but there is still a PPA missing for one of the project's three solar PV plants, according to Scatec Solar. The delay is due to a breakdown in negotiations between Eskom and the South African government regarding grid overcapacity and financial aspects of the REIPPP program. Eskom is currently reluctant to sign new, and fulfill pending, PPAs for IPP projects before the issue is solved. The case has gone so far that the South African Renewable Energy Council has threatened to take Eskom to court (Ola, 2017b). Hence, there is uncertainty related to pending and future solar PV projects in South Africa. Construction start for the Upington project is therefore adjusted to 2018, while operations at the plant is expected in 2019. This means that substantial cash flows are delayed considering the project's high capacity and contribution to production. In Honduras, construction start of the 53 MW Los Prados project is pushed back from third quarter in 2016 to 2017, and is currently awaiting financial close. Also the PPA-secured 150 MW project in Brazil is delayed. It was expected to be in operation by 2018, but is now delayed until 2019 according to Scatec Solar. The complete timeline of the company's projects is presented in Appendix 3. It should be mentioned that the expected delays only are predictions from the company. Hence, changes in the project timeline might occur.

In addition to project delays, Scatec Solar has yearly revised downwards the company's stated capacity target since 2014, when the company had 219 MW in operation and an ambition of 969 MW in operation by 2016. This was far too ambitious at the time considering the fact that only 425 MW was in operation in 2016, even before the 104 MW plant in Utah was sold in December. The company's ambition in 2016 was to have 1.3-1.5 GW in operation and under construction by 2018, slightly lower than the target of 1.4-1.6 GW in 2015. During 2017, the company will have a total of approximately 750 MW in operation and under construction. This means that the company is dependent on commencing construction of the backlog projects in South Africa and Brazil, in addition to at least one of the major projects in pipeline, by 2018 to reach the target (Scatec Solar, 2017a, 2016a, 2015, 2014). Due to the 50% likelihood of realizing projects in pipeline and the occurrence of project delays it is questionable whether or not the target will be met. The risk of not having the winning bid in reverse auctions and the several stakeholders affecting projects in backlog and pipeline are expected to be the main reasons behind SSO's overestimations. Nevertheless, continuously underachievement relative to the company's targets is not a positive signal towards investors.

6.2.3 Opportunities

In the previous section, we discussed the internal drivers that affect Scatec Solar and its operations. We will now address external strategic drivers that could influence the company's performance in the future. These drivers are independent of Scatec Solar, meaning that the company has no impact on them.

When addressing these external drivers, it is natural to first address those that are on a macro-level before digging deeper into the industry-specific factors. On the macro-level the most obvious subject to address is global warming and the resulting focus on renewable energy, and how to make it more competitive. Typical elements of this are government involvement in the form of incentives, and global initiatives, such as agreements like The Paris Agreement. Further, it is important to address the development of industry specific-drivers, such as development in component prices, efficiency, capacity, and innovation.

6.2.3.1 Macro Factors

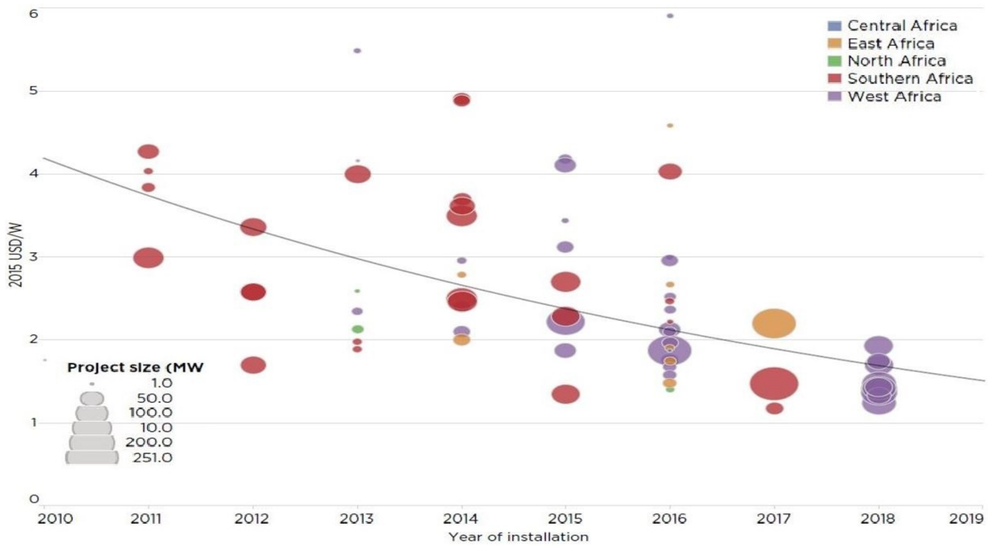
Solar energy is often in the context of being one of the solutions to global warming. It is, therefore, realistic to believe that increased focus on global warming will result in more attention towards renewable energy and solar power. An increased focus on the effects of global warming creates an opportunity for Scatec Solar as countries might consider using solar power as an energy source, increasing the demand for utility-scale solar parks.

As awareness of global warming increases, it is reasonable to assume that this will lead to government incentives encouraging the development of solar energy production. However, we believe that the use of incentives primarily will be used in countries where the prevalence of solar energy is either limited or non-existent. This due to the fact that recent trends show established solar energy markets phasing out the use of incentives because of solar PV being more cost competitive compared to ten years ago. However, we believe that, despite the fact that solar energy is looking to become as cheap as other energy sources, companies that are heavily invested in, or reliant on, energy through fossil fuels will need an extra push in the form of incentives to transform into renewables.

When more countries become aware of the need to replace its fossil energy sources with renewables, it creates a bigger market in which Scatec Solar can operate. In the last ten years, more and more countries have started to consider the use of solar as an energy source. Going back to figure 5.7, it can be seen from the graph that countries, such as China, the U.S, and India, have expanded their capacity towards solar energy, while yearly added capacity in the rest of world has the potential to double. The largest portion of growth n this segment is expected in emerging markets where Scatec Solar operates. In addition to the introduction of new markets through increased awareness and need for cleaner energy, the need for electricity in emerging markets, such as in Sub-Saharan Africa, is critical.

In Africa, more than 600 million people do not have access to electricity, while several countries experience power outages almost daily. Considering the fact that, in 2015, solar and wind power only produced 0.1% of total energy supplied in Africa, there is a significant potential in this region (IRENA, 2016d, p.23). After having developed four plants in South Africa, where they have qualified as a preferred bidder on all four, Scatec Solar has gained experience in the region and is therefore well equipped to enter into other parts of Africa.

Figure 6.3: Installation cost by project size and region, 2011-2018.

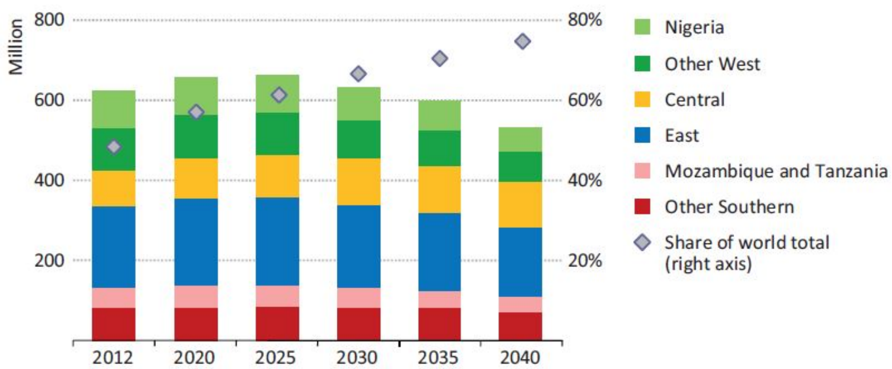


Source: International Renewable Energy Agency - IRENA (2016d)

Figure 6.3 shows installed cost by region and size of solar PV projects in Africa. By looking at the figure it is clear that the installations costs have decreased since 2010. In 2016, several smaller projects were installed with costs ranging from approximately \$1.5/W to \$6/W, a significant difference. Most projects were installed in West Africa, with a few in both Eastern and Southern Africa. Relating this to Scatec Solar, many of the projects are similar in size to those developed by the company. Judging by the small number of constructed and planned projects, there is significant potential in Africa, especially in Northern and Central Africa where few or no plants have been constructed.

Looking at the information from figure 6.3 in combination with the figure below, we are convinced that Scatec Solar has an opportunity to expand their operations in Africa significantly.

Figure 6.4: Population without access to electricity by sub-region in sub-Saharan Africa.



Source: International Energy Agency - IEA (2014)

As mentioned above, more than 600 million people in Africa are without electricity. According to the report *Africa Energy Outlook*, published by IEA (2014), this number is expected to increase to almost 650 million by 2025. From the figure above, it seems that the largest number of people without electricity are located in Western and Eastern Africa, with a significant percentage located in Central Africa as well (IEA, 2014). Combining this information with the discussion above, we find that Scatec Solar could face large opportunities in both Central and Eastern Africa. In these regions, there are few developed projects while the need for a stable supply of electricity is critical. However, it is important to note that this relies on the governments in the respective countries and how they welcome the use of solar energy, in addition to the accessibility to a grid network.

6.2.3.2 Industry Specific Factors

After discussing opportunities that Scatec Solar faces on a macro-level, it is natural to look closer on the elements that directly affect costs of development, in addition to opportunities related to the utilization of the energy produced and sold.

In section 5.3 we discussed the development in system costs and how figure 5.1 shows how costs have decreased, enabling the rapid expansion of solar energy. The majority of the decrease in costs has been due to cheaper components, namely modules. Further in the section we argued that this was mostly due to the drop in poly-silicone prices and the fact that China has allocated considerable resources in order to control the market. If this decreasing trend in costs continues, Scatec Solar has the opportunity to purchase cheaper components and either decrease their capital expenditures and system costs further, or build larger plants for the same amount of capital. This opportunity, however, relies on the size of PPA agreements and the counterparty-need for projects with larger capacities.

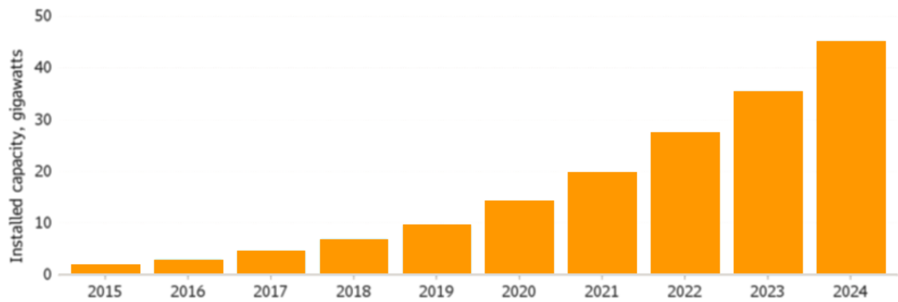
Related to system and module costs is the efficiency of the solar panel cells. The efficiency of a cell determines how much electricity can be produced from the energy of the sun. In terms of technologies, single and multi-crystalline, plus thin-film solar cells have been the most widespread (SEIA, 2017a). A common perception is that the development in efficiency has been the cause of solar power becoming more competitive. However, from the figure found in Appendix 4, which was published by the National Renewable Energy Laboratory and covered by Shahan (2015), it is clear that both crystalline technologies have not experienced any development in efficiency in the last 20 years. Thin-film, however, seems to have become more efficient, but only by 2 or 3% over the last five years. Given that seven of Scatec's plants in operation are using multi-crystalline technology, we do not see an increase in efficiency of the company's current solar panels in the future. However, there is a potential regarding the company's backlog and the technology used on those projects. The figure also shows that other technologies have higher efficiency, which could create an opportunity if Scatec finds it favorable to change solar cell technology.

In addition to facing opportunities from lower system cost and solar cell efficiency, innovation could create new future prospects for Scatec. Specifically, the development in power storage technology could affect production utilization significantly.

According to one of the company's investor presentations, the use of storage systems could expand the market for large-scale PV in the future (Scatec Solar, 2016b). Storage systems can be used to conserve excess energy that is produced during the day before being used at night when the power consumption is greater. If the plant produces more electricity than the agreed upon amount in a day, saving the excess electricity, rather than letting it go to waste, could decrease operational risk related to weather conditions and potentially secure a stable revenue stream in the long-run.

Before 2020, it is expected that the price of these power storage systems will decline by 41%, making it more affordable to store electricity and utilize the full capacity of the solar systems (Munsell, 2016). Considering the fact that Scatec Solar has several plants in areas where there, during periods of the year, are many hours of nighttime, the company could benefit from installing power storage systems.

Figure 6.5: Global energy storage forecast, 2015-2024.



Source: Bloomberg New Energy Finance - BNEF (2016)

Figure 6.5 shows BNEF's expectations for the installed storage capacity between 2015 and 2024. If Scatec integrates these systems with their solar parks, we believe that the company has an excellent opportunity to fully utilize its capacity and power production on all of their plants, limiting losses from operational downtime.

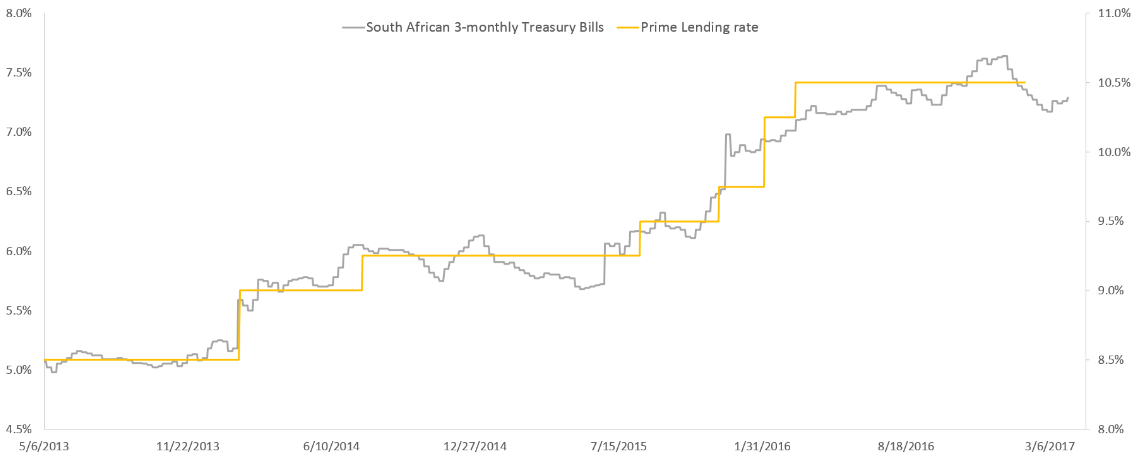
6.2.4 Threats

Threats represent external factors with a potential negative impact on the future profitability of a company, and sometimes even an entire industry. Even though it is challenging to predict the future, companies should always be aware of how potential threats could affect their operations.

Chapter 5 discussed how subsidy policies and support mechanisms have been used to stimulate the solar industry during the last decade. It also showed that the prevalence of them seem to slow down in several existing solar markets. Solar energy becoming competitive against other energy sources, and the substantial public costs the subsidies entail, are the main reasons behind the slow down. Less subsidies are of course unfavorable for any industry, even though the need for such incentives is decreasing in many of the established solar markets. The investment tax credit in the U.S is a good example on how much a subsidy can impact a market. As the ITC initially was set to expire in 2016, pipelines were filled during the year in order to make projects qualify for the tax credit. This resulted in over a doubling of added solar PV capacity compared to 2015 (BNEF, 2017b). Also the generous FiT scheme in Japan has had visible effects on their solar market. While annual added capacity grew rapidly between 2009 and 2014, the recent decreases in FiT rates have led to a distinct decline in added capacity. As subsidies like the ITC and FiTs are being phased out and replaced by reverse auctions, it might be harder for Scatec Solar to expand to other established solar markets. It could also slow down the overall growth of solar power if subsidies are not applied by governments in new solar markets.

Like many other industries, the solar industry is exposed to interest rate fluctuation risk. The importance of external financing for solar projects has been emphasized several times in the thesis. Scatec Solar manages interest rate risk by using a combination of long-term financing at fixed rates and floating to fixed interest rate swaps. The interest rate swaps serve as hedging instruments as they enable the company to convert financing from floating rates to fixed rates. The majority of Scatec Solar's projects in operation are financed using non-recourse debt at floating rates, both hedged and unhedged (Scatec Solar, 2017a). A more detailed overview of the company's financial obligations will be presented in chapter 9. Debt at floating rates is favorable if the interest rates are expected to fall, but represent a substantial risk should the interest rates rise. We have looked at the recent development in interest rates in South Africa, where Scatec Solar is exposed to the most interest fluctuation risk in terms of both outstanding balance and current interest rate level. The company uses floating to fixed interest rates for all of its three projects in the country. Recent development in the South African prime lending rate and 3-monthly Treasury Bills is illustrated in figure 6.6 below.

Figure 6.6: South African 3-monthly treasury bills and prime lending rate.



Source: South African Reserve Bank - SARB (2017)

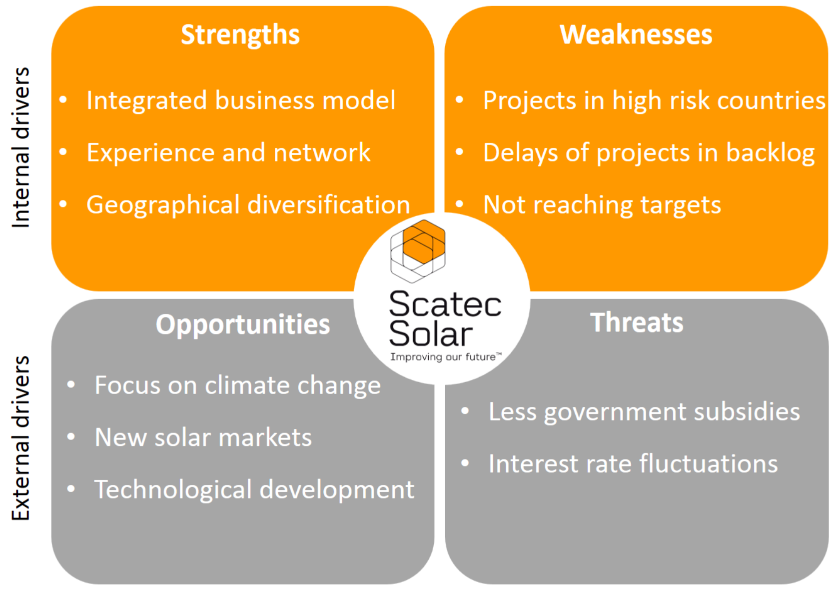
The figure reveals rising interest rates in South Africa over the last few years. Both rates have seen inclines of approximately 2%-points during the period. While the T-bill has increased from 5% to over 7%, the prime lending rate has increased from 8.5% to 10.5%. Scatec Solar has suffered from this development as the interest rate interval on the non-recourse debt for the three South African projects has increased from 8.3-9.4% to 13.2-15.6% between 2013 and 2016 (Scatec Solar, 2017a, 2016a, 2015, 2014). Even though SSO is able to hedge some of the risk by converting to fixed rates, increasing interest rates will lead to higher fixed rates as well. This has a negative effect on cost of capital, resulting in higher financial expenses, and represents a threat to the profitability of the company should the interest rates continue to rise.

The company's solar project in Honduras is the only project that is financed at a floating rate. Unlike South Africa, interest rates in Honduras have fallen in recent years (BCH, 2017). Despite this, the interest rate of the project has remained unchanged at 6.31% since 2015. As the non-recourse debt is at a floating rate, unfavorable future interest rate fluctuations represents a threat.

6.2.5 SWOT Matrix

The strategic drivers from the internal and external analysis are summarized in a SWOT matrix, illustrated in figure 6.7.

Figure 6.7: SWOT matrix.



Source: Authors' own compilation

We believe that Scatec Solar's integrated business model combined with the company's experience and strong network in emerging markets represent the most significant strengths. Even though some diversification effects can be captured through the geographical spread of projects, it might also be a source to operational risk given the high risk of the different countries in the company's project portfolio. Projects in high risk countries and the apparent delays of projects in backlog are considered to be the main weaknesses of the company. Scatec Solar's history of not reaching the company targets is also not considered to be a positive signal towards investors. Concerning external drivers, we find continued technological development and the possibility of entering new markets to be opportunities that the company could exploit. Finally, cutbacks in government subsidies, in addition to risk associated with interest rate fluctuations, could potentially have a negative impact on Scatec Solar in the future.

7. Valuation Methods

There is a significant number of valuation models in existence. Even though the models are based on different assumptions they do share some common properties. According to Damodaran (2012), all of these models can be divided into three different approaches to valuation; discounted cash flow (DCF) valuation, relative valuation, and contingent claim valuation. The outcomes of these three approaches are likely to differ, meaning that choice of approach has an effect on the estimated value of a firm. However, Damodaran further argues that these three approaches are not mutually exclusive and can serve as complements to each other. The following sections will focus on the different aspects and implications of the different approaches, before we conclude by choosing the approaches we find best suited for valuing SSO.

7.1 Discounted Cash Flow Valuation (DCF)

In a DCF valuation the intrinsic value of an asset is estimated based on the asset's fundamentals. The intrinsic value is derived by estimating the present value of the asset's expected future cash flows. Stock dividends is an example of such cash flows. The present value of cash flows is estimated by discounting at an appropriate discount rate which is closely related to the riskiness of the asset. In practice, several variations of DCF models are used by investors and analysts worldwide. All of these models are, however, built on two paths in the DCF framework: to value the equity stake of the firm or to value the entire firm. The main difference between the two approaches lies in the estimation of relevant cash flows and discount rates (Damodaran, 2012). We will start by looking at how to value an entire firm, also known as enterprise value.

7.1.1 Free Cash Flow to the Firm (FCFF)

In order to estimate enterprise value, the relevant free cash flows have to be computed. Free cash flows are defined in various ways across textbooks and other finance literature. As we are using Penman (2013) as our foundation for forecasting, we have used his definition of free cash flows. shown in equation 7.1 below.

$$\text{FCFF} = \text{Operating income} - \Delta\text{Net operating assets} \tag{7.1}$$

This definition implies that free cash flow is equal to operating income, or cash from operations, minus the change in net operating assets, which typically includes changes in net working capital and investments.

Once the free cash flows to the firm are computed, the nest step is to estimate the appropriate discount rate. When an entire firm is valued, free cash flows are available to both equity holders and debt holders. Thus, the discount rate must reflect the risk that both parties face. The weighted average cost of capital (WACC) allows this as it combines the required rates of return for all investors, and is also affected by a firm's capital structure (Koller et al., 2010). The FCFF model is often described as not working well with a changing capital structure. However, this assumption is typically accompanied by an assumed constant WACC, which does not capture the changes to the debt-to-equity ratio. Given that the valuation framework used by Penman (2013) implies a changing capital structure, the FCFF model is well suited at capturing these effects as long as a dynamic WACC is assumed. For a fully equity financed firm the WACC equals the cost of equity and the unlevered cost of capital. Scatec's WACC will be further discussed in chapter 9. With free cash flows and the appropriate discount rate in place, a firm value can be estimated. The enterprise value is simply the present value of free cash flows to the firm discounted by the weighted average cost of capital (Damodaran, 2012), as shown in equation 7.2

$$\text{Enterprise Value} = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} \tag{7.2}$$

where n is the life of the asset, and t represents the different cash flow periods. Furthemore, the equity stake value can be found by subtracting net financial obligations and minority interest from the EV. Minority interest will be discussed further in chapter 8.

7.1.2 Free Cash Flow to Equity (FCFE)

Valuing the equity stake of a firm is based on the same approach, but the cash flows and appropriate discount rates are different from the ones used in the enterprise DCF. As cash flows and discount rates should be aligned, the free cash flows to equity and the cost of equity should be used in an equity DCF. Damodaran (2012) defines the free cash flows to equity as

$$\text{FCFE} = \text{NI} - \text{Net CAPEX} + \Delta\text{Non-cash NWC} + \text{New debt} - \text{Debt repayment} \tag{7.3}$$

where NI is net income, net CAPEX is equal to capital expenditures less depreciation, and NWC represents net working capital. Scatec Solar's reports do, however, not include changes in NWC and net CAPEX in the company's cash flows to equity for each operating segment (Scatec Solar, 2017b). This is further explained in chapter 10.

The value of equity is then obtained by discounting the free cash flows to equity at the cost of equity (Damodaran, 2012), as illustrated in equation 7.4 below.

$$\text{Value of Equity} = \sum_{t=1}^{t=n} \frac{FCFE_t}{(1+k_e)^t} \tag{7.4}$$

In this way the cash flows equity holders are entitled to are discounted at a rate that corresponds to their required return for taking on risk. Cost of equity is estimated using the CAPM model in this thesis, and will be further discussed in chapter 9.

The benefit of the FCFE approach is that it directly computes the equity value. This is an advantage when valuing a firm with a complex capital structure as only the equity cash flows need to be considered. Even though the FCFE approach might appear as the most intuitive to equity investors, there are some drawbacks to it when using a static valuation model. Unlike the WACC approach, future debt capacity must be determined in order to estimate net interest expenses. The approach is also dependent on a stable capital structure as it directly affects the risk of equity (Berk and DeMarzo, 2013). These issues do, however, not apply to a dynamic model which continuously captures the effect of a changing capital structure.

7.2 Relative Valuation

Relative valuation is the most widely used approach in the real world. The core idea of the approach is that the value of a given asset is based on how the market prices similar assets. This makes it possible to value a firm based on market prices of comparable firms, standardized by using multiples. Examples of such common multiples, often called comparables, are price-book (P/B), price-earnings (P/E) and enterprise value-EBITDA (EV/EBITDA). Damodaran (2012, p.19) states that relative valuation relies on the fulfillment of two assumptions. First, that other firms in the industry should truly be comparable to the firm we want to value, and second, that the comparable firms, on average, are priced correctly by the market. Most markets are considered to be fairly efficient in the sense that small pricing errors are exploited and corrected over time (Damodaran, 2012). Multiples are simple to use, and make it possible to obtain value estimates for firms in an easy and time-saving manner compared to DCF valuation. There are, however, some drawbacks to the approach. First, it can be difficult to find obvious peers for all types of firms, potentially making the results of the valuation biased. Relative valuation is also an unsuitable approach if the market has overvalued or undervalued an industry (Damodaran, 2012). For instance, the use of multiples during severe downturns, such as the financial crisis of 2007-08 or the Dot-com bubble in the 1990s, would lead to mispricing.

7.3 Contingent Claim Valuation

Contingent claim valuation is based on option pricing models. Put more precisely, a contingent claim or option is a claim that can be made if a specified outcome occur. For a call option the claim will have a payoff if the value of a firm is greater than a set value, and vice versa for a put option. According to Damodaran (2012), equity can be seen as a call option on the firm value, with an exercise price equal to the face value of debt and the maturity of debt serving as the maturity of the option. Equity holders are only eligible to cash flows if the value of equity exceeds the face value of debt. This can be used to value the equity stake of a firm. Two assumptions for option pricing models are constant volatility and dividend yields. This is usually not an issue for short-term options, but is more problematic for options with longer maturities (Damodaran, 2012). As the equity of a firm can be viewed as a long-term call option, often with frequent changes in both risk and dividend payments, keeping these parameters constant in the option pricing model could result in severe biases in the valuation.

7.4 Choice of Valuation Method

Based on the discussion above, we will now decide which of Damodaran's valuation methods we find most appropriate for Scatec Solar

The contingent claim approach will not be used in the valuation due to its limits in valuing long-term options with changing parameters. Both the stock price's volatility and the dividends payments of Scatec Solar are likely to vary in the future, potentially leading to a flawed valuation. Nor the relative valuation method is suitable for a valuation of Scatec. Due to the company's relatively unique business model, it has proven difficult to find obvious peers. Using multiples based on companies with different business models and operations within other renewable energy industries is not ideal. We will therefore base our valuation on the DCF approach.

As we will apply a dynamic DCF model proposed by Penman (2013), a potential change in capital structure in the future is of no major concern. SSO has, however, reported a stable debt ratio at around 80% since 2013, so both DCF approaches are considered to be suitable. We will divide our valuation into two parts. First, a core valuation, followed by a sensitivity analysis based on both the core valuation and a sum-of-the-parts (SOTP) approach. This allows us estimate a core value for Scatec Solar based on consolidated numbers, using two different approaches. Also, we will be able to observe how changes in the applied drivers in both models would affect the value.

Further, we want to specifically observe how cash flows to equity from the different segments of the company are affected by future scenarios. As SSO has reported each operating segment's cash flows to equity we will base our scenario analysis on the FCFE model. Only focusing on the equity stake is also an advantage as it removes potential noise in the analysis. Various scenarios, based on the SOTP framework, will be estimated, allowing us to define an appropriate value interval for Scatec Solar's estimated share price.

8. Financial Statement Analysis

This chapter seeks to analyze the financial statements of Scatec Solar. We will perform a reformulation of the company's income statement, balance sheet, and statement of shareholder's equity, before the historical performance of SSO is examined. Furthermore, we will dig deeper into the historical performance by covering the performance at business segment-level. This gives us a better understanding of the extent each segment contributes to the company's overall performance. First, a brief assessment of the quality of the data and financial statements follows.

8.1 Quality of Data and Financial Statements

In terms of historical financial statements, we have been able to find annual and quarterly reports dating back to 2012 and 2014, respectively. However, in 2012, Scatec Solar went through a change in strategy. The company changed from selling D&C services to third-parties to position themselves as an independent power producer (IPP). A result of this is that their financial numbers for 2012 were restated in the 2013 Annual Report. This means that we potentially have five years of historic data to use in our valuation if we include 2012. Although more historical data would be preferable, there has been a significant increase in the performance potential of the company. This considering the more favorable conditions for renewable energy in 2016 compared to 2012. Given the increased potential for renewable energy in recent years, we believe that the last four years of financial data give a more accurate depiction of the company's performance today.

8.2 Reformulation

In order to get an accurate view of Scatec Solar's income from operations we have to reformulate their financial statements. The company's reformulated income statement is a reflection of the income that the company earns through its core business operations. It should therefore not include dirty-surplus items, such as results from hedging activities, unrealized gains or losses on available-for-sale securities, or gains or losses on foreign currency translation. These items are not part of the company's core business activities, but they can still be related to operations. This is why we have to analyze and reformulate both the income statement and balance sheet. In addition, we will have to reformulate the statement of changes in equity to extract the balance that is related to the common equity holder's share of equity, which is total equity minus non-controlling interest (Penman, 2013). In the sections below, we will address the reformulation of the specific financial statements and the special items that we believe should be included as part of the business operations. All statements have been formulated using Penman (2013) as a foundation.

8.2.0.1 Accounting for Non-Controlling Interest

Before reformulating the financial statements, it is important to address minority interest, also called non-controlling interest (NCI), as Scatec has part-ownership in many SPVs and supporting companies. NCI is defined as the share in a subsidiary that Scatec's parent company does not own. As NCI does not involve the common shareholder, it must be subtracted either from income or equity, depending on the financial statement, to estimate the share belonging to the Scatec's common shareholder (Penman, 2013, p.260). In the income statement, net income is divided into Scatec's parent company share and NCI share. On the balance sheet, NCI is reported separately under equity, while the statement of changes in equity presents transactions related to NCI in its own column.

In terms of valuation and the FCFF model, Koller et al. (2010) subtracts NCI's share from forecasted income before estimating cash flows. However, given the complex ownership structure in subsidiaries with NCI share varying significantly the last three years, we find that subtracting the market value of NCI from the estimated enterprise value would produce less forecasting error. This is also proposed by Damodaran (2006), who argues that one should use the average price to book value of the companies within an industry. Using the competitors mentioned in section 4.5, we found that the average price-to-book ratio was equal to 2.73, resulting in a market value of NCI equal to NOK 1,712,897.

8.2.1 Income Statement

The purpose of reformulating the consolidated income statement is to separate operating and financing activities and identify the items that contribute to the company's core operation (Penman, 2013). The reformulation of Scatec's income statement is fairly straight forward. However, we do want to address a few items that were either included or removed from the operating section in the statement. The reformulated statement is shown in appendix 5, where it can be observed that the core operating income is varying between being both higher and lower than the after-tax Comprehensive operating income. This is mostly due to the dirty surplus activities that are not reported directly in the income statement, in addition to items that we have moved from core operations to unusual items.

8.2.1.1 Unusual Items

As Scatec Solar is a company that conduct all of their business in several different countries they are exposed to many types of risk. One of these risks is currency risk. To account for the risk of changes in currency rates, Scatec Solar has been engaging in forward currency contracts up until 2016 (Scatec Solar, 2017a). The result is that the company has to report gains or losses on these contracts, in addition to foreign exchange gains/losses where they are not hedged. These gains/losses have been reported in the financial section of income statement and belong to unusual items, which should not be forecasted.

In addition to gains/losses related to currency, the company has reported gains and losses on project assets. This item is related to the sale of solar parks or other project assets. As Scatec Solar is not in the business of developing and immediately selling solar parks, but rather owning and operating, we argue that this can be characterized as an unusual item. Like the items related to currency, the gain or loss on the sale on project assets will not be forecasted.

8.2.1.2 Dirty Surplus Items

Among the items that are not part of Scatec Solar's day-to-day operations, or core activities, are *Net Movement of Cash Flow Hedges*, which relates the company's interest rate swaps, and *Foreign Currency Translation Differences.* These numbers are reported pre-tax, which is why Scatec also has included the item, *Income Tax Effect*, in their statement of comprehensive income. This is the tax effect of the two above-mentioned items as the statement of comprehensive income is normally reported net of tax.

Scatec Solar's cash flow hedges relate to the company securing stable and predictable interest rates on their project financing. Considering the fact that this item has shifted between NOK -125 and 143 the last two years (Scatec Solar, 2017a), it is quite clear that the company operates in emerging markets with risky financing.

The item *Foreign currency translation differences* relates to the fact that Scatec Solar owns several subsidiaries where the financial reporting is done in a currency different from Norwegian kroner (NOK). As these subsidiaries' results are consolidated with the parent company, it creates translation differences due to changing exchange rates. These translation differences are not part of the company's core activities, and are therefore reported in the statement of comprehensive income rather than the income statement. In 2014, Scatec Solar reported almost MNOK 118 under this item, which could be an indication of a year with significant currency fluctuations (Scatec Solar, 2015).

8.2.1.3 Hidden Dirty Surplus Items

In the 2016 Annual Report, under *Employee Benefits*, Scatec Solar reports that they adopted a retention and share incentive plan in July 2014. Through the plan, certain key employees were invited to participate in the one-time plan, which awarded them the right to subscribe to a specific number of shares at their nominal value (Scatec Solar, 2017a). The fair value of the plan was estimated to NOK 36.3 million, where 10.3 million were recorded under personnel expense in the income statement in 2016.

Also, in September 2015, the company invited key employees to participate in a personnel-award program, where the employees were granted 80 000 synthetic Scatec Solar shares. The estimated fair value of the plan was NOK 8.4 million at the grant date.

Given the fact that the costs of the incentive plans are recorded under personnel expenses, have a small impact on the total, and the lack of detailed information, we find that the impact is well captured in the company's profit margin and would only create forecasting noise if forecasted separately.

8.2.1.4 Operating Leases

In their 2016 annual report, Scatec Solar writes that the company is currently engaged in operating leases related to both cars and land use at their operations in Jordan. According to Penman (2013), operating leases should be capitalized if they "(...) are effectively an obligation to use an asset for most of its useful life" (Penman, 2013, p.684). The process of capitalizing makes it easier to compare companies, when all leases are reported in a similar fashion.

Using the approach proposed by Damodaran (2012, p.38), we have capitalized lease-obligation by calculating the present value of future lease payments, using the pre-tax cost of debt rate in Jordan as a discount rate. From table 12.2, it can be seen that the capitalization increased core operating income in all years, except for 2014, where the replaced lease payment was small compared to the straight-line depreciation expense generated from the lease obligation, which was calculated based on the estimated length of the lease obligation.

The bottom-line effect of capitalizing the operating leases was that comprehensive income to common was not equal to reported comprehensive income. This was due to fact that the reported lease payment was not equal to the sum of interest and depreciation expense from the capitalized lease, causing comprehensive income to change. Although we expected comprehensive income to remain unchanged, the approach that would ensure this, where depreciation was set equal to the difference between lease payment and capitalized interest expense, made depreciation become negative in 2013. This was due to interest expense being larger than the lease payment that year.

Lastly, despite the company stating that they have operating leases in Jordan, we could not find any indication of this in either the income statement or the statement of cash flows. However, we chose to capitalize the leases, in order to depict the company's income statement, balance sheet, and cash flow statement as accurately as possible. The capitalization will also affect financial ratios, which will be discussed further in section

8.3.1.

8.2.2 Balance Sheet

The reformulation of the income statement enabled us to separate line items that are not considered operating. Similarly, the purpose of reformulating the balance sheet is to separate the items that are considered a part of operations from those that are strictly related to financing activities. Items that are considered operating are assets or liabilities that directly support a company's core business operations. Further, the operating items are divided into current or non-current depending on the liquidity and time horizon of the items (Penman, 2013, p.241). The table in appendix 6 shows the reformulated balance sheet where items are separated into current and non-current operating assets and liabilities. This reformulation will, by definition, result in the same balances as the reformulation of financing and equity items, shown in appendix 7. Below, we will address some of the items that, we believe, could be defined as either operating or financing depending on the business nature of the company.

8.2.2.1 Operating Assets

In the current operating assets-section of the balance sheet there are two items in particular that stand out. In their 2015 Annual Report, Scatec Solar disclosed that the balance of the item *Non-current assets held for sale* in 2016 is related to the amount that is recoverable after the impairment of project assets in the U.S. For forecasting purposes this item will be removed as it is not relevant for the company's core business operations (Scatec Solar, 2017a). The second item that is worth mentioning is the *Financial assets - current.* This is the fair value of the current portion of Scatec Solar's interest rate swaps. It is included as operating due to the fact that it is a vital part of the company's operations considering that they operate in emerging markets where interest rates vary significantly from year to year.

Similar to the item in the current operating assets section *Financial assets - non-current* relates to the company's interest rate swaps, only the non-current portion. Another non-current item is the *Investments in associated companies*, which is Scatec Solar's investments in subsidiaries. In 2014, the company acquired 50% of SSOGE Limited, which increased their balance in associated companies. In both 2015 and 2016, the balance was equal to zero as the remaining companies were inactive (Scatec Solar, 2017a). In terms of forecasting, this item line will be removed when estimating net operating assets in future years.

8.2.2.2 Operating Liabilities

Similar to financial assets under operating assets, *Financial liabilities* relates to both the current and non-current portions of the company's interest rate swaps. On the balance sheet these items are divided into current and non-current depending on the settlement date. Other items that are classified as operating liabilities are *Trade and other payables, Income tax payable, and Deferred tax liabilities.* These all relate to operating activities, which is why they are classified as operating liabilities.

8.2.3 Statement of Shareholder's Equity

According to Penman (2013), there are three main purposes of reformulating the statement of shareholder's equity. First we want to separate non-controlling interest (NCI) from the beginning balance of total equity. This is to create a more accurate estimate of the value of equity that is related to the common shareholder and not subsidiaries. Second, we want to identify transactions with common shareholders that add or subtract to the common equity balance. Therefore, in each line item, we separate out the portion that is related to NCI and add the rest to common equity. Third, we do the same to comprehensive income to end up with Scatec's share, which is the reported net income, minus NCI-share, plus other comprehensive income. Scatec reported two items under *Other comprehensive income.* These items were *Foreign currency translation* and *Cash flow hedges.* The result is an updated balance for common stockholder's equity (CSE) at the end of the year, which includes the effects of capitalizing the operating leases. The reformulated statement is located in appendix 8. The relevance for us is that we will use CSE in a profitability analysis later in the thesis.

8.3 Historical Performance

Before being able to forecast the company's future performance it is important to evaluate how they have done in the past. To do so we have decided to look at both the reformulated income statement and reformulated balance sheet separately, touching on profitability, liquidity, solvency etc. As it is more relevant to us how Scatec has performed after they switched business model in 2012, we will evaluate the last four years.

8.3.1 Profitability

When evaluating a firm's performance, it is natural to address its profitability in previous years. In terms of profitability, it is common to analyze a variety of ratios and measures. We have decided to use the operating profit margin (PM), asset turnover (ATO), return on invested capital (ROIC), and return on common equity (ROCE). The profitability measures are listed in table 8.1 below.

Table 8.1: Profitability measures

NOK in thousands

	2013	2014	2015	2016
Revenues	132,163	455,098	867,714	1,012,938
Core operating income	38,962	136,099	322,137	360,345
Profit Margin	**29.5%**	**29.9%**	**37.1%**	**35.6%**
Revenues	132,163	455,098	867,714	1,012,938
Net Operating Assets	2,259,018	4,195,619	6,569,401	6,351,688
Asset Turnover	**0.06**	**0.11**	**0.13**	**0.16**
Profit Margin	29.5%	29.9%	37.1%	35.6%
Asset Turnover	0.06	0.11	0.13	0.16
Return On Invested Capital w/ Goodwill	**1.7%**	**3.2%**	**4.9%**	**5.7%**
Profit Margin	29.5%	29.9%	37.1%	35.6%
Asset Turnover	0.06	0.11	0.13	0.16
Return On Invested Capital w/o Goodwill	**1.7%**	**3.3%**	**4.9%**	**5.7%**
Return On Invested Capital	1.7%	3.2%	4.9%	5.7%
Net Financial Expense	12,949	-141,404	-215,358	-326,059
Net Financial Obligations	1,860,402	3,039,461	5,147,751	5,038,733
Spread	1.0%	7.9%	9.1%	12.1%
Financial Leverage	78.7%	63.3%	69.8%	71.6%
Effect of Financial Gearing	0.8%	5.0%	6.3%	8.7%
Return on Common Equity	**2.5%**	**8.2%**	**11.2%**	**14.4%**

Source: Authors' own compilation / Company reports

The operating profit margin measures how well the company turns revenues into core operating profits. During the last four years, Scatec Solar's profit margin increased from 29.5% in 2013 to 37.1% in 2015, before dropping to 35.6% in 2016. The drop between 2015 and 2016 can best be explained by a significant loss on interest rate swaps in 2016, compared to a gain in 2015. Also, between 2014 and 2015, depreciation expense increased more than 73%, much due to large additions in property, plant, and equipment. The capitalization of Scatec Solar's operating leases had both a positive and negative effect on operating income between 2014 and 2016. Despite seeing the drop in 2016, we believe that it is reasonable to assume a profit margin for future years in the range between the 35 and 40%, like previous years. This will be discussed further in the forecasting section (Scatec Solar, 2017a).

The asset turnover is a measure of the company's ability to generate revenues through the utilization of its net operating assets. From table 8.1 we see that Scatec performed poorly in terms of generating sales from their assets. Although the ratio increased steadily between 2013 and 2016, the company only generated NOK 0.16 of revenues per NOK in assets in 2016. At first it can seem as Scatec has not been very efficient in recent years in terms of utilizing its assets. However, taking into account that roughly NOK 637 million, or 12.5%, of assets are still under construction and do not generate revenues, in addition the company having large amounts of PP&E, it is reasonable to assume that the asset turnover will increase in the near future, but remain low given the financial structure (Scatec Solar, 2017a).

One of the most significant measures in terms of evaluating a company's performance is the return on invested capital (ROIC). This measures how well a company utilizes its net operating assets to generate operating profits. In the past, Scatec Solar, has shown poor performance in terms of the return on invested capital. In 2013, Scatec Solar's ROIC was only 1.7% and increased steadily to 5.7% in 2016. This means that the company, in 2016, was only able to generate NOK 5.7 in operating profits from every NOK 100 in net operating assets. In terms of value creation, a company only creates value if ROIC is at a level above the weighted average cost of capital (WACC) (Damodaran, 2007). We will address Scatec Solar's WACC in the next chapter, however, considering that we have estimated the cost of equity and cost of debt to be equal to 5.25% and 10.72%, respectively, in 2016, it is highly unlikely that Scatec has created value between 2013 and 2016.

The last profitability measure we want to discuss is the return on common equity (ROCE), which enables us to estimate the effect of financial gearing over the ROIC. If there is no financial leverage in the firm, the ROCE is equal to the ROIC (Penman, 2013, p.367). When looking at Table 8.1, one can see that the ROCE increases from 2.5% in 2013 to 14.4% in 2016. Comparing the ROCE to the ROIC, reveals that Scatec had a financial gearing effect of 0.8%, 5.0%, 6.3%, and 8.7% in 2013, 2014, 2015, and 2016, respectively. This is quite significant, but also expected considering the company's financial leverage.

Although the profit margin is the only profitability measure that shows strong performance from Scatec Solar over time, all other measures do show an increasing trend between 2013 and 2016. From the profitability analysis we can see that the company is struggling to utilize its assets to generate revenues. Even though the increase in revenues between 2013 and 2016 was larger than the increase in investments, it did not significantly affect the company's asset turnover (Scatec Solar, 2017d). When considering the combination of all profitability measures we see that Scatec Solar is profitable in terms of operations, but that they have struggled to generate value from their assets, which also affects the ROIC. We do, however, think that there is reason to believe that the company will continue the trend from the years before 2016 into the future.

8.3.2 Liquidity and Solvency

The purpose of evaluating a company's liquidity and solvency is to estimate its ability to meet both short-term and long-term obligations. Liquidity ratios are measures that cover the company's ability to cover its short-term obligations, typically due within one year. Solvency ratios measure the company's ability to meet long-term obligations. This typically means long-term debt or total debt measures (Penman, 2013, p.684).

8.3.2.1 Liquidity

Table 8.2: Liquidity measures.

	2013	2014	2015	2016
Current assets (free cash)	477,771	615,618	1,151,720	650,795
Current liabilities	642,824	282,980	548,640	229,776
Current Ratio	**0.74**	**2.18**	**2.10**	**2.83**
Free cash + Short-term investments	296,510	403,653	650,933	303,918
Current liabilities	642,824	282,980	548,640	229,776
Cash ratio	**0.46**	**1.43**	**1.19**	**1.32**
Cash flow from operations	301,080	-96,467	504,827	731,971
Current liabilities	642,824	282,980	548,640	229,776
Cash flow ratio	**0.47**	**-0.34**	**0.92**	**3.19**
Cash flow from operations	301,080	-96,467	504,827	731,971
Capital expenditures	1,313,765	923,315	2,512,284	883,634
Cash flow to capital expenditures	**0.23**	**-0.10**	**0.20**	**0.83**

Source: Authors' own compilation / Company reports

Table 8.2 above shows the development of Scatec Solar's liquidity between 2013 and 2016. From the current ratio we can see that the company is able to cover their short-term obligations. Beside from 2013, Scatec Solar has had over twice as many short-term assets compared to short-term liabilities. To get a fair estimate of the company's ability to meet short-term liabilities, we only included free cash under current assets. If we had included cash that were restricted to projects or other purposes the ratios would be significantly higher.

Turning the focus to the cash ratio, we can see that this measure has been varying, much due to fluctuations in both the free cash and current liabilities balances. In the last three years, the company has been able to cover their current liabilities with their free cash balances alone, indicating that they are not in the risk of being illiquid in the near future.

The cash flow ratio is an indication of how good a company is at generating cash flows from operations that cover their current liabilities. Focusing on Scatec Solar, in 2013 and 2014, the company was only able to cover either less than half or none of their current liabilities with cash flow generated from operations. From Scatec Solar's annual report (2015), we can see that the company had a negative cash flow from operations (OCF) in 2014, which was mostly due to large repayments of trade payables, making the cash flow ratio negative as well.

A ratio that is especially relevant for a company like SSO, which investments significant amounts in property, plant, and equipment, is the cash flow to capital expenditures ratio. In 2013 and 2015, the company was only able to cover roughly 20% of their capital expenditures through OCF. In 2014, as with the cash flow ratio, they covered none. However, in 2016, they could cover 83% of CAPEX with the OCF. This was due to an increase in OCF from 2015 and a significant decrease in CAPEX (Scatec Solar, 2017a).

Based on these liquidity measures, it seems that Scatec Solar has a varying liquidity position. Both the current and cash ratio show that the company is able to meet its short term obligations, also showing an increasing trend. Based on their cash flow ratios, Scatec has been able to meet short-term obligations through OCF. Even though, in terms of covering their CAPEX through OCF, the company is not performing optimally, it can be explained by their focus on expansion. Scatec operates by purchasing, developing, and operating solar plants. This business model requires large amounts of CAPEX, which is not necessarily recorded in line with the corresponding cash flow in the form of revenues. The overall opinion is that Scatec does not have difficulty meeting short-term obligations, but the company is not free of liquidity risk.

8.3.2.2 Solvency

Table 8.3: Solvency measures.

	2013	2014	2015	2016
Total debt	3,259,944	4,133,137	6,858,223	5,967,110
Common shareholder's equity	398,616	1,176,582	1,425,397	1,312,739
Debt to equity	**8.18**	**3.51**	**4.81**	**4.55**
Long-term debt	2,536,226	3,752,631	6,106,147	5,602,496
Total equity	398,616	1,176,582	1,425,397	1,312,739
Long-term debt ratio	**6.36**	**3.19**	**4.28**	**4.27**
Core operating income	31,245	134,697	320,942	355,976
Net financial expenses	30,953	173,643	348,644	457,477
Interest coverage	**1.01**	**0.78**	**0.92**	**0.78**
Core operating income plus interest-rate swaps	156,525	47,700	463,655	241,394
Net financial expenses	30,953	173,643	348,644	457,477
Interest coverage	**5.06**	**0.27**	**1.33**	**0.53**

Source: Authors' own compilation / Company reports

Table 8.3 above shows a collection of ratios related to Scatec Solar's solvency position. From the debt to equity ratio we can see that Scatec is a company that is in large part financed by debt. Over the last two years the company has had over four times (4.39) as much debt as equity, or, in other words, debt was equal to roughly 80% of total assets. In 2013, the number was close to 8, however, this was before the company went public in 2014, resulting in a larger share premium and an increase in total equity. The long-term debt ratio was 4.11 in 2016, indicating that long-term debt amounts to over 90% of total debt. This is due to the nature of how Scatec Solar finances their projects, using long-term non-recourse project financing (Scatec Solar, 2017a).

Lastly, it is important to evaluate how well the company can cover their interest payments. The interest coverage ratio is a measure of how well Scatec Solar covers their net interest expenses through their operating income. A number below 1 means that the company cannot payoff their financial obligations with the income from their core operating activities alone. Looking at table 8.3, we can see that, in 2013, Scatec Solar's core operating income barely covered their net financial expenses. Over the last three years, the company's core operations could not cover all of their net financial expenses. In 2016, the ratio dropped to 0.78, which was due to increased interest expenses as a result of the company issuing the NOK 500 million green bond in late 2015. If we add the net movement from the company's interest rate swaps to core operating income, we can see that Scatec Solar has, in a varying degree, been able to cover their net financial expenses. This could indicate that the company could reconsider their hedging strategy, based on the fact that it does not seem to offset the fluctuation in financial expenses.

Our overall opinion of the company's solvency position is that Scatec Solar is a highly leveraged company. All of their solar projects are funded by non-recourse financing, which provides smaller risk, but also higher interest rates. Considering that 80% of their long-term debt in 2016 was non-course financing with high interest rates, it is evident that there is a risk of the company not meeting their long-term financial obligations. Given the risky business model, it is vital for the company that they will increase their ability to cover financial expenses with core operations in the future, rather than relying on hedging activities.

8.4 Historical Segment Performance

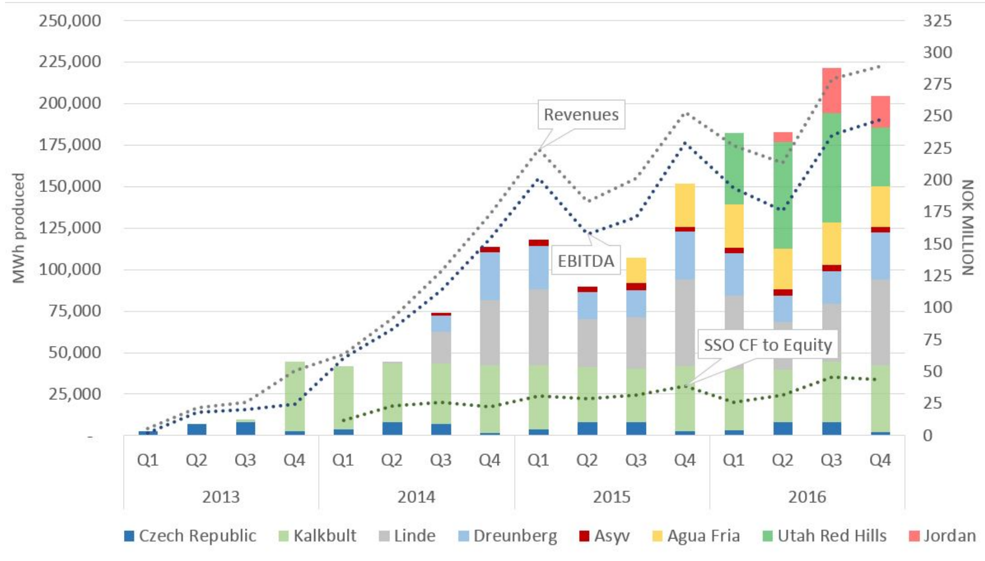
After evaluating the company's past performance on an aggregated level, we want to dig deeper into the company's segments. Given that we are planning to conduct a valuation both on an aggregate level and based on a sum-of-the-parts approach, it is important to see where value, in terms of cash flows, was generated. This section will, therefore, cover the historical operating performance of the different segments that are part of Scatec Solar operations. As discussed above, these segments include Power Production, Operation &

Maintenance, Development & Construction, and Corporate & Eliminations. When valuing SSO, it is essential to analyze each segment's past performance and try to identify which segments that will provide cash flows in the future. By identifying trends in the data, or the lack thereof, we can collect valuable information that can be used in our forecast of the different segments.

8.4.1 Power Production

As mentioned in chapter 4, the power production (PP) generates its revenues through the production and sale of generated electricity. This is done through the enforcement of PPAs and FiTs. Power production consists mostly of revenues generated externally and is Scatec Solar' main source of revenue. Almost all of the company's total revenues are generated in this segment. In addition, the segment generates value in the form of cash flow to the company through the equity share of dividends. Between Q1 2013 and Q3 2016, Scatec Solar's best quarter yet in terms of revenue, the company's quarterly income grew with a multiplicative factor of 50. According to Scatec Solar (2017a), the PP segment consists of solar PV plants in operation, which produces electricity for sale on long-term contracts. The company currently has eight solar PV plants in production, having sold its Utah Red Hills plant in late December 2016. Table 4.1 presented an overview of all solar plants currently in operations.

Figure 8.1: Development of power production.



Source: Authors' own compilation / Company reports

8.4.1.1 Project Developments

From figure 8.1 it can be seen that in early 2013, the production facility in the Czech Republic was the only project operating. During the last quarter the same year, Scatec

Solar's first solar project in South Africa, Kalkbult, came online, boosting production to almost 50 000 MWh in one quarter. Since then, Kalkbult has shown stable production each quarter.

During Q3 2014, three other operations began. Linde and Dreunberg, also located in South Africa, quickly ramped up production, but has not been able to show the same consistency in production levels as Kalkbult. The third project starting operations in the third quarter of 2014 was Asyv, located in Rwanda. Compared to Scatec Solar's other projects, Asyv has a much lower capacity of 9 MW, compared to Kalkbult and Dreunberg's 75 MW. However, ignoring capacity, Asyv has been a stable contributor to the company's production since start up.

In Q3 2015, SSO began operating at their solar PV plant in Agua Frìa, located in the southern part of Honduras. This is the company's third largest project in terms of production capacity. After a short ramp up in the opening quarter, the solar park has shown stable production of approximately 25 000 MWh each quarter.

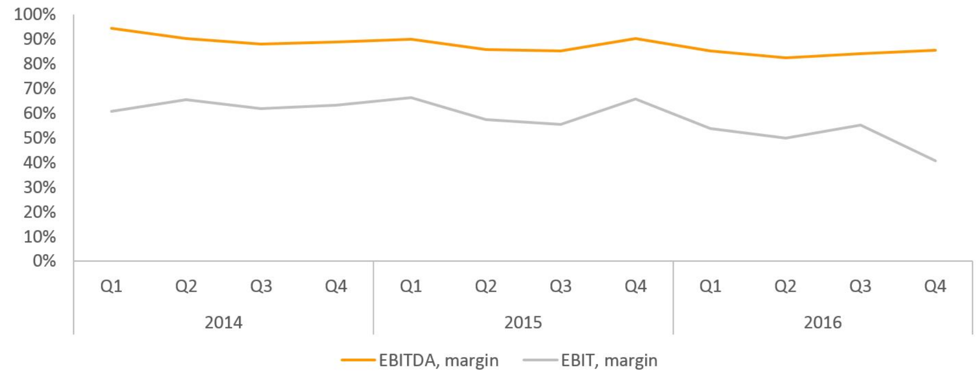
In the first and second quarter of 2016, Scatec Solar began operations both in the United States and Jordan, respectively. Having been the sole owner of the 104 MW Utah Red Hills project in the U.S, the company increased quarterly production significantly. The project provided stable production through 2016, before being sold in late December the same year. The project in Jordan (43 MW) is the fourth largest in terms of capacity, but has, during the three quarters it has been operating, shown varying output.

Considering the historical data, it seems that the majority of Scatec Solar's projects has reached a stable production level. In terms of our valuation this is quite important since it enables us to provide a good estimate when forecasting the production of the company's current projects into the future.

8.4.1.2 Operating Margins

In figure 8.1 you can also see two plotted lines for both revenues and operating profits. Naturally, both revenues and operating profits increased as more projects came online and more electricity was produced. Up until the fourth quarter of 2015, both revenues and operating profits seem to move with total production. However, in Q1 and Q2 2016, revenues and profits fell despite the fact that production remained stable or increased in the period. From the underlying data we can see that although the Utah Red Hills-project added significant production of electricity, it barely generated revenues in 2016. This caused the natural relationship between production and revenues to break in 2016. From the data it can seem that the company's revenues, in large part, moved with the changes in production at the Linde project. This is quite interesting considering that Linde is not the largest production contributor. However, it could also just be a coincidence.

Figure 8.2: Operating margins, power production.



Source: Authors' own compilation / Company reports

When considering the relationship between revenues and profits it seems that the relationship has been quite stable. As production has increased it is clear from the underlying data that revenues have increased more than expenses. This can also be seen in the 8.1, as the gap between revenues and operating profits has increased as production grew. Figure 8.2 shows the development of the EBITDA and EBIT-margins since Q1 2014. Since 2013 was the start-up year of production it created many outliers in terms of the relationship between revenues and costs, which is why we have excluded it from the graph. During Q1 2014, the power segment had strong EBITDA and EBIT-margins of 94.4% and 60.7%, respectively. While the EBITDA-margin has been quite stable between Q1 2014 and Q4 2016, an indication of a consistent relationship between revenues and operating expenses, the EBIT-margin has fluctuated more and shown a decreasing trend over the same time period. According to Scatec Solar (2017a), this was a combination of increased depreciation and inconsistent impairment charges. The drop in Q4 2016 is due to a significant impairment charge after the sale of Utah Red Hills-plant (Scatec Solar, 2017d).

If we remove the effect of the large impairment in the last quarter of 2016, the EBIT-margin will be at same level as the rest of 2016. We are therefore confident that we can use both the EBITDA- and the EBIT-margin when forecasting this segments future performance.

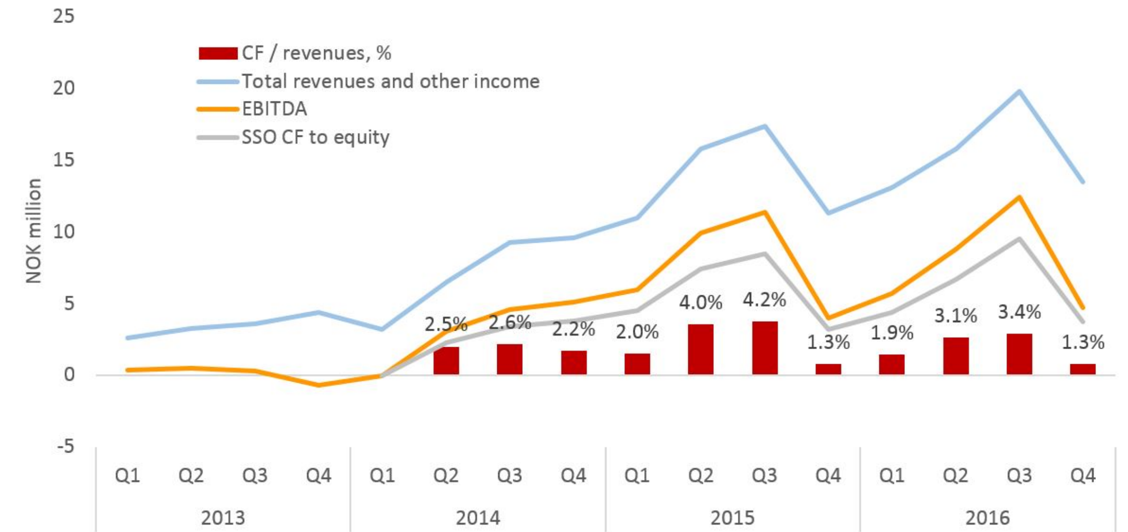
8.4.2 Operation & Maintenance

According to (Scatec Solar, 2017a), the Operation & Maintenance (O&M) segment provides services both to solar PV plants where the company has an ownership share and to third-party owned plants designed and constructed by Scatec Solar.

During 2013, total revenues increased slowly to almost NOK 5 million in the fourth quarter.

This revenue consisted mostly of external revenues for services provided to third parties. During the beginning of 2014, the segment's income structure shifted from generating mostly external revenue to almost solely generating internal revenues. This means that the company shifted focus from servicing and maintaining third party solar parks, to operating strictly on project assets fully or part-owned by SSO. In their 2016 annual report, the company writes that income is recorded as internal revenue when there is a transaction between the company's segments and where the company holds a controlling interest in a subsidiary (Scatec Solar, 2017a). Since internal revenue is eliminated from consolidated numbers, it does not affect the company's bottom line directly. However, considering that the company can perform these service activities internally rather than hiring a third party, it will keep cash flows within the group.

Figure 8.3: EBITDA to cash flow to equity for the O&M segment.



Source: Authors' own compilation / Company reports

Over the last two years, internal revenues have accounted for over 90% of this segment's total revenues. Since all internal revenues are eliminated on a consolidated level, it is more important to estimate the cash flows that SSO receives from this segment in order to estimate the future value creation.

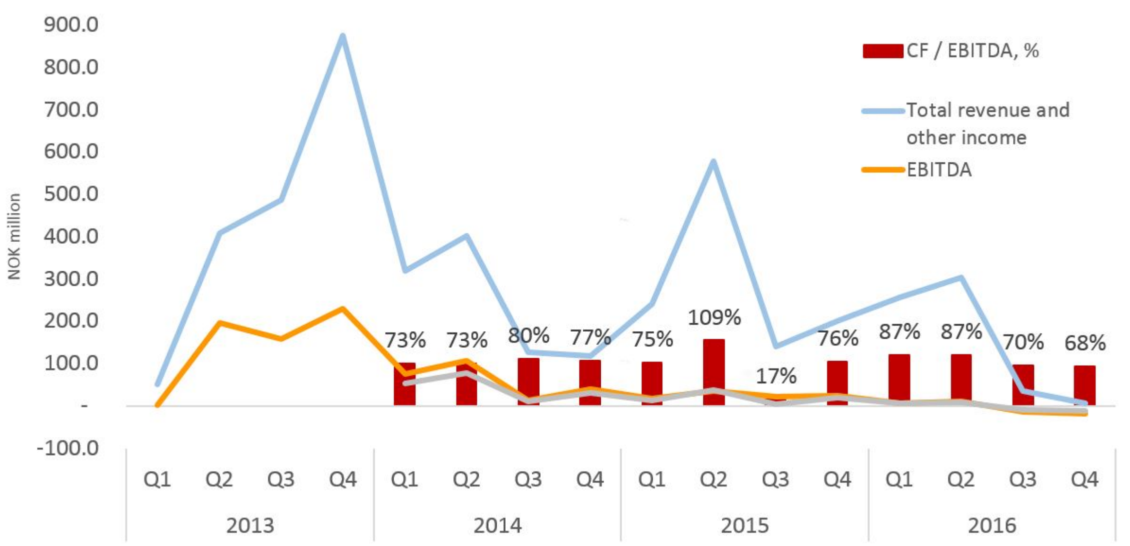
Figure 8.3 below shows the quarterly development of the O&M segment's total revenues, earnings before depreciation and amortization (EBITDA), and cash flow to equity generated from the segment between 2014 and 2016. During the last two years, approximately 2.7% of revenues was turned into cash flow to equity on average, indicating that the company is only able to turn a small portion of the segment's revenues into cash flow to SSO's equity (Scatec Solar, 2017b).

According to information from Scatec's *Capital Markets Day 2016* presentation, SSO expects that the O&M segment will turn approximately 3% of a plant's revenue into cash flow to SSO's equity. The company's target, together with the fact that cash flow to SSO's equity compared to revenues has been close to this percentage in the past, enables us to forecast the segment more accurately.

8.4.3 Development & Construction

The segment Development & Construction (D&C) comprises of activities related to project development, engineering and procurement, construction management, and quality assurance (Scatec Solar, 2017a). Considering that this segment generates revenue through the construction of projects, the revenue stream is highly dependent on the construction activity from quarter to quarter. In the third quarter of 2016, the construction of the company's project in Jordan was completed, resulting in zero revenues in the following quarter as no other projects are under construction.

Figure 8.4: EBITDA to cash flow to equity for the D&C segment



Source: Authors' own compilation / Company reports

Similar to the O&M segment, almost all income is classified as internal revenue and is therefore eliminated on a consolidated basis. However, this revenue still generates cash flows for the company. Between Q1 2014 and Q4 2016, revenues have varied significantly. As mentioned above, the segment only generates revenue if there is construction activity. From figure 8.4 it is clear that the construction of new projects has been moving in cycles, with significant activity towards the end of 2013, but also in Q2 2014, Q2 2015, and Q2 2016. During 2013, SSO built three of their solar power parks, all located in South Africa. Asyv, located in Rwanda, was built in 2014, explaining the peak in the second quarter of that year. Later in 2015, SSO built another three facilities, with one located in the Utah, United States, and two located in Jordan, again explaining the peak in second quarter of 2015. Later, in 2016, SSO constructed facilities in South Africa, Mali, and Honduras, generating approximately NOK 300 million in revenues that year.

Compared to the O&M segment, a small part of revenues results in cash flow to SSO, shown by the gap between *Total revenue and other income* and *SSO CF to Equity* in the figure above. However, as the D&C segment also has little to no debt, approximately 76% of EBITDA is turned into cash flow to SSO on average. This number does not include the outlier in Q3 2015 where there were no revenues, resulting in a large negative cash flow to Scatec.

In their *Capital Markets Day 2016* presentation, Scatec stated that approximately 80% of a project's capital expenditures is turned into EPC revenue. Further, the company discloses that they get a 15% margin on this revenue, which in turn converts into EBITDA and cash flow to SSO. This information, along with the analysis above, enables us to forecast this segment based on expected future capital expenditures disclosed by the company.

8.4.4 Corporate & Eliminations

The last two segments are not related to the core operating activities. The revenues generated in the corporate segment is mostly related to corporate services, such as management fees, while expenses are incurred from administrative activities and the lease of corporate offices. Since the majority of segment activities generates expenses, it has experienced operating losses the last three years with no clear trend. Considering the small size of the segment and lack of obvious cost drivers, the forecast of this segment will be based on its 2016 numbers.

The eliminations segment is strictly an accounting segment, eliminating internal revenues since the company cannot earn revenue from itself on a consolidated basis. As the amount of internal revenues incurred in the other segments has increased, so has the amount eliminated in this segment.

9. Estimating Cost of Capital

The estimation of cost of capital is an essential part when valuing a company. As all future cash flows are discounted at the estimated rate, the cost of capital has a significant impact on the valuation. Several parameters need to be estimated in order to end up with an applicable discount rate. These parameters are the cost of equity, risk-free rate, market risk premium, beta, cost of debt, tax rate and, capital structure. This chapter covers the estimation of these parameters, starting with the cost of equity.

9.1 Cost of Equity

In order to calculate the cost of capital we first have to estimate the cost of equity. Due to the importance of cost of equity when discounting future cash flows, we find it relevant to discuss the potential approaches in more detail. There are several methods to calculate the cost of equity, however, many of them are better in theory than in practice. In their book, Koller et al. (2010) discuss three relevant models for calculating the cost of equity.

9.1.1 Capital Asset Pricing Model

The first, and most commonly used, model is the capital asset pricing model (CAPM). This model uses the risk-free rate, r_f, beta, β_i, a measure of the systematic risk, and the market risk premium, r_m - r_f. The beta is estimated by regressing a stock's excess returns on a market proxy's excess returns. In combination with the risk free rate and the market risk premium, the beta is used to estimate the cost of equity. The formula for the model is retrieved from Koller et al. (2010, p.239) and listed below in equation 9.1.

$$E[r_i] = r_f + \beta_i(r_m - r_f) \tag{9.1}$$

The drawbacks of the model are linked to the estimation of the inputs. Both the risk-free rate and the market risk premium are estimated by choosing proxies, such as a long-term government bond or the historical premium of a stock index. Another issue is how to estimate the beta, which is dependent on a linear relationship between the excess returns on the stock and the excess returns of the market proxy. Lastly, the quality of the data set plays an important role. In their book, Koller et al. (2010), suggest using monthly returns compared to daily or weekly returns to prevent the presence of systematic biases. They also stress the importance of having enough data points with 60 data points being the suggested minimum. Using monthly returns requires more data points and a larger data set. All of these drawbacks make the CAPM model an uncertain tool at best, despite being the most commonly used model.

9.1.2 Fama-French Model

A second approach, introduced by Koller et al. (2010), is to use the Fama-French model, which adds two additional factors to the CAPM model. They argue that "equity returns are inversely related to the size of a company (as measured by market capitalization) and positively related to the ratio of a company's book value to its market value of equity (Koller et al., 2010, p.258)". In addition to the regression involved in CAPM, the model is based on a regression between the excess returns of small versus big stocks (SML), and high versus low book-to-market value (HML). The Fama-French model is presented in equation 9.2

$$r_i - r_f = \alpha + \beta_1(r_m - r_f) + \beta_2(SMB) + \beta_3(HML) + \epsilon_i \tag{9.2}$$

Although a model is often considered better when there are more variables involved, it can also be the source of its shortcomings. The Fama-French model is suffering from the same shortfalls as the CAPM model in terms on how to estimate its inputs. In addition, Koller et al. (2010) mention that the relationship between the performance of small companies versus large companies has flipped after 1982 compared to the period from 1926 to 1982.

9.1.3 Arbitrage Pricing Theory Model

A third approach discussed is the arbitrage pricing theory-model. According to Koller et al. (2010), the model suggests that a security's return can be estimated by studying its relationship to common risk-factors. The authors further argue that the model is a good model in theory, however, due to the disagreement on which factors to use, how many factors to include, and how to measure these factors, the model is hard to implement accurately.

From the discussion above it could be argued that the arbitrage pricing theory model and the Fama-French model has the potential to provide a better estimate of the cost of equity. However, we find that the uncertainty surrounding the estimation of the additional factors in both models outweigh the benefits. Considering that the solar power consists of several companies with completely different business models, it will be challenging to find factors that could be compared across business models in the industry. We have therefore chosen to proceed with the CAPM model as our estimate for the cost of equity.

9.2 Risk-Free Rate

When estimating the term structure of the risk free rate there are two approaches that are commonly used. The first approach is simply using a government bond with a long maturity. In Norway, the bond with the longest maturity is the 10-year government bond, which has a yield to maturity of 1.64% as of 31.03.2017. However, a 10-year bond might not be a good depiction of the term structure from short to long run, which leads us to the introduction of the second approach. By using the Nelson-Siegel model (equation 9.3) we estimate parameters that will minimize the squared error between the approximated and observed market prices at a point in time (Benninga, 2014, p.564), as eq. 9.3.

$$NS: \quad n_t = \theta_1 + (\theta_2 + \theta_3)\frac{1 - e^{-t/\beta}}{t/\beta} - \theta_3 e^{-t/\beta} \tag{9.3}$$

The model converges to the long term interest rate, which is the parameter value θ_1. In addition to the Nelson-Siegel model (NS), there is an extension of the model called the Nelson-Siegel-Svensson model (NSS), seen in equation 9.4. This model is assumed to be a better approximation of non-linear term structures, as it incorporates an additional set of variables, and could therefore be a better fit for our data.

$$NSS: \quad n_t = \theta_1 + (\theta_2 + \theta_3)\frac{1 - e^{-t/\beta_1}}{t/\beta_1} - \theta_3 e^{-t/\beta} + \theta_4 \left(\frac{1 - e^{-t/\beta_2}}{t/\beta_2} - e^{-t/\beta_2}\right) \tag{9.4}$$

As of March 16, 2017, there are ten government bonds issued in Norway, seven bullet bonds and three zero coupon bonds. All three zero coupon bonds mature in 2017, while the bullet bond with the longest maturity is the 10-year bullet bond maturing in 2026. The bond data is gathered from Thomson Reuters Datastream, and to increase our data set and make the term structure estimate as accurate as possible, we have to use all ten bonds to estimate the NS and NSS parameters. After applying both models, using all bonds mentioned above, the output is the following parameters for both models in table 9.1:

Table 9.1: Term-structure parameters

	Nelson-Siegel		Nelson-Siegel -Svensson
β	1.7861	β_1	1.9742
θ_1	0.0292	β_2	1.5733
θ_2	-0.0226	θ_1	0.0284
θ_3	-0.0320	θ_2	-0.0196
		θ_3	0.0022
		θ_4	-0.0352

Source: Authors' own compilation

Using the parameters in table 9.1 we see that, for both models, it can be argued that the term structure, found in appendix 9, has started to converge with the long-term rate, θ_1, after 12 years extending our forecasting period to 2028. Although the NSS model is expected to be a better approximation of a non-linear term, it seems that both models are almost identical with the largest difference in year 1. We have chosen to use the term structure estimated with NSS due to the fact that, in year 1, the NSS estimates a slightly higher rate compared to NS. This is closer to the current yield of the zero coupon bond (0.71%) with the shortest time to maturity. The NSS model estimates a long-term rate of 2.84%, which we will use as the terminal risk-free rate. Compared to the yield on the 10-year bullet bond this estimate is quite high. However, the Norwegian central bank just recently updated the forecast for the key policy rate, which indicates a 200% increase compared to today's rate by 2021 (Takla, 2017). We therefore consider our estimate as a fair long-term rate for the risk-free rate.

9.3 Market Risk Premium

The market risk premium (MRP) is the difference between the expected return of the market and the risk-free rate. Assuming investors are risk-averse, they demand a premium for investing in stocks rather than risk-free securities, like government bonds. According to Koller et al. (2010), the level of the premium is hard to estimate, as the true market portfolio is unobservable, which tend to result in an imprecise estimation of the parameter. Due to the estimation uncertainty, various methods can be used to estimate the market risk premium. We will consider two of them in this analysis.

9.3.1 Historical Market Risk Premium

Koller et al. (2010) suggest estimating the historical market risk premium by comparing the historical market returns with the return on 10-year government bonds. They recommend using the longest period possible as estimates of shorter periods are exposed to volatility. The drawback of the approach is, however, the challenge of observing a statistically significant trend applicable to future MRPs. The authors also found no statistically significant trend when regressing the U.S. market risk premium from 1907 to 2015. Based on this result, we have chosen to apply a different approach in the estimation of market risk premium.

9.3.2 Appropriate Range

Although there is disagreement in the finance industry on the appropriate estimation method, a general MRP close to 8% seems to be the consensus among the majority of finance literature. This level is considered too high by Koller et al. (2010). They find a MRP between 4.5% and 5.5% to be a reasonable range. According to Damodaran (2017b) data, the MRP in Norway is currently 5.69%. Both of these estimates are well in line with the results of a survey performed by PwC in 2016. The yearly survey is based on responses from 143 financial analysts and economists with experience from the Norwegian finance- and stock market. A market risk premium of 5% in the Norwegian market was found by the survey. In fact, the result of the survey has practically remained unchanged since PwC initiated the survey back in 2011. As consensus among financial professionals in Norway corresponds to the range of 4.5% to 5.5%, and it is close to the estimate proposed by Damodaran (2017a) (5.69%), a market risk premium of 5% will be used in the estimation of cost of capital.

9.4 Beta

Beta is the measure of an asset's sensitivity to market movements, or market risk. Unlike the risk-free rate and market risk premium, the beta value varies across companies in the CAPM model. A risk-free asset has a beta of 0, while the market portfolio has a beta of 1. Thus, a riskier asset with a beta of 1.5 will move 1.5 times more than the market. In other words, a 1% increase in the market portfolio will yield a 1.5% increase in the asset price (Petersen and Plenborg, 2012). Hence, investors should expect excess returns compared to the market portfolio when investing in high beta assets as a compensation for taking on higher market risk. The derivation of the beta for an asset i is shown in equation 9.5,

$$\beta_i = \frac{Cov[r_i, r_m]}{Var_{rm}} = \frac{Corr[r_i, r_m] * \ Std[r_i] * \ Std[r_m]}{Std[r_m]^2} = Corr[r_i, r_m]\frac{Std[r_i]}{Std[r_m]} \tag{9.5}$$

where r_i is the excess return of asset i, and r_m is the market risk premium (Munk, 2016, p.248). The beta value must be estimated as it is unobservable. There are several approaches for estimating the beta available. This analysis will use the historical market beta approach as well as the bottom-up approach.

9.4.1 Historical Market Beta

Using historical data is the most common approach to estimate beta. It is based on running a regression on a stock's excess returns against a market proxy's excess returns, i.e. the market risk premium, over the estimation period.

As mentioned in the previous section, the true market portfolio is unobservable. Therefore, we must use a proxy for the market. Choice of market proxy for the regression is of importance. Since Scatec Solar is listed in Norway the Oslo Stock Exchange Benchmark Index (OSEBX) is a natural choice as proxy for the Norwegian market. However, it is also natural to consider SSO's returns against the returns of a larger market portfolio, such as the S&P Composite Index (SPCOMP) or the MSCI World Index (MSCIW). This due to the fact that SSO operates in large parts of the world, being exposed to risk on a global level.

The international and well-diversified market indexes, SPCOMP index and MSCIW index, are both suitable as proxies for the global market. Between 2000 and 2009 the two indexes were 95.8% correlated, so the choice between the two indexes should have a small impact on the beta estimation (Koller et al., 2010). In order to generate excess returns, we have subtracted the three-month interbank rates for each market, where the excess returns are calculated log-normally to avoid potential problems related to the normal distribution of returns. All data is retrieved from Datastream (2017). Once the proxies for the market and the risk-free rate are in place, the measurement frequency is considered. Five years of monthly data is the recommended frequency of measurement according to Koller et al. (2010). Scatec Solar was listed on OSEBX as late as in 2014. In order to comply with the recommended 60 observations, the beta estimation has to be based on weekly data.

When running the regression, we have compared beta estimates from regressing returns over the entire estimation period, in addition to estimating a value based on a one-year rolling beta. This procedure entails estimating a number of betas by rolling the estimation window, in our case, one week at a time before taking the average of estimated betas. This method is better at capturing the stability and movements of the beta over time, compared to estimating one value over a longer period. Estimations using both methods can be seen in table 9.2 below.

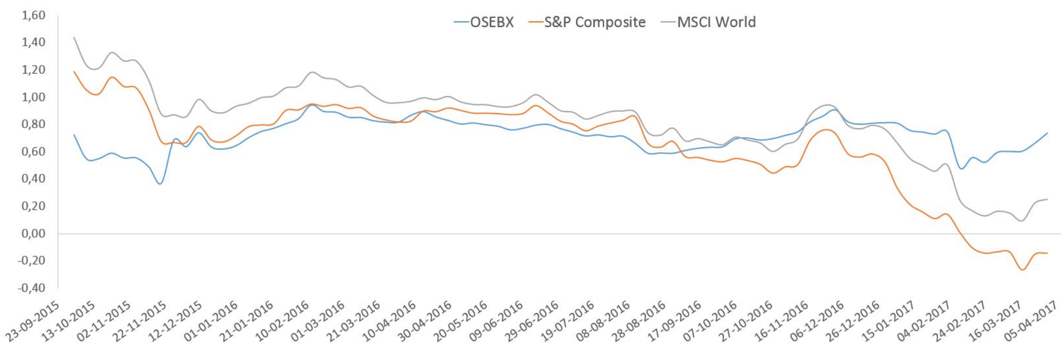
Table 9.2: Overview of estimated betas.

	S&P Comp	**MSCI World**	**OSEBX**
Raw betas	0.71	0.92	0.65
One-year rolling betas	0.65	0.83	0.72

Source: Authors' own compilation

After estimating the average one-year rolling betas, it is important to consider the stability and magnitude of the estimated betas. Figure 9.1 shows the relationship over time between the regressed betas on the three different indexes.

Figure 9.1: Yearly rolling betas.

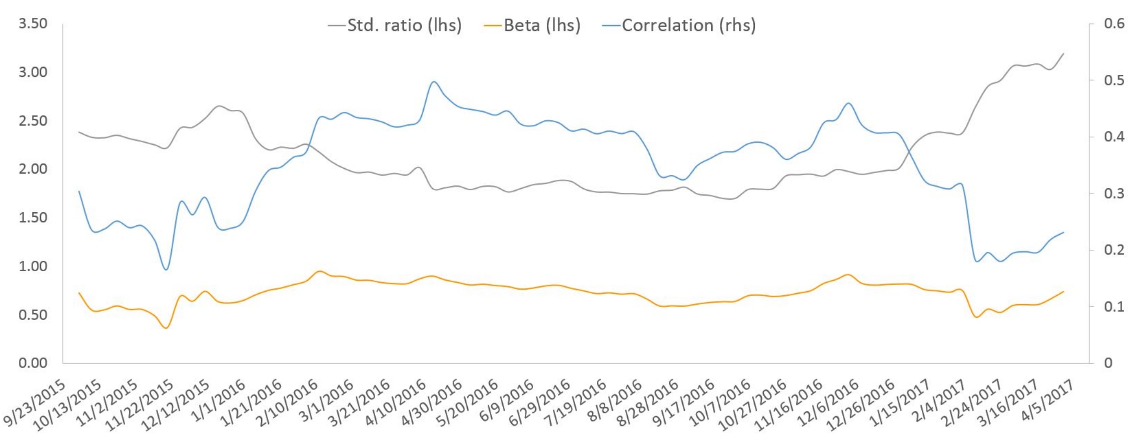


Source: Authors' own compilation / Datastream (2017)

From the table above it is clear that the regression has revealed that the SSO's beta on OSEBX has remained the most stable compared to the other indexes. Between September and December 2015, the betas on the SPCOMP index and the MSCIW index both dropped significantly. This was also the case between January and March 2017. The interpretation is that SSO's share price moved less and less with the larger indexes in that period, while its movement against the OSEBX remained stable. Looking more closely, it is clear that the rolling one-year beta decreases more and more in the period after January 1, 2017 for both the SPCOMP and MSCIW. Between January 1 and the beginning of March 2017, the two world indexes experienced significant growth, while SSO's share price either decreased or remained stable. It is therefore reasonable to assume that this is the reason why the rolling beta has decreased for the two world indexes. Although the one-year rolling beta from the OSEBX index is the least volatile compared to the other indexes, it still moves between 0.37 and 0.94 over the estimation period. It is therefore necessary to investigate what causes these fluctuations through the analysis of the components that make up the beta.

By dividing the beta into its components, we are able to dig deeper into the cause of the beta fluctuating. As shown in equation 9.5, the beta comprises of the standard deviation of SSO's returns, the standard deviation of market index returns, and the correlation between the SSO returns and market returns. Figure 9.2 below shows how the three components changed relative to each other over the estimation period.

Figure 9.2: Yearly rolling OSEBX beta components.



Source: Authors' own compilation / Datastream (2017)

From looking at the figure above, it seems that the standard deviation ratio has been more stable than the correlation. The interpretation of this is that the relationship between volatility of Scatec Solar and the OSEBX index has been quite stable compared to the volatility of the market. The average standard deviation ratio is equal to 2.13, meaning that SSO has been over twice as volatile compared to the market on average. From the beginning of 2017, the rolling ratio has increased significantly, indicating that the riskiness of SSO has increased compared to the market so far in 2017.

The correlation is a measure of how the returns of SSO move in relation to the market returns. Its value will always be between -1 and 1. In terms of the correlation between the SSO returns and market returns, it is evident from the graph that this measure is varying significantly over the estimation period. The average one-year rolling correlation was equal to 0.35 over the period, which could be considered weak. This means that SSO and the market, on average, moves in the same direction, but with different magnitudes. However, considering that Scatec Solar operates in emerging markets outside of Norway, we find that 0.35 is a reasonable measure.

To draw a conclusion from the discussion above, it is important to consider how the standard deviation ratio and the correlation has affected the beta. From the figure above, it can seem that movements in either correlation or standard deviation ratio has been offset by the other, making the beta of SSO relatively stable throughout the estimation period. It is important to address the fact that the two components are somewhat linked. As mentioned earlier, if the standard deviation ratio increases, the volatility of SSO increases compared to the market. As this happens, it is reasonable to assume that this will result in larger movements of the stock price, which will lower the correlation between the two if the magnitude in the market's movements remain unchanged. However, looking at the graph, it seems like this has only happened when there have been large increases in the volatility of SSO compared to the market, which again resulted in an opposite movement in correlation. It is therefore hard to find a realistic cause to the stable beta. Despite not seeing an obvious trend between volatility and correlation, we believe that an equity beta, β_e of 0.72 could be a fair estimate using this approach. Also, considering that almost 70% of all rolling beta values are within one standard deviation of the mean, we are confident that the beta will stay within this range going forward. However, as our data set is limited, we want to compare our findings from the regression approach with betas of comparable firms using the bottom-up approach.

9.4.2 Bottom-Up Approach

Stocks in the same industry are exposed to similar operating risks, and should therefore move towards the average industry beta, according to Koller et al. (2010). The bottom-up approach improves the beta estimation as it is based on averages of industry betas. The first step in the bottom-up approach is to find peers. As previously mentioned, we have chosen one U.S. and three Canadian renewables companies: FirstSolar, Innergex, Algonquin and Etrion. The different companies' raw regression betas are estimated, and unlevered to level out any leverage and tax shield effects, as in equation 9.6.

$$\beta_U = \frac{\beta_L}{1 + (1 - T_m) * \frac{D}{E}} \tag{9.6}$$

In order to obtain an industry beta, the simple average across these unlevered betas is estimated. The last step is to compute the levered beta of Scatec Solar using the company's debt-to-equity ratio and unlevered beta (Koller et al., 2010). All necessary data and the bottom-up adjusted beta of Scatec Solar is presented in table 9.3 below.

Table 9.3: Bottom-up adjusted beta of Scatec Solar.

Company	Scatec Solar	First Solar	Etrion	Innergex	Alconquin
Regression beta	**0.72**	**1.03**	**0.99**	**0.99**	**1.00**
Market cap	3,611,916	3,496,415	100,228	1,502,202	3,130,074
Net interest-bearing debt	3,941,764	307,371	273,756	3,062,745	5,077,139
Debt to equity ratio	1.09	0.09	2.73	2.04	1.62
Marginal tax rate	25.0%	40.0%	26.5%	26.5%	26.5%
Unlevered beta	**0.40**	**0.98**	**0.33**	**0.40**	**0.46**
Industry beta	0.51				
Scatec Solar levered beta	**0.93**				

Source: Authors' own compilation / Datastream (2017) / Company reports

The data is retrieved from Datastream and company reports of the peers, while marginal tax rates are taken from Damodaran (2017c) data. All debt to equity ratios are based on book values of equity and stock prices as of December 31, 2016. As we can see from the table, the bottom-up approach gives a levered beta of 0.93 for Scatec Solar. Compared to the regressed beta in the previous section, this seems to be a more realistic beta value going forward when comparing it to the betas of the peers, which all have beta values around 1.

9.4.3 Beta in Forecast

As our valuation model is based on an approach introduced by Penman (2013), which implies a changing capital structure, where excess cash flow is used to payoff debt, it is necessary to adjust the equity (levered) beta to the changing financing structure. This is done by first estimating the equity beta for 2016, before unlevering it using formula 9.7 from Christensen (2017) listed below.

$$\beta_t{}^E = \beta_t{}^{UA} + (\beta_t{}^{UA} - \beta_t{}^D)\frac{D_t}{E_t} \quad \Longleftrightarrow \quad \beta_t{}^{UA} = \frac{E_t}{E_t + D_t}\beta_t{}^E \tag{9.7}$$

The purpose is to use this asset (unlevered) beta to adjust the cost of equity to the changing capital structure by re-levering the asset beta with the structure at a point in time, resulting in a new equity beta and a new cost of equity. In this case, the tax effect, which was included in formula 9.6, is excluded as we assume a constant tax rate.

9.5 Cost of Debt

The cost of debt is the effective rate that a company pays on its financial obligations. As debt is tax deductible, the cost of debt is typically measured on an after-tax basis, also called the effective cost of debt (Penman, 2013, p.447). The measure comprises of three components. The risk-free rate, the default spread, which reflects the default risk of the debt, and the tax rate. As the risk of the debt increases the default spread increase, which is offset by the tax rate (Damodaran, 2011a).

Financial text book authors often suggest several different approaches for estimating the cost of debt. Damodaran (2011a) suggests that one could use the yield to maturity on the firm's traded bonds outstanding as the cost of debt. However, the yield to maturity on a bond does not only contain the actual cost of the debt as it also reflects the firm's probability of default and the recovery rate after default (Koller et al., 2010, p.264). Therefore, it must be implied that the bonds are liquid and has a low risk of defaulting, which is not the case for all bonds. If the bonds are rated by an agency, such as Standard & Poor's, Damodaran (2011a) suggests that one can use this rating to estimate the default spread. If the firm is not rated, Damodaran suggests that one can estimate the cost of debt either based on a synthetic rating using the firm's interest-coverage ratio to estimate a default spread, or, if the firm has recently issued debt, use the rate related to the issue as a proxy (Damodaran, 2011b). Lastly, Penman (2013) defines the cost of debt being equal to the "weighted average of all components of net financial obligations, including preferred stock and financial assets" (Penman, 2013). In order to use this approach we are relying on the fact that all interest rates are disclosed in the firm's financial reports in order to calculate the cost of debt to the firm.

In the case of Scatec Solar AS, the company is not rated. The company's long-term debt consists of non-recourse financing and an unsecured green bond issued in fourth quarter 2015. In their 2016 annual report, Scatec Solar writes that non-recourse financing is used to fund construction and/or acquiring assets (Scatec Solar, 2017a). This means that financing is directly linked to each project and consequently, the interest rate paid for each project is disclosed in their annual report. Due to the fact that the company is not rated, but discloses all interest rates paid for each project, we believe that two of the approaches discussed above are most appropriate compared with the rate on the last issued bond. These two approaches are the weighted average approach discussed by Penman (2013) and the use of a synthetic rating addressed by Damodaran (2011a). Also, as 90% of the company's debt is non-recourse financing with no market risk, we assume a debt beta of zero. We will therefore not use a debt beta to estimate the cost of debt via the CAPM model.

9.5.1 Weighted Average of Non-Recourse Financing

In table 9.4 below, we have listed all of Scatec Solar's long-term debt, which is the combination of the non-recourse financing and the green bond issued in 2015. The rates are weighted based on the outstanding balance of each project and the green bond.

Table 9.4: Weighted average cost of debt.

Type of debt	Interest rate	Maturity	Balance	Weight	Weighted rate
Non-recourse financing					
Kalkbult	15.60%	31-12-2028	997,541	20%	3.06%
Dreunberg	14.20%	31-12-2029	1,092,142	22%	3.05%
Linde	14.40%	30-06-2029	540,395	11%	1.53%
Czech portfolio	5.80%	05-11-2029	370,112	7%	0.42%
Rwanda	8.08%	11-01-2030	145,445	3%	0.23%
Jordan portfolio	5.70%	01-10-2032	833,417	16%	0.94%
Aqua Fria	6.31%	31-12-2036	604,546	12%	0.75%
Green bond	7.47%	01-11-2018	495,417	10%	0.73%
Total long-term debt			**5,078,988**	**100%**	**10.72%**

Source: Authors' own compilation / Scatec Solar (2017a)

The projects in Kalkbult, Dreunberg, and Linde are the ones where the creditors require the highest return. All three projects are located in South Africa, indicating that either the cost of funding or the risk involved is higher in South Africa compared to projects in other countries. As we can see from the table more than 50% of the long-term debt is from South African projects. Thus, the high interest rates in the country affects the weighted average cost of debt to a great extent. Further, the four projects in Czech Republic and the three projects in Jordan are compiled into portfolios as each of the individual projects represent small contributions to the weighted rate. The green bond carries an interest of 3 month NIBOR plus 6.5%. As of 31.03.2017 the 3 month NIBOR rate was 0.97%, yielding a 7.47% interest rate for the bond Scatec Solar (2017a). To sum up, the cost of debt, is equal to 10.72% when using the weighted average approach.

9.5.2 Synthetic Rating

To supplement the cost of debt found in the previous section, we found it appropriate to use the synthetic rating approach suggested by Damodaran (2011a). The purpose is to estimate a default spread that is added to the risk-free rate, resulting in the cost of debt. The default spread is estimated using the interest-coverage ratio, which Penman (2013) defines as the earnings before interest and tax divided by net interest expense. This ratio is then compared to Damodaran's list of default spreads based on firm ratings (Appendix 10), last updated in January 2017. Based on a Norwegian risk-free rate of 1.64% and an estimated default spread of 6.5%, the estimated cost of debt is equal to 8.14%.

Compared to the weighted-average approach, the cost of debt estimate is approximately 2.6% lower when using a synthetic rating. This seems to be a rather large spread, even though we have to take into account that the Norwegian risk-free rate has fluctuated between 1.61 and 1.84% during the first months of 2017 (NBIM, 2017). The rate estimated, based on a synthetic rating, therefore varies depending on the time of the estimation during Q1. When using the average rate for the 10-year government bond so far in 2017, the estimated cost of debt increases to 8.23%. Nevertheless, there is still a gap between the results of the two approaches. There is a natural explanation to this. The interest-coverage ratio, which the synthetic rating is based on, does not cover the fact that most of SSO's debt is accumulated in foreign countries. As we discussed in chapter 6, the interest rates in South Africa and Honduras, where the majority of the company's debt is located, are significantly higher than in Norway. This results in a high cost of debt for Scatec Solar's projects, compared to the synthetic rating which uses the relatively low Norwegian risk-free rate. Thus, the deviating cost of debt estimations of the two approaches come as no surprise.

9.5.3 Recent Borrowings

During the fourth quarter in 2015, Scatec Solar AS issued a three-year senior unsecured green bond of NOK 500 million, which matures in November 2018. The bond is listed on the Oslo Stock Exchange and carries an interest of 3 month NIBOR plus 6.5% (Scatec Solar, 2017a). The yield to maturity of the bond on the first trading date after issuance was equal to 7.99%, indicating that the default spread was slightly lower in the market compared to both the weighted average approach and the rate based on the synthetic rating. It can, however, be argued how recent Q4 2015 really is, but we find it reasonable to include the estimate as the NIBOR has been relatively stable since the issuance of the green bond (Oslo Børs, 2017).

9.5.4 Section Conclusion

Based on the three measures listed above, we see that estimates for the cost of debt ranges from 7.99% to 10.72%. We do, however, believe that the weighted average approach of Scatec Solar's long-term debt is the most appropriate to accurately capture the company's actual cost of debt. This is due to the fact that the company's projects are individually financed with different risk associated with each project. With this in mind, the weighted average approach accurately depicts the cost of the company's long-term financial obligations and allots it to the projects with the largest outstanding balance. We will therefore use a pre-tax cost of debt, k_d, that is equal to 10.72% in our valuation.

9.6 Tax Rate

The pre-tax cost of debt was estimated in the previous section. As interest expenses are tax deductible to the firm, we also have to estimate the after-tax cost of debt. It is computed by multiplying the pretax cost of debt by (1 - tax rate). Although the computation itself is simple, there are several options regarding what tax rate to use. Companies often use an effective tax rate in their reports, which can be found by dividing the taxes due by the taxable income. The drawback of this approach is, however, that the effective tax rate often differs from the marginal tax rate, which is the amount of tax a company has to pay on an additional dollar of income. Interest expenses save a company taxes at the margin, so the marginal tax rate should be used in the computation. The marginal tax rate is also recommended when valuing a company, and should in particular be used to compute the terminal value (Damodaran, 2012).

Scatec Solar is a global producer of solar power with operations in several countries, meaning that the company's income is taxed at different rates. There are different ways to deal with this problem, but we will focus on the two methods we consider most appropriate in the case of SSO. The first method is to use the Norwegian marginal tax rate as the company is listed and incorporated in Norway. This method assumes that the income in other countries eventually is gathered in Norway and taxed at the applicable rate, which currently is 25%. The second method proposed by Damodaran is to compute the weighted average of the marginal tax rates, with weights based on the income in the different countries. For Scatec Solar it is reasonable to base the weights on the external revenues in each of the countries. SSO's external revenues, the revenue weights and marginal tax rates for the different countries are presented in table 9.5 below. The marginal tax rates are retrieved from Damodaran's data, while the external revenues for 2016 are reported by Scatec Solar (2017a).

Table 9.5: Marginal tax rate in operational countries.

Country	Norway	South Africa	Czech Republic	Rwanda	Honduras	Jordan	Italy	Germany
External revenue	1,411	661,988	93,136	31,148	117,543	56,158	2,242	53
Weight	0.1%	68.7%	9.7%	3.2%	12.2%	5.8%	0.2%	0.0%
Marginal tax rate	25.0%	28.0%	19.0%	30.0%	30.0%	20.0%	31.4%	29.7%
Average marginal tax rate	**27.0%**							

Source: Authors' own compilation / Damodaran (2017c)

From the table a weighted average marginal tax rate of 27% is observed. The different marginal tax rates range from 19% to 31.4%, but several of the countries have rather small contributions to the external revenue. As we can see, the South African projects account for almost 70% of the external revenue. This drags the weighted average towards the country's marginal tax rate of 28%. Even though the estimated tax rate above probably is the most precise estimation of the company's current marginal tax rate, there is a drawback to the approach. The project portfolio of Scatec Solar will change in the future when projects in backlog and pipeline are realized and in operation. Currently, the company's backlog consists of projects in four additional countries. These countries have different marginal tax rates and will also change the revenue weights, resulting in an unstable tax rate during the forecasting period. We therefore argue that using the Norwegian marginal tax rate, T_m, of 25% will be more consistent over time. This yields an after-tax cost of debt of (1-0.25)*10.72% = 8.04%.

9.7 Capital Structure

The last step of the process is to obtain a capital structure in order to weight the after-tax cost of debt and cost of equity. The valuation approach used by Penman (2013) implies a changing capital structure in the forecasted period, where NOA is forecasted and NFO changes with the difference between free cash flow, financial expenses, and dividends. Consequently, it is assumed that excess cash is used to pay off debt. Scatec Solar's estimated capital structure is based on reformulated statements as of December 31, 2016, where the debt and equity ratios are defined, according to Penman, shown in equation 9.8 below

$$\text{Debt ratio} = \frac{D_t}{NOA_t} \qquad \text{Equity ratio} = \frac{E_t}{NOA_t} \tag{9.8}$$

Net operating assets, NOA_t, corresponds to the sum of net financial obligations, D_t and book value of equity, E_t (Penman, 2013). In 2016, Scatec's NFO was equal to MNOK 5,039 and SE equal to MNOK 1,312, a debt ratio of 0.79 and an equity ratio of 0.21. These ratios are applied to estimate WACC in 2016, but will vary with the changes in NOA and NFO during the forecasting period. Calculations are shown in Appendix 11

9.8 Results

We are now able to estimate the cost of equity and WACC. Cost of equity is based on the CAPM model, while Penman (2013) defines WACC as in equation 9.9

$$\text{WACC} = \frac{D_t}{NOA_t} k_d (1 - T_m) + \frac{E_t}{NOA_t} k_e \tag{9.9}$$

where k_d and k_e represent the rates of return required by debt holders and equity holders, respectively. The marginal tax rate (T_m) is included to value the interest tax shield (ITS) which is excluded from the free cash flows. The ITS has a value for a levered firm, as interest expenses reduce the taxable income of a company. In an enterprise valuation, the ITS is given value by reducing the WACC (Damodaran, 2012).

When all of the parameters are estimated and plugged into the models, we end up with a cost of equity of 5.25% and a WACC equal to 7.46% as of December 31, 2016.

Table 9.6: Results of CAPM and WACC.

Cost of Equity		**WACC**	
Risk-free rate*	0.61 %	Cost of equity, k_e	5.25 %
Beta	0.93	Cost of debt, k_d	10.72 %
Market premium	5.00 %	Tax rate, T_m	25 %
		Debt ratio	0.79
		Equity ratio	0.21
CAPM, k_e	**5.25 %**	**WACC**	**7.46 %**

** changes with the term structure*

Source: Author's own compilation

Both of these estimates will vary during the forecasting period. Cost of equity will change with the term structure of the risk-free rate and the changing equity beta, while WACC will change depending on the relationship between NOA and NFO, as well as the change in cost of equity each period.

10. Forecasting

The purpose of this section is to estimate and forecast the company's free cash flows before performing a sensitivity and scenario analysis in the next section. This enables us to estimate a core value of Scatec's common equity using the DCF model, assuming that the company will not go into new projects in the future. Prior to forecasting it is important to understand that the historical and future performance of the company might not be the same. This is especially true when valuing Scatec Solar, a company that operates in a rapidly growing industry. In chapters 6 and 8 we performed both a strategic and financial analysis, respectively, of the company. While the financial analysis describes how the company has performed in the past, the strategic analysis identifies both the internal and external factors that will influence both company and industry in the future (Penman, 2013, p.504-505). Both analyses provide information that can be used when forecasting the future.

In order to estimate the future performance of the company it is important identify the value drivers. Penman (2013) proposes using sales growth, profit margin, and the asset turnover when forecasting value drivers. This is due to the fact that the combination of the three captures how the company is performing in terms of growing revenues, generating profits from its revenues, and how well it utilizes its assets to generate revenues (Penman, 2013, p.507). In the case of Scatec Solar, we find sales growth to be an inaccurate measure of what is driving the value of the company. In chapter 5, we discussed how SSO's future production and revenue growth depend on whether the company is able to develop and operate new projects through winning auctions. It is therefore more relevant to consider the amount of added capacity and the power produced as a value driver. Further we will use operating profit margin as a value driver to estimate SSO's future profits, before focusing on what drives the level of net operating assets. Instead of using asset turnover, we will analyze the relationship between the amount of property, plant, and equipment, and net operating asset. This will enable us to accurately capture added yearly CAPEX rather than basing it on revenues. These three factors will enable us to forecast free cash flows, which will be used in the discounted free cash flow (DCF) model. To reduce potential forecasting noise, we will focus, for the main part, on these three value drivers.

The forecast is divided into a four-year growth period and an eight-year stable period. The cut-off at 2028 is based on our term structure analysis, which indicated that interest rates were converging towards the long-term level after 12 years. Also, given the rapid developments in the industry, we do not find it reasonable to have a longer forecasting period. The growth period is based on information from the company related to projects in backlog, which enables us to predict the level of production four years into the future with some extra certainty. While the growth period provides a fair amount of certainty, the forecasted stable period is much more uncertain. Therefore, we have decided to only include projects currently in operation and those in backlog in an initial core valuation, using the FCFF-model. This enables us to estimate a value of SSO's common equity as if the company did not expand further after the growth period. As mentioned above, we will use our findings in the strategic and financial analysis to perform a sensitivity and scenario analysis where the pipeline plays a significant role on future performance. The projects in pipeline will also be discussed further in section 10.3.1.3.

In order to estimate the future performance of SSO as accurately as possible, we have also decided to forecast each segment's separate cash flow to SSO's equity, given the company's business model of retaining cash flows to equity within the segments. Although we are aware that this could create some forecasting noise, we find this approach valuable when performing a sensitivity analysis, where we can alter segment-specific variables and see how it affects the value of SSO's common equity. All segments will therefore be forecasted, except for eliminations, which is only relevant if we forecasted internal revenues as well.

10.1 Profit Margin

In order to estimate future free cash flows, following the approach by Penman (2013) discussed above, we need to estimate the company's profit margin over the forecasting period. Nissim and Penman (2001) introduced the approach of using fade diagrams to estimate a long-term level of the value drivers sales growth, profit margin, and asset turnover using comparable firms. As discussed above, out of the three, we will only use profit margin as a value driver.

When trying to estimate the profit margin using this approach, we encountered several problems related to the quality of data and the number of peers. In order to model a long-term level, we are dependent on having comparable companies within the same industry, typically identified by a Standard Industrial Classification (SIC) code, which is a grouping of comparable companies within the same industry. However, in the case of Scatec Solar and the solar energy industry, the only relevant grouping contains few companies, which also have a different business model. Many of the companies are solar panel producers, which we expect will have different margins than IPP companies. Therefore, we moved away from using SIC code and rather used the competitors addressed in section 4.5. From there the long-term level was calculated to 23.19%. This is significantly lower than the margin Scatec Solar has achieved over the last four years. We therefore do not believe that this approach provides a conclusive estimate of the long-term profit margin. Given the difference in business models and the lack of comparable firms, it is reasonable to assume that the company's historical profit margins provide a better estimate for the future than the quantitative fade approach.

Figure 8.1 shows how the operating profit margin has varied between 29.5% in 2013 and 37.1% in 2015, before decreasing to 35.6% in 2016. We do, however, believe that the drop in 2016 was due to the lack of construction activity during the year, resulting in an operating loss for the D&C segment. As several projects are expected to commence construction in the growth period, it is reasonable to assume that Scatec will be able to maintain its 2016 level going forward. Our estimate for the long-term profit margin is, therefore, 35%.

Given the lack of alternative estimation methods, such as the quantitative fade, and the fact that we are estimating a price interval of SSO's shares, we believe that these estimates are a solid foundation for the valuation/sensitivity analysis later in the thesis.

10.2 Net Operating Assets

In order to forecast free cash flows in agreement with Penman (2013) and the definition in section 7.1.1, we have to forecast net operating assets. As mentioned in the section intro, Penman (2013) suggests using the asset turnover. However, in the case of Scatec solar, this would create an unrealistic level of net operating asset. SSO's net operating assets are closely linked to the company's property, plant, and equipment. Between 2013 and 2016, PP&E accounted for 79% of Scatec Solar's net operation assets, on average, with the 2016 ratio being 80%. If we were to use the asset turnover ratio, which was 0.16 in 2016, NOA would be close to NOK 24 billion by the end of the growth period. This translates into NOK 1.7 billion per plant in operation or NOK 20.5 million per MW in capacity. Compared to today, where NOK 800 million of NOA per plant or NOK 15 million per MW in capacity, this is a doubling in terms of per plant-basis or a 33% increase in on a capacity basis. Given that PP&E is 79% of net operating asset on average, we do not believe that it is realistic that the amount of PP&E per plant will increase by over 37% for future projects.

Therefore, given that Scatec's net operating assets are closely tied to PP&E, we believe it will be accurate to forecast NOA based on future PP&E since we already have company estimates for CAPEX in the growth period.

10.2.1 Capital Expenditures

Table 10.1: Forecasted Capital Expenditures

in thousands		Amount	Currency	FX rate, local /NOK	2017	2018
Backlog	Los Prados, Honduras	100,000	USD	8.52	852,000	
	Segou, Mali	52,000	EUR	9.14	475,280	
	Malaysia	1,240,000	MYR	1.94	2,405,600	
	Mocuba, Mozambique	80,000	USD	8.52	681,600	
	Brazil	720,000	BRL	2.74		1,972,800
	Uppington, South Africa	4,600,000	ZAR	0.64		2,944,000
Total invested in PP&E					**4,414,480**	**4,916,800**

Source: Authors' own compilation / Company reports

Table 10.1 below shows the forecasted capital expenditures in the growth period. During 2018 and 2019 we estimate that SSO will spend approximately MNOK 4.4 and MNOK 4.9 on capital expenditures, respectively. These numbers are based on information disclosed by Scatec Solar in their 2016 annual report, which lists each projects expected CAPEX in local currency. These numbers are then converted to Norwegian kroner using the respective exchange rates from XE (2017) on March 31. Given our assumption of no growth after the realization of the backlog in the core valuation, we have estimated CAPEX of NOK 10 million from year 2020 and beyond, which is based on the average capital expenditures in *Machinery and Equipment* over the last three years and does not seem to rely on the number of plants or activity level.

10.2.2 Property, Plant, and Equipment, and Net Operating Assets

Table 10.2: Forecasted PP&E and NOA

NOK in thousands	Growth period			
Property, plant, and equipment	**2017**	**2018**	**2019**	**2020**
Beg. PP&E	5,081,267	9,303,835	13,869,242	13,355,421
+ Additions	4,414,480	4,916,800	10,000	10,000
- Depreciation	191,912	351,392	523,821	504,415
End. PP&E	9,303,835	13,869,242	13,355,421	12,861,006
Estimated Net Operating Assets	11,814,632	17,612,092	16,959,607	16,331,766
% of PP&E	*79 %*	*79 %*	*79 %*	*79 %*
- Bond repayment		500,000		
+ Required funding	323,618			
Net Operating Assets	12,138,250	17,435,710	16,783,226	16,155,385

Source: Authors' own compilation / Company reports

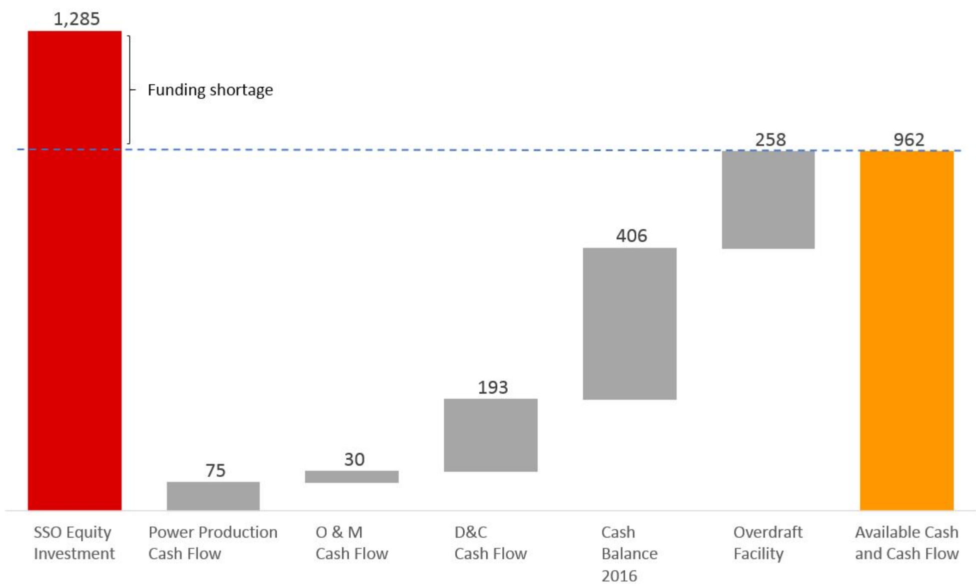
The estimated CAPEX numbers from table 10.1 are transferred to the forecast of property, plant, and equipment in table 10.2. For simplicity we have only forecasted additions

(CAPEX) and depreciation as changes in PP&E. Other reported items, such as "*Impairment losses* and *Effect of Movements in Foreign Exchange* have had a small effect in previous years and is difficult to forecast, which is why they have been excluded.

In order to forecast depreciation, we followed Koller et al. (2010) who suggests calculating historical depreciation as a percentage of total PP&E if the company does not have a stable CAPEX schedule (Koller et al., 2010, p.196). After calculating this ratio for all years, we found that it had been a stable relationship between the two, with depreciation being 3.8% of total PP&E, on average. This percentage will be used when estimating future depreciation expenses, before estimating the ending balance of PP&E for each year.

Once PP&E was estimated, this was converted into net operating asset using the 79% estimate. Table 10.2 shows a significant increase in net operating assets between 2017 and 2018. Naturally, this is caused by the significant amount of capital expenditures expected in 2017 and 2018. Further, in 2018, the company's unsecured green bond matures, which leads to a negative cash flow of NOK 500 million that year. Given the significant amount expected in investments in 2017 and 2018, and the repayment of the bond, we found it necessary to analyze whether the company is in need of additional financing. The results are found in table 10.3 below, while the calculations are presented in Appendix 12.

Table 10.3: Equity Investment Funding



Source: Authors' own compilation and Nordea Markets (2016)

Based on our estimates in the table above, Scatec Solar needs another NOK 323 million in order to fund both the bond repayment and the company's future equity investments in the backlog projects. These estimates are based on information disclosed by the company in their Capital Markets Day presentation (Scatec Solar, 2017b) and a share price of NOK 38.30. We assume that all projects are funded by 25% equity, and that, on average, Scatec has 53% ownership in the projects. This is based on the average of current ownership in projects. Further, we assume that the company has NOK 422 million in free cash in 2016 and accessibility to a $30 million overdraft facility (Scatec Solar, 2017a). The purpose is to estimate the funds Scatec has available compared to what they need in order to fund its backlog projects. From there we estimate that Scatec has to raise NOK 323 million in equity to be able to fund its expansion, which we assume will be added to net operating assets in the form of cash in 2017. This estimate is based on the Scatec's 2016 financial reports. In a company announcement from March 23, 2017, Scatec informed that they had successfully raised approximately NOK 380 million at NOK 40.50 per share through a private placement. However, since we do not have financial statements with the resulting effects, we have chosen proceed with our own estimate.

10.3 Power Production

As was discussed in section 8.4, the power production segment generates almost all of SSO's total revenues. It is therefore natural that the forecast has a strong focus on this segment. As mentioned above, one of the value drivers is the combination between added capacity and the amount of power produced. In order to estimate this driver into the future it is important to consider how the company will perform in the next four years (growth period) and beyond (stable period). In their annual report, Scatec Solar (2017a) lists which projects are part of their backlog and which projects that are in the pipeline. From this we are able to estimate SSO's expected production four years into the future. As mentioned in the section-introduction, forecasting beyond this involves more uncertainty and further discussion.

Table 10.4: Historical project production.

		Production (MWh)				
Plant	**Capacity (MW)**	**2013**	**2014**	**2015**	**2016**	**Stated production**
Czech Republic	20	20,317	20,686	22,364	21,327	20,500
Kalkbult	75	43,639	150,528	143,788	145,528	150,000
Linde	40	-	59,461	157,708	160,266	94,000
Dreunberg	75	-	38,133	87,554	88,447	178,000
Asyv	9	-	5,019	13,817	14,169	15,500
Agua Fria	60	-	-	41,047	100,948	103,000
Utah Red Hills (sold)	104	-	-	-	208,044	104,000
Jordan	43	-	-	-	52,091	43,000
Projects in operation	**426**	**63,956**	**273,827**	**466,278**	**790,820**	**708,000**

Source: Authors' own compilation / Company reports

Table 10.4 shows the historical production of all plants in operations, in addition to their capacity and the company's stated annual production. In 2013, SSO only had plants in the Czech Republic and Kalkbult, South Africa, with a total plant production of 63.956 MWh. By the end of 2016, total plant production increased to 790.820 MWh, resulting in a compounding annual growth rate (CAGR) of 131% between 2013 and 2016.

When looking closer at the figure above, it is evident that the company both over- and underestimated annual production at three of their plants. At their plant Linde, in South Africa, and Utah Red Hills, in the U.S, SSO lists annual plant production (nameplate) of 94.000 MWh and 104.000 MWh, respectively. However, the plant in Linde produced over 67% more than nameplate in both 2015 and 2016, while the Utah plant doubled production compared to SSO's expectations. In Dreunberg, South Africa, the plant produced only half of what was expected. The other five plants performed closer to SSO's stated production. The variations in production compared to nameplate make it harder to forecast production into the future, especially, considering that these plants have been running for two or three years and should have reached a stable level. The company does not disclose any information to why the production at some of their plants is so different from expectations.

10.3.1 Expected Future Production

In chapter 4, we gave an overview of Scatec's projects both in backlog and pipeline. These projects are set to add considerable capacity to the company's already rapid growth. As earlier mentioned, the projects that are in the company's backlog have reached a PPA agreement, except Upington, and are either awaiting construction or will soon commence operations. These projects have a 90% probability of reaching financial close, meaning that Scatec and their partners have decided to go through with the project. The last project in backlog is expected to start operations in 2020. Scatec reports that total capacity in the backlog is approximately 730 MW. The company also reports potentially having an extra 1.085 MW in their pipeline. These projects could also be realized during the growth period, but only has a feasibility of realization of 50% (Scatec Solar, 2017a).

In order to forecast Scatec Solar's production in the future, we find it necessary to divide the forecast into a growth period and a stable period. This is because there is significantly more uncertainty and less disclosed information related to the projects in the pipeline and production beyond 2020, compared to those in backlog. Even though there is uncertainty concerning the company's backlog as well, we have more information on the company's expected production and can link this to past performance of projects already in operation.

10.3.1.1 Growth period 2017-2020

In the growth period we have divided the production forecast into the projects that are either in operation or in the backlog. Table 10.5 below shows our estimates for the amount of MWh produced for each project during the growth period.

Table 10.5: Estimated production in growth period.

			Production (MWh)				
	Plant	**Capacity (MW)**	**2017E**	**2018E**	**2019E**	**2020E**	**Stated production**
Operation	Czech Republic	20	21,327	20,500	20,500	20,500	20,500
	Kalkbult	75	145,528	146,983	148,453	149,938	150,000
	Linde	40	160,266	161,869	163,487	165,122	94,000
	Dreunberg	75	88,447	89,331	90,225	91,127	178,000
	Asyv	9	14,169	14,311	14,454	14,598	15,500
	Agua Fria	60	100,948	101,957	102,977	103,000	103,000
	Jordan	43	92,478	93,403	94,337	95,280	43,000
Backlog	Los Prados	53	-	41,250	110,000	110,000	110,000
	Segou	33	-	22,500	60,000	60,000	60,000
	Malaysia	197	-	106,875	285,000	285,000	285,000
	Mocuba	40	-	28,875	77,000	77,000	77,000
	Brazil	150	-	-	114,375	305,000	305,000
	Upington	258	-	-	241,875	645,000	645,000
	Projects in operation	**322**	**623,163**	**628,354**	**634,433**	**639,565**	**604,000**
	Projects in backlog	**731**	**-**	**199,500**	**888,250**	**1,482,000**	**1,482,000**
	Sum	**1,053**	**623,163**	**827,854**	**1,522,683**	**2,121,565**	**2,086,000**

Source: Authors' own compilation / Company reports

Operation:

By the end of 2016 most of the company's projects performed close to the expected production disclosed by Scatec. We believe that the relatively small differences from the expected level is due to changing production conditions. Typical elements that could affect production are climate changes, such as weather conditions and solar radiation, and maintenance schedules, which affect the amount of operating hours. Therefore, we have considered the expected annual production disclosed by the company as valid long term levels going forward for the plants that have been close to expected production in the past. For the plants that have produced slightly more/less than expected, but shown a decreasing/increasing trend, we have applied a growth rate so that production in 2020 is closer to Scatec's expectations. Given the lack of information related to past production discrepancies, we found this to be the best estimate for the average annual production in the long run.

There were, however, some larger deviations that were discussed in section 10.1. The plants in Linde, Dreunberg, and Utah either over- or underperformed during 2015 and 2016. The Utah plant was sold in late 2016, which means that we only have to estimate production levels for the two other plants. To do this, we have estimated each plants average production over the past two years and added a growth rate based on historical trends, leaving out years with a start-up period like the one Linde and Dreunberg experienced in 2013.

Backlog:

In order to forecast the projects in backlog, which naturally do not have any past production or observable trends, we have based our estimates on Scatec's expected annual production. Also, in the main forecast, we have assumed that all projects in backlog will be realized, despite the uncertainties surrounding the Upington project in South Africa. In a later section we will perform a scenario analysis where we change this assumption to see the effect on the company's value of common equity.

The production numbers in figure 10.5 are based on the expected year of start-up found in Appendix 3. Using information from projects already in operation, we have found that the majority has commenced operations during Q3, which is consistent with the fact that their first-year production was between 30 and 40% of their production in 2016. Therefore, during the projects' first year of operation, we have assumed a first year production equal to 35% of expected annual production, and then the company's expected annual production thereafter.

From figure 10.5 it is clear that the projects in backlog will increase annual production significantly. In fact, the projects in backlog, by themselves, will produce more than the projects currently in operation. This is due to the fact that the backlog projects have significantly higher capacity than those that are in operation. If the plants in Brazil (150 MW) and in Upington (258 MW) are realized, them alone will more than double capacity.

10.3.1.2 Stable period, beyond 2020

When estimating Scatec's performance beyond 2020 it is important to consider that this is how Scatec will perform into the distant future. Therefore, it might not be valid to apply historical growth rates given the rapid expansion of the solar PV industry in recent years. Between 2013 and 2016, Scatec experienced an CAGR in capacity of 64.90%, compared to a global CAGR of 29.54% (REN21, 2016). If we include the backlog, the company will have experienced a CAGR of 41% between 2013 and 2020. Given that the global capacity is expected to experience a CAGR of 11.35% between 2015 and 2040, we find it unrealistic that Scatec will experience an annual growth almost four times as high as the rest of the world if we base future growth on historic growth.

As it is difficult to link past growth to the future, we are forced to focus on the information given by the company. However, as we addressed above, the uncertainty surrounding the company's projects in pipeline forces us to exclude these from the main forecast. We understand that given the company's growth history it is unlikely that they will not expand further into the future. However, given the difficulty of providing an accurate long-term estimate, we have decided to include all growth potential in the stable period in the scenario analysis, and rather forecast performance strictly based on the projects currently in operation and those in backlog.

As described in the previous section, the forecasted production will be either based on Scatec's stated annual production, or an average of past production if actual production has deviated significantly from stated production. Therefore, given the nature of the PPA contracts, we have assumed that revenues will stay constant given the constant expected production. The forecasted production beyond 2020 can be found in Appendix 13.

10.3.1.3 Pipeline

As discussed above, Scatec Solar lists projects that are in their pipeline. According to Scatec, these projects are in a phase where the probability of reaching financial close is smaller than of those in backlog. Therefore, given the uncertainty and lack of disclosed information, we have decided to exclude the pipeline projects from the main forecast and rather include them in a scenario analysis later in the thesis. Either way, we have to estimate their future production potential as accurately as possible.

In their 2016 Annual Report, the company only discloses the pipeline plants' expected capacity and not expected annual production. In order to transform capacity into an annual production number we had to link capacity to the capacity and production of existing projects. After further analysis, we found that there was a reoccurring relationship between Scatec's stated expected annual production and maximum production in a year at a given capacity. Since the number of hours of sunshine in a year is a strong indicator of the level of production, we compared the location of the existing plants to the locations of those in the pipeline to make the connection in terms of yearly sunshine-hours reported by W&C (2017). Table 10.6 shows the capacity per pipeline project and their estimated annual production based on the approach described. The formula for the ratio between stated production and maximum production for existing projects is expressed in equation 10.1.

$$\text{Performance ratio} = \frac{\text{Stated expected production}}{\text{Capacity * 24 * 365}} \tag{10.1}$$

where maximum production represents a plant's production when operating at 24 hours a day, 365 days a year.

Table 10.6: Expected production of projects in pipeline

	Plant	Capacity (MW)	Expected startup	Comparative project	Stated production / Full year production	Full year production (24hr, 365 days)*	Est. annual production*
Pipeline	*South Africa*	*430*		*South Africa*	*27 %*	*3,766,800*	*1,010,500*
	Egypt	340		Jordan	11 %	2,978,400	340,000
	Pakistan	150		Jordan	11 %	1,314,000	150,000
	Nigeria	100	2019	Honduras	20 %	876,000	171,667
	Kenya	48	2018	Rwanda	20 %	420,480	82,667
	Burkina Faso	17	2019	Honduras	20 %	148,920	29,183
	Projects in pipeline	**655**				**5,737,800**	**773,517**
	Projects in pipeline, incl. South Africa	**1,085**				**9,504,600**	**1,784,017**

* MWh

Source: Authors' own compilation / Scatec Solar (2017a)

In the figure above, we have estimated totals both including and excluding a potential project in South Africa due to the uncertainties regarding Eskom's future involvement in the REIPPP program. According to SSO, they made a bid on the project in late November 2015, and the process has been delayed since then (Scatec Solar, 2017a). Given its significant production potential, we find it necessary to include both numbers when preparing a scenario analysis in a later section. This is due to the fact that the estimated annual production potential of the project in South Africa, alone, is higher than the sum of the remaining projects in the pipeline.

10.3.1.4 Forecasted Revenues

Table 10.7 below shows the expected revenue in both periods. As we are unable to find any disclosed PPA prices for the plants in operation, we have calculated the average quarterly revenue per MWh produced in 2016 and used this as our estimated for the future. For the projects in backlog, we have compared these projects to those in operation to find projects in the same area. This is because we believe that projects in similar areas will have similar value of production. However, only two of the projects are located close to plants already in operation, namely the ones in Honduras and in South Africa. As we do not have a disclosed price for the remaining plants, we used the average revenue generated per MWh of all projects in operation, except those in the Czech Republic, which is much higher than the others.

The table also shows expected revenues in the stable period, which will be constant given the constant production-assumption in the period. As earlier discussed, the forecasted revenues in the power production segment will be the total consolidated revenues for the company.

Table 10.7: Estimated revenues during growth and stable period.

	Plant	Average TNOK/MWh	Revenues, TNOK Growth period 2017E	2018E	2019E	2020E	Stable period 2021 -
Operation	Czech Republic	4.42	94,164	90,513	90,513	90,513	90,513
	Kalkbult, South Africa	1.88	274,060	276,800	279,568	282,364	282,482
	Linde, South Africa	0.84	134,736	136,083	137,444	138,818	136,770
	Dreunberg, South Africa	2.84	251,385	253,898	256,437	259,002	505,913
	Asyv, Rwanda	2.20	31,219	31,531	31,846	32,165	34,152
	Agua Fria, Honduras	1.16	117,409	118,583	119,769	119,796	119,796
	Jordan	1.00	92,869	93,798	94,736	95,684	94,272
Backlog	Los Prados, Honduras	1.16	-	47,976	127,937	127,937	127,937
	Segou, Mali	1.72	-	38,804	103,476	103,476	103,476
	Malaysia	1.72	-	184,317	491,512	491,512	491,512
	Mocuba, Mozambique	1.72	-	49,798	132,794	132,794	132,794
	Brazil	1.72	-	-	197,252	526,004	526,004
	Upington, South Africa	1.86	-	-	448,768	1,196,716	1,196,716
	Projects in operation		**995,842**	**1,001,207**	**1,010,314**	**1,018,341**	**1,263,897**
	Projects in backlog		**-**	**320,895**	**1,501,740**	**2,578,440**	**2,578,440**
	Sum		**995,842**	**1,322,102**	**2,512,054**	**3,596,781**	**3,842,336**

Source: Authors' own compilation / Company reports

10.3.1.5 Cash Flow to SSO Equity

In order to estimate Scatec Solar's value of common equity using the SOTP approach we have to analyze how well the company has done in the past. In their quarterly reports, the company lists the cash flow to SSO's equity generated by the different segments. Using the analysis from section 8.4.1, we see that over the last two years, on average, 15% of Scatec's power production quarterly revenue has been converted to cash flow to SSO's equity. In 2014, the segment converted between 20 and 25% of revenues into cash flow to equity. However, in a footnote, the company also defines cash flow to equity as only being EBITDA minus interest and tax expenses, leaving out changes in net working capital and capital expenditures. Therefore, we have added these elements in our forecast of the future cash flow to SSO's equity.

Taking into account the technological advances, discussed in the strategic section of the thesis, and the fact that the company is maturing with stabilizing production once all projects are up and running, we estimate that this SSO's cash flow to equity as a percentage of revenue will increase to 20% as a result of lower costs and higher margins.

10.4 Operation & Maintenance

In their Capital Markets Day presentation, Scatec Solar discloses that the company is able to generate approximately 3% of the Power Production segment's revenues into cash flows to SSO's equity in the O&M segment (Scatec Solar, 2017b). As discussed in section 4.4.6, approximately 6% of a plant's revenues results in operating expenses for the company when assuming 50% ownership. Given the integrated business model, this is considered revenue for the O$M segment where the company is able to realize a 50% margin, resulting in approximately 3% of a plant's revenue being turned into cash flow to SSO's equity in the O&M segment. When analyzing the cash flow to SSO's equity as a percentage of total plant revenues, we find that the average quarterly estimate is slightly less than 3%. Based on this, we are confident that this a good estimate when forecasting the future performance of the O&M segment.

10.5 Development & Construction

Similar to the O&M segment, Scatec is able to generate cash flows to the D&C segment through its integrated model. The company handles all construction activity, which means that they keep all cash flows in the segment to themselves. From total capital expenditures, approximately 80% is converted into EPC revenue, where Scatec typically realizes a 15% margin (Scatec Solar, 2017b). Based on our calculations, approximately 60% of gross profit is converted into EBITDA. Using the analysis from section 8.4.3, where we found that 76% of EBITDA was converted into cash flow to SSO's equity, we argue that this segment wil convert 5.5% of CAPEX into cash flow to SSO's equity.

Contrary to the O&M segment, it is difficult to compare this estimate to historical data in the D&C segment. The reason is that revenue from construction activities are recognized based on the percentage-of-completion method where construction progress is not disclosed by the company. This makes it hard to track which revenue stream corresponds to CAPEX in a specific quarter or year (Scatec Solar, 2017a). Given the difficulty interpreting historical data, we assume that 5.5% is a fair estimate of the amount of cash flow to SSO's equity the D&C segment can generate from capital expenditures.

10.6 Section Conclusion

In this section we have forecasted all components that are relevant value drivers when using the FCFF model on an aggregated level, and the SOTP approach, which incorporates the forecasted free cash flow to SSO's equity from all segments. Both models use the forecast of the PP segment as revenue from this segment drives both models. In the FCFF model, revenues drive the operating income, which in combination with the forecasted CAPEX and NOA results in free cash flows to the firm. The SOTP model uses revenues as the driver to generate cash flows to SSO's equity in both PP- and O&M segment. The D&C segment uses CAPEX as a driver of cash flows. The combination of all segments results is total free cash flow to SSO's equity, which is incorporated in a FCFE model.

The next chapter will seek to transform these forecast-estimates into a value of Scatec's common equity using the two mentioned frameworks, the FCFF- and FCFE model.

11. Valuation

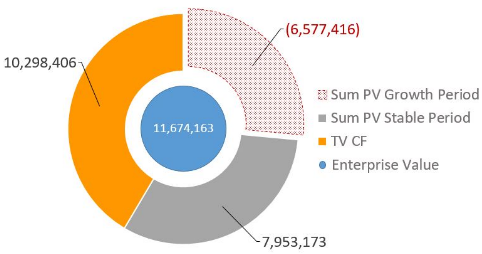
The valuation of Scatec Solar is based on the two approaches addressed in chapter 7. First, we have estimated the value of Scatec's common equity using the FCFF model. This approach incorporates the financial statement analysis from chapter 8 on an aggregated level. The value found is to be considered the foundation for a share-price interval. The second approach seeks to extend the interval through a scenario analysis, implementing company information we have considered too uncertain for the core valuation, and combine this information with the strategic analysis from chapter 6 and the segment analysis also from chapter 8. As Scatec consistently emphasizes its integrated model and the resulting cash flows to SSO's equity from each segment, we seek to value these cash flows using a sum-of-the-parts approach, resulting in a combined cash flow to equity and the use of the free cash flow to equity model as framework.

11.1 Core Valuation

The FCFF model discounts the free cash flows calculated from operating income and the change in net operating assets using the varying weighted average cost of capital. The result is an enterprise value of TNOK 11,674,163. After-subtracting net financial obligations of TNOK 5,038,733 and a minority interest of TNOK 1,712,897, the estimated value of Scatec's common equity is equal to TNOK 4,922,534, or NOK 48.14 per share as of January 1, 2017. As our valuation date is March 31, 2017, the value is compounded three months forward by the cost of equity, resulting in a share price of NOK 48.92. We believe that this is a fair estimate considering that the forecasted ROIC is increasingly larger than WACC through 2028. The forecast, including WACC, ROIC, and free cash flows is shown in appendix 14. This value will serve as a foundation for the scenario analysis in the following section.

Table 11.1: Enterprise value distribution.

NOK in thousands	Growth Period				Stable Period							
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Operating Income	348,545	462,736	879,219	1,258,873	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818
NOA	12,138,250	17,435,710	16,783,226	16,155,385	15,551,256	14,969,944	14,410,588	13,872,358	13,354,456	12,856,114	12,376,594	11,915,185
Change in NOA	5,786,562	5,297,460	-652,485	-627,841	-604,129	-581,312	-559,356	-538,230	-517,902	-498,342	-479,520	-461,409
Free Cash Flow	**-5,438,018**	**-4,834,724**	**1,531,704**	**1,886,715**	**1,948,946**	**1,926,129**	**1,904,174**	**1,883,048**	**1,862,720**	**1,843,159**	**1,824,338**	**1,806,227**

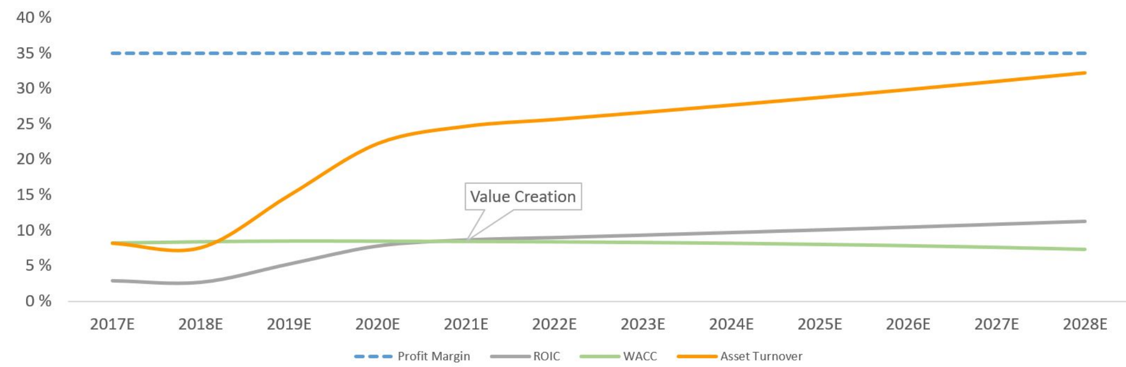


PV - Growth Period	-6,577,416
PV - Stable Period	7,953,173
PV - Terminal Value	10,298,406
Enterprise Value	**11,674,163**
Less Net Financial Obligations	5,038,733
Less Non-Controlling Interest	1,712,897
Value of Common Stockholder's Equity	**4,922,534**
Number of shares outstanding	102,260,146
Estimated Share Price, 01.01.17	48.14
Estimated Share Price, 31.03.17	48.92

Source: Authors' own compilation

From the forecasted numbers, it is also valuable to take not of the development in financial ratios. In section 8.3, we analyzed the profitability of Scatec Solar in the past. While the profit margin and Return on common equity ratios were strong, the return on invested capital and asset turnover were weak, though showing a positive trend. Therefore, we find it valuable to see how these ratios will look in the forecast period. Table 11.2 shows the development in the WACC, ROIC, and ATO, including the forecasted profit margin of 35%.

Table 11.2: Forecasted profitability ratios.



	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E
Profit Margin	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %
ROIC	2.87 %	2.65 %	5.24 %	7.79 %	8.65 %	8.98 %	9.33 %	9.69 %	10.07 %	10.46 %	10.87 %	11.29 %
WACC	8.25 %	8.44 %	8.55 %	8.52 %	8.49 %	8.43 %	8.34 %	8.21 %	8.05 %	7.85 %	7.61 %	7.31 %
Asset Turnover	0.08	0.08	0.15	0.22	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32

Source: Authors' own compilation

From the figure above we observe that ROIC increases quite significantly once all projects have been constructed and the company is able to produce positive cash flows. The figure also shows that the company starts to create value right after the growth period, where the ROIC is larger than the WACC. The weighted cost of capital is increasing in the growth period, but starts to decrease as the debt-to-equity ratio decreases as well. The asset turnover seems to go from 0.16 in 2016 to 0.32 in 2028. This means that the company will be able to generate more revenues from its assets. However, given its financial structure with significant amounts invested in assets, the ratio is still low. After analyzing the ratios in relation to our estimated core valuation price, we believe that there is support for a price of NOK 48.92.

11.2 Sensitivity Analysis

11.2.1 Sensitivity - Core Valuation

In order to estimate a share price interval, it is important to consider how different variables might affect future value. This is done through a sensitivity analysis where key measures and value drivers are changed to estimate a range of SSO's share price. By doing this, we are able to identify which variables have the most effect on the value. Once the effect of each variable is mapped, we will seek to combine this with the information from the financial and strategic analysis to discuss the importance of each variable's effect on the share price.

Table 11.3: Sensitivity analysis - MRP/beta and pre-tax cost of debt/tax rate.

Market Risk Premium \ Beta	0.40	0.50	0.60	0.70	0.80	0.93	1.00	1.10	1.20	1.30	1.40
2.5%	74.7	72.8	70.8	68.9	67.1	64.7	63.4	61.6	59.9	58.1	56.4
3.0%	73.2	70.8	68.6	66.3	64.1	61.4	59.9	57.8	55.8	53.8	51.8
3.5%	71.6	68.9	66.3	63.8	61.3	58.1	56.4	54.1	51.8	49.6	47.3
4.0%	70.1	67.1	64.1	61.3	58.5	55.0	53.1	50.5	48.0	45.5	43.1
4.5%	68.6	65.2	62.0	58.8	55.8	51.9	49.9	47.0	44.3	41.6	39.0
5.0%	67.1	63.4	59.9	56.4	53.1	48.9	46.7	43.7	40.7	37.8	35.0
5.5%	65.6	61.6	57.8	54.1	50.5	46.0	43.7	40.4	37.2	34.2	31.2
6.0%	64.1	59.9	55.8	51.8	48.0	43.2	40.7	37.2	33.9	30.7	27.5
6.5%	62.7	58.1	53.8	49.6	45.5	40.4	37.8	34.2	30.7	27.3	24.0
7.0%	61.3	56.4	51.8	47.3	43.1	37.8	35.0	31.2	27.5	24.0	20.6
7.5%	59.9	54.8	49.9	45.2	40.7	35.1	32.3	28.3	24.5	20.8	17.3

Pretax Cost of Debt \ Tax Rate	20 %	21 %	22 %	23 %	24 %	25 %	26 %	27 %	28 %	29 %	30 %
9.0 %	82.5	88.0	93.5	99.2	105.0	110.8	116.7	122.7	128.7	134.8	140.9
9.3 %	72.9	78.4	84.0	89.6	95.4	101.3	107.2	113.2	119.3	125.5	131.7
9.5 %	63.6	69.0	74.6	80.3	86.0	91.9	97.9	103.9	110.0	116.3	122.5
9.8 %	54.5	59.9	65.4	71.1	76.8	82.7	88.7	94.7	100.9	107.1	113.5
10.0 %	45.7	51.0	56.5	62.1	67.9	73.7	79.7	85.7	91.9	98.2	104.5
10.7 %	21.8	26.9	32.2	37.6	43.2	48.9	54.8	60.8	66.9	73.2	79.5
11.0 %	13.1	18.1	23.3	28.6	34.1	39.8	45.6	51.5	57.6	63.8	70.2
11.3 %	5.6	10.6	15.7	20.9	26.3	31.8	37.6	43.4	49.5	55.6	62.0
11.5 %	-1.5	3.3	8.3	13.4	18.7	24.2	29.8	35.6	41.6	47.7	54.0
11.8 %	-8.4	-3.7	1.1	6.2	11.4	16.7	22.3	28.0	33.9	39.9	46.1
12.0 %	-15.0	-10.4	-5.7	-0.8	4.3	9.5	15.0	20.6	26.4	32.3	38.5

Source: Authors' own compilation

Table 11.3 above shows the share price's sensitivity to changes in different elements related to the cost of capital. This includes the beta, market risk premium, which is related to cost of equity, and tax rate and after-tax cost of debt. Together, the cost of equity and cost of debt constitute the weighted average cost of capital. Given that our model assumes a changing capital structure in accordance with Penman (2013), we are not able to estimate the sensitivity of the WACC as it is dynamic.

In the core valuation in the previous section, we estimated a price of NOK 48.92, which assumed a market risk premium and equity beta of 5% and 0.93, respectively. Increasing both variables separately will decrease the share price. This is in line with our expectations as an increase in these variables will increase cost of equity and the WACC, resulting in a higher discount rate and smaller present values of cash flows. However, given Scatec's highly levered capital structure, the effect of changing these variables is relatively low due to the small weight in equity.

When looking at pre-tax cost of debt and the tax rate, the price is much more sensitive. As Scatec is highly levered, the change in pre-tax cost of debt has a significant impact on the share price. This is due to the fact that the high amount of debt in the company makes WACC and discounting particularly sensitive to changes in the cost of debt, resulting in large changes in share price. It is especially important to note that, with its current financial position, a lower tax rate and higher pretax cost of debt could result in a negative value of equity, though it is not very realistic. While the pre-tax cost of debt affects both financial expenses and the WACC in our model, the tax rate affects after-tax cost of debt, WACC, and free cash flows through after-tax operating income. This leads to the tax rate having a significant effect on the share price, as seen in the figure above.

In addition to variables relevant for the cost of capital, the profit margin is a natural measure of a company's future profitability and value. Therefore, we see value in observing to what extent changes in the profit margin affect Scatec Solar's share price. In addition, a common indicator of the strength of a firm's financial position is the amount of dividends paid to shareholders. As Scatec has indicated a 50% target dividend payout ratio based on contributions from project companies, which is incorporated in the core valuation, we want to investigate how changes in the ratio would affect share price. Table 11.4 shows the price sensitivity relative to the variables addressed.

Table 11.4: Sensitivity analysis - profit margin and dividends.

Profit Margin	Dividends, % of contributions project companies										
	45 %	46 %	47 %	48 %	49 %	50 %	51 %	52 %	53 %	54 %	55 %
32.5%	25.4	24.5	23.6	22.8	21.9	21.0	20.2	19.4	18.5	17.7	16.9
33.0%	30.8	29.9	28.9	28.0	27.1	26.2	25.3	24.5	23.6	22.7	21.9
33.5%	36.4	35.4	34.4	33.5	32.5	31.6	30.7	29.8	28.8	27.9	27.1
34.0%	42.2	41.2	40.1	39.1	38.1	37.2	36.2	35.2	34.3	33.3	32.4
34.5%	48.2	47.1	46.1	45.0	44.0	42.9	41.9	40.9	39.9	38.9	37.9
35.0%	54.5	53.3	52.2	51.1	50.0	48.9	47.8	46.8	45.7	44.7	43.7
35.5%	61.0	59.8	58.6	57.4	56.3	55.1	54.0	52.9	51.8	50.7	49.6
36.0%	67.7	66.5	65.2	64.0	62.8	61.6	60.4	59.2	58.1	56.9	55.8
36.5%	74.8	73.4	72.1	70.8	69.6	68.3	67.1	65.8	64.6	63.4	62.2
37.0%	82.1	80.7	79.3	78.0	76.6	75.3	74.0	72.7	71.4	70.1	68.9
37.5%	89.7	88.3	86.8	85.4	84.0	82.6	81.2	79.8	78.5	77.1	75.8

Source: Authors' own compilation

As expected, the profit margin is one of the variables with the largest effect on the share price. If we reduce the profit margin by only 2.5% points, the share price drops to NOK 21, holding dividends constant. This implies that Scatec Solar relies heavily on maintaining or increasing their profit margin, meaning that the company has to be very selective in terms of new projects. When analyzing the impact of dividends as a percentage of the power production segment's cash flows, it seems that it has a much smaller effect. In the model, dividends only affects the NFO, as it reduces the amount of free cash flow used to pay back debt. Within the 45-55% sensitivity interval, the share price only moves NOK 11 given a PM of 35%.

11.2.2 Sensitivity - SOTP

In addition to forecasting the value drivers related to the core valuation using the FCFF model, we also estimated drivers for each business segment in the sum-of-the-parts approach through an FCFE. These drivers were estimated using either trends from historical data or information disclosed by the company. In terms of the power production segment, we argued in section 10.3 that cash flows to SSO's equity would increase to 20% due to a maturing company. For the O&M segment, we based our forecast on 3% of revenues being turned into cash flow. This was based on information disclosed by Scatec. When forecasting the performance of the D&C segment, we assumed that the company was able to turn 5.4% of CAPEX into cash flows. This assumption was also based on company information regarding margins. Lastly, the corporate segment was forecasted with a fixed negative cash flow to SSO's equity as it is not directly linked to operations. Therefore, in order to fully utilize the sum-of-the-part approach, we wish to estimate how sensitive the stock price is to changes in the mentioned drivers. The sensitivity is based on the calculated SOTP price of NOK 48.08, which was estimated using the assumption from the core valuation, i.e. realizing 100% of the backlog.

Table 11.5: Sensitivity analysis - Sum-of-the-Parts Variables.

	Operation and Maintenance, CF%										
	1.75 %	2.00 %	2.25 %	2.50 %	2.75 %	3.00 %	3.25 %	3.50 %	3.75 %	4.00 %	4.25 %
17.5%	28.1	29.4	30.7	32.1	33.4	34.7	36.1	37.4	38.7	40.1	41.4
18.0%	30.7	32.1	33.4	34.7	36.1	37.4	38.7	40.1	41.4	42.7	44.1
18.5%	33.4	34.7	36.1	37.4	38.7	40.1	41.4	42.7	44.1	45.4	46.7
19.0%	36.1	37.4	38.7	40.1	41.4	42.7	44.1	45.4	46.7	48.1	49.4
19.5%	38.7	40.1	41.4	42.7	44.1	45.4	46.7	48.1	49.4	50.7	52.1
20.0%	41.4	42.7	44.1	45.4	46.7	48.1	49.4	50.7	52.1	53.4	54.7
20.5%	44.1	45.4	46.7	48.1	49.4	50.7	52.1	53.4	54.7	56.1	57.4
21.0%	46.7	48.1	49.4	50.7	52.1	53.4	54.7	56.1	57.4	58.7	60.1
21.5%	49.4	50.7	52.1	53.4	54.7	56.1	57.4	58.7	60.1	61.4	62.8
22.0%	52.1	53.4	54.7	56.1	57.4	58.7	60.1	61.4	62.8	64.1	65.4
22.5%	54.7	56.1	57.4	58.7	60.1	61.4	62.8	64.1	65.4	66.8	68.1

D&C, CF %	Corporate CF, MNOK										
	11	12	13	14	15	15.5	16	17	18	19	20
1.0 %	47.0	46.9	46.7	46.6	46.4	46.3	46.3	46.1	46.0	45.8	45.7
2.0 %	47.4	47.3	47.1	47.0	46.8	46.7	46.7	46.5	46.4	46.2	46.0
3.0 %	47.8	47.7	47.5	47.4	47.2	47.1	47.1	46.9	46.7	46.6	46.4
4.0 %	48.2	48.1	47.9	47.8	47.6	47.5	47.5	47.3	47.1	47.0	46.8
5.0 %	48.6	48.5	48.3	48.2	48.0	47.9	47.8	47.7	47.5	47.4	47.2
5.4 %	48.8	48.6	48.5	48.3	48.2	48.1	48.0	47.9	47.7	47.5	47.4
6.0 %	49.0	48.9	48.7	48.5	48.4	48.3	48.2	48.1	47.9	47.8	47.6
7.0 %	49.4	49.2	49.1	48.9	48.8	48.7	48.6	48.5	48.3	48.2	48.0
8.0 %	49.8	49.6	49.5	49.3	49.2	49.1	49.0	48.9	48.7	48.6	48.4
9.0 %	50.2	50.0	49.9	49.7	49.6	49.5	49.4	49.3	49.1	49.0	48.8
10.0 %	50.6	50.4	50.3	50.1	50.0	49.9	49.8	49.7	49.5	49.4	49.2

Source: Authors' own compilation

From the table to the left it can be observed that changes in the assumption regarding cash flow from the power production segment has a significant impact on the stock price. This does not, however, come as a surprise. As mentioned earlier in the thesis, the PP segment accounts for almost all of the company's external revenues. It is then natural that changing the assumption regarding utilized cash flows will have a significant impact on the company's share price. Changing the assumption by plus or minus 2.5% creates an interval of more than NOK 25. Compared to the sensitivity of the PP assumption, the O&M estimate is less sensitive. When changing the estimate by 1.25% up or down, the price moves between NOK 41.40 and NOK 54.70. Given that this segment is the largest in terms of cash flows, after the PP segment, we find these results to be realistic.

When looking at the table to the right, the sensitivity seems to be much lower for both assumptions. The low sensitivity of the D&C segment has a natural explanation. In the core valuation, it is assumed that Scatec will not grow further after realizing their projects in backlog. As the D&C segment is forecasted based on CAPEX, the future cash flows will be minor as there will be no construction activity. Therefore, this variable only moves price by less than NOK 4 when changing the assumption by plus or minus 5%. Similarly, the effect of changing the negative Corporate cash flow assumption is very small as the cash flows are marginal compared to the total.

11.3 Scenario Analysis

Considering that Scatec Solar operates in an industry that contains lots of potential, but also much uncertainty, we find it valuable to conduct a scenario analysis. In this analysis we want to address both the future growth potential of Scatec, discussed in the strategic analysis, but also scenarios which challenge the security and certainty of the company's backlog. We have therefore created four scenarios based on findings in our strategic analysis in terms of future growth, together with the company's disclosed information related to the timing of its backlog projects. The purpose is to combine this information with our segmented financial analysis in order to transform future growth into cash flows and, consequently, a share price.

Since the scenario analysis is an extension of the core valuation in section 11.1, we have held the capital structure over the forecast period equal to the one in the core valuation. By doing so, we assume that the company is able to provide additional funding in order to neutralize the effect of future expansions on the capital structure. We believe that this will create less forecasting noise than if we were to forecast funding into the future. Table 11.6 below shows the four scenarios with information related to each scenario. The result of the scenario analysis will work as a supplement to when we estimate a range of Scatec's share price.

Table 11.6: Scenarios overview.

Scenario 1 45% of backlog	Scenario 2 65% backlog	Scenario 3 15% of pipeline	Scenario 4 100% of pipeline
• Exclude Upington, South Africa, and Brazil • Capacity – 645 MW	• Exclude Upington, South Africa • Capacity - 795 MW	• Backlog plus Nigeria, Kenya, and Burkina Faso • Capacity – 1,218 MW	• All pipeline projects realized • Capacity – 2,138 MW

Scenario 1

- Potential worst case, where off-taker in Upington, SA, backs out, and Brazil is not realized after recent delay.

Scenario 2

- Off-taker in Upington, South Africa, backs out after recently claiming that solar PV is too costly.

Scenario 3

- Currently the only projects in pipeline with PPA and Joint Venture-agreements.

Scenario 4

- Optimistic scenario, with full realization of pipeline.

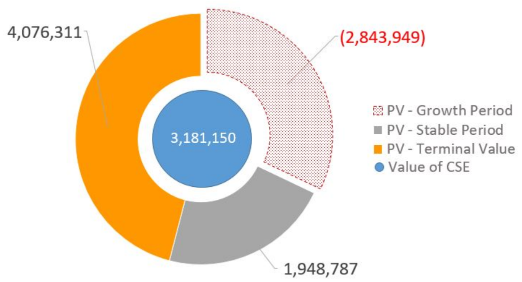
Source: Authors' own compilation

11.3.1 Scenario 1

As addressed earlier in the thesis, the company states that 90% of the backlog and 50% of pipeline are expected to be realized. In the first scenario we want to challenge that assumption and create a worst case scenario where the two largest projects in backlog are cancelled, leaving approximately 45% of the backlog in terms of capacity. After analyzing the company's financial reports, we have noticed that the Brazil project has recently been postponed, only a few months after the deal was signed, which is why we find it appropriate to exclude this project in this scenario. In addition, there is a lot of uncertainty surrounding the Upington project in South Africa, where Eskom, the off-taker, is refusing to sign PPAs. Based on this information and our assessment of the situation, we find it valuable to test the impact on share price if the two projects were to be cancelled. Table 11.7 shows the cash flows to SSO's equity generated by each segment, in addition to comparing the cash flows to SSO's equity, based on the assumptions from the core valuation, to the ones generated in this scenario. For all scenarios, we assume that corporate cash flows will remain constant as the majority is related to the administration in Oslo.

Table 11.7: Scenario 1 - Value distribution.

NOK in thousands	Growth Period				Stable Period							
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash Flow to SSO's Equity												
Power Production	-3,961,167	47,820	388,654	389,298	437,484	436,594	435,738	434,914	434,122	433,359	432,625	431,918
Operation & Maintenance	29,875	39,663	55,981	56,222	63,588	63,588	63,588	63,588	63,588	63,588	63,588	63,588
Development & Contruction	192,723	540	540	540	540	540	540	540	540	540	540	540
Corporate	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500
Free Cash Flow to SSO's Equity	**-3,754,069**	**72,523**	**429,675**	**430,560**	**486,113**	**485,223**	**484,367**	**483,543**	**482,750**	**481,987**	**481,253**	**480,547**



PV - Growth Period	-2,843,949
PV - Stable Period	1,948,787
PV - Terminal Value	4,076,311
Value of Common Stockholder's Equity	**3,181,150**
Number of shares outstanding	102,260,146
Estimated Share Price, 01.01.17	31.11
Estimated Share Price, 31.03.17	31.61

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Free Cash Flow to SSO's Equity												
Core Valuation, FCFE	-3,754,069	-4,569,310	578,259	826,785	882,338	881,448	880,592	879,768	878,976	878,213	877,479	876,772
Scenario 1	-3,754,069	72,523	429,675	430,560	486,113	485,223	484,367	483,543	482,750	481,987	481,253	480,547
Difference	-	4,641,833	-148,585	-396,226	-396,226	-396,226	-396,226	-396,226	-396,226	-396,226	-396,226	-396,226

Source: Authors' own compilation

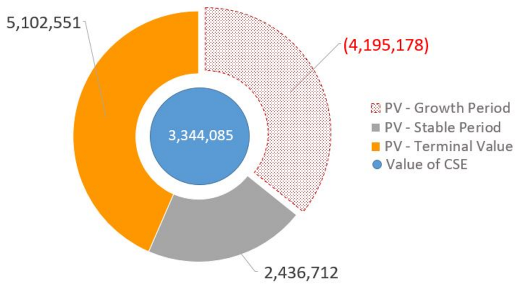
From the table above and our analysis it is clear that excluding the two largest projects from the backlog could lower the value of common stockholder's equity by about 35% to NOK 31.61 per share. Even though it removes all CAPEX in year 2018, it also lowers future cash flows by almost half going into the stable period. The decrease in CAPEX is not enough to offset the loss in future cash flow from the projects, which decreases the equity value significantly.

11.3.2 Scenario 2

In the second scenario, we assume a slightly more optimistic view on the backlog. Here only the Upington project in South Africa is excluded, and not the project in Brazil, as we, in this case, assume that the delay in Brazil does not necessarily result in cancellation. The exclusion of Upington results in 65% of the backlog being realized. We find this scenario valuable as it enables us to see the how much the Brazil project would contribute to the total based on our assumptions, in addition to presenting a more realistic downside. As with the previous scenario, table 11.8 shows the cash flows to SSO's equity generated by each segment, in addition to comparing the cash flows to SSO's equity, based on the assumptions from the core valuation, to the ones generated in this scenario.

Table 11.8: Scenario 2 - Value distribution.

NOK in thousands	Growth Period				Stable Period							
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash Flow to SSO's Equity												
Power Production	-3,961,167	-1,914,980	428,104	494,499	542,685	541,795	540,939	540,115	539,322	538,559	537,825	537,119
Operation & Maintenance	29,875	39,663	61,899	72,002	79,369	79,369	79,369	79,369	79,369	79,369	79,369	79,369
Development & Contruction	192,723	106,531	540	540	540	540	540	540	540	540	540	540
Corporate	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500
Free Cash Flow to SSO's Equity	**-3,754,069**	**-1,784,286**	**475,043**	**551,541**	**607,094**	**606,204**	**605,348**	**604,524**	**603,731**	**602,968**	**602,234**	**601,528**



PV - Growth Period	-4,195,178
PV - Stable Period	2,436,712
PV - Terminal Value	5,102,551
Value of Common Stockholder's Equity	**3,344,085**
Number of shares outstanding	102,260,146
Estimated Share Price, 01.01.17	32.70
Estimated Share Price, 31.03.17	33.23

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Free Cash Flow to SSO's Equity												
Core Valuation, FCFE	-3,754,069	-4,569,310	578,259	826,785	882,338	881,448	880,592	879,768	878,976	878,213	877,479	876,772
Scenario 2	-3,754,069	-1,784,286	475,043	551,541	607,094	606,204	605,348	604,524	603,731	602,968	602,234	601,528
Difference	-	2,785,024	-103,217	-275,245	-275,245	-275,245	-275,245	-275,245	-275,245	-275,245	-275,245	-275,245

Source: Authors' own compilation

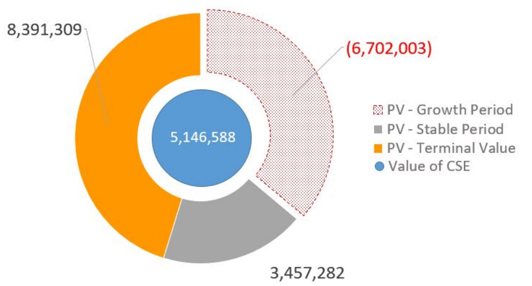
When only the Upington project is excluded, the price decreases to NOK 33.23. At first glance, we would have expected that the price would drop less now that the Brazil project is included. However, after further investigation, we see that including Brazil will introduce a significant amount of CAPEX in 2018. Based on our assumptions and information disclosed by Scatec regarding CAPEX and expected production on the Brazil project, we find that the value from future cash flows will not neutralize the high CAPEX. The Brazil project has one of the highest ratios of all the backlog projects, in terms of CAPEX as a percentage of expected production, meaning that it could potentially provide less value than other projects. However, as we do not have access to information regarding the actual PPA price, we cannot say this for certain.

11.3.3 Scenario 3

The last two scenarios analyzed the impact of Scatec Solar not being able to fully realize its backlog. In this scenario we want to use findings from our strategic analysis, which revealed that it is expected a significant increase in the global solar PV capacity. As we addressed in section 11.3, Bloomberg New Energy Finance expects an annual growth of 11.35% in solar PV capacity between 2015 and 2040 (BNEF, 2017b). In this scenario we are assuming an annual growth of 7.5% in both 2020 and 2021, through the realization of Scatec's pipeline projects in Nigeria, Kenya, and Burkina Faso. These three projects have either an PPA or Joint Venture agreement linked to them, which we believe make them more realistic in terms of being realized. This estimate is more modest than expected world growth, but still in line with Scatec assumption of pipeline projects having a 50% probability of being developed. As with the previous scenario, table 11.9 shows the cash flows to SSO's equity generated by each segment, in addition to comparing the cash flows to SSO's equity, based on the assumptions from the core valuation, to the ones generated in this scenario.

Table 11.9: Scenario 3 - Value distribution.

NOK in thousands	Growth Period				Stable Period							
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash Flow to SSO's Equity												
Power Production	-3,961,167	-4,858,980	527,858	-309,278	-212,196	878,929	878,073	877,249	876,456	875,693	874,959	874,253
Operation & Maintenance	29,875	39,663	75,362	107,903	122,604	129,939	129,939	129,939	129,939	129,939	129,939	129,939
Development & Contruction	192,723	265,507	0	56,868	56,868	540	540	540	540	540	540	540
Corporate	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500
Free Cash Flow to SSO's Equity	**-3,754,069**	**-4,569,310**	**587,719**	**-160,006**	**-48,223**	**993,908**	**993,052**	**992,228**	**991,435**	**990,672**	**989,938**	**989,232**



PV - Growth Period	-6,702,003
PV - Stable Period	3,457,282
PV - Terminal Value	8,391,309
Value of Common Stockholder's Equity	**5,146,588**
Number of shares outstanding	102,260,146
Estimated Share Price, 01.01.17	50.33
Estimated Share Price, 31.03.17	51.14

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Free Cash Flow to SSO's Equity												
Core Valuation, FCFE	-3,754,069	-4,569,310	578,259	826,785	882,338	881,448	880,592	879,768	878,976	878,213	877,479	876,772
Scenario 3	-3,754,069	-4,569,310	587,719	-160,006	-48,223	993,908	993,052	992,228	991,435	990,672	989,938	989,232
Difference	-	-	9,460	-986,791	-930,562	112,459	112,459	112,459	112,459	112,459	112,459	112,459

Source: Authors' own compilation

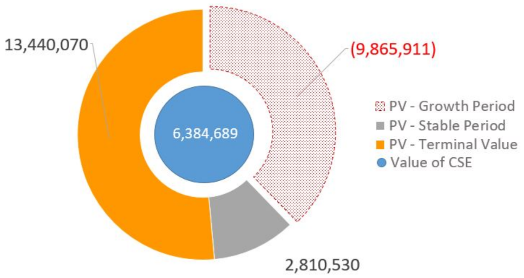
Compared to the cash flows with the core valuation assumptions, this scenario will generate additional CAPEX in both 2020 and 2021, resulting in lower cash flows. After 2021, cash flows will increase by roughly NOK 112 million per year compared to the core valuation, which assumes that 100% of backlog, but none of the pipeline projects will be realized. This results in an increase of approximately 4% in the estimated share price and a value of NOK 51.14 per share, which is modest, but realistic given the small increase in production.

11.3.4 Scenario 4

In the last scenario we assume that Scatec Solar is able to realize 100% of its backlog and pipeline projects and that it does so through large investments in 2020 and 2021. The result would be an annual growth of 43% in 2020 and 2021, which is quite optimistic going forward. However, as we discussed in section 10.3, Scatec grew almost 65% annually between 2013 and 2016, so it is not impossible.

Table 11.10: Scenario 4 - Value distribution.

NOK in thousands	Growth Period				Stable Period							
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash Flow to SSO's Equity												
Power Production	-3,961,167	-4,858,980	527,858	-6,181,219	-5,825,360	1,396,483	1,395,626	1,394,803	1,394,010	1,393,247	1,392,513	1,391,807
Operation & Maintenance	29,875	39,663	75,362	107,903	161,421	207,572	207,572	207,572	207,572	207,572	207,572	207,572
Development & Contruction	192,723	265,507	0	373,953	373,953	540	540	540	540	540	540	540
Corporate	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500	-15,500
Free Cash Flow to SSO's Equity	**-3,754,069**	**-4,569,310**	**587,719**	**-5,714,862**	**-5,305,486**	**1,589,094**	**1,588,238**	**1,587,414**	**1,586,621**	**1,585,859**	**1,585,125**	**1,584,418**



PV - Growth Period	-9,865,911
PV - Stable Period	2,810,530
PV - Terminal Value	13,440,070
Value of Common Stockholder's Equity	**6,384,689**
Number of shares outstanding	102,260,146
Estimated Share Price, 01.01.17	62.44
Estimated Share Price, 31.03.17	63.45

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Free Cash Flow to SSO's Equity												
Core Valuation, FCFE	-3,754,069	-4,569,310	578,259	826,785	882,338	881,448	880,592	879,768	878,976	878,213	877,479	876,772
Scenario 4	-3,754,069	-4,569,310	587,719	-5,714,862	-5,305,486	1,589,094	1,588,238	1,587,414	1,586,621	1,585,859	1,585,125	1,584,418
Difference	-	-	9,460	-6,541,647	-6,187,824	707,646	707,646	707,646	707,646	707,646	707,646	707,646

Source: Authors' own compilation

With a 100% of pipeline projects realized, we estimate that the company will face large negative cash flows to equity in 2020 and 2021, with a significant increase in cash flows thereafter compared to the core valuation. The result is that the estimated share price increases by 30% to NOK 63.45 per share.

11.3.5 Section Conclusion

We consider scenario 2 and 3 to be the most realistic outcomes in the next few years. Thus, if we leave out the worst case scenario and the highly optimistic scenario, of realizing all pipeline projects, we end up with a share price interval ranging from NOK 33.23 to NOK 51.14. This interval is well in line with the most sensible parameter values from the sensitivity analysis. In comparison, the estimated share price from the core valuation is NOK 48.92 and the true market value of Scatec Solar's share as of March 31 was NOK 38.30.

12. Conclusion

Scatec Solar ASA is an IPP company operating in the solar power industry. The company is operating mainly in emerging markets, with more than 50% of capacity located in South Africa. In 2012, Scatec went from solely providing D&C services to third parties to being a fully integrated company, keeping cash flows from its segments within the Scatec Solar group. The company is somewhat unique in the way that it is present in the entire process of producing energy through solar power. This keeps cash flows within the group, generating margins through every aspect of the plants' operations. The main source of income is the production of electricity to its counter-parties through its power production segment. Given that Scatec is an IPP company, operating in emerging markets, the presence of comparable firms is somewhat limited.

The solar power industry has experienced significant growth over the last ten years. Between 2005 and 2016, the industry grew from an installed solar PV capacity of 5.1 GW to 300 GW. This development is due to increased global focus on renewable energy and the introduction of government policies, together with the use of different support mechanisms. Adding to governments making solar energy more desirable, is the significant reduction in costs of solar panel components. Between 2009 and 2016, the cost of solar systems dropped by more than 60%, reducing the cost of implementing solar energy significantly. This has resulted in a shift in the use of government incentives, where reverse auctions are about to become the preferred pricing mechanism. The positive historical development is expected to continue in the future where installed capacity is expected to increase to a number between 490 and 716 GW by 2020. Emerging markets are expected to account for a significant portion of the increase, creating a significant growth potential for Scatec Solar in the future, considering the company's strategic positioning.

The strategic analysis revealed that Scatec Solar has a strong competitive position in an industry that shows great potential of being profitable, while also having an increasing support worldwide. The company is able to use its experience and connections as a competitive advantage, enabling Scatec to win auctions in emerging markets and expand its portfolio. However, even though Scatec expresses enthusiasm regarding its future, postponed projects, in addition to the company lowering their estimates for future expansions, could be an indication that the company has been overly optimistic. Though, if Scatec is able to acquire funding in the future, the expansion potential in parts of Africa could generate further growth in the future.

The financial analysis gives an indication of a company with solid historical profit margins. Despite showing poor performance in terms of asset turnover and return on invested capital, the financial ratios analyzed showed positive trends. However, given Scatec's low historical ROIC, it is unlikely that the company created value given their high cost of capital. Analysis also revealed a varying liquidity position, with Scatec being able to cover short-term obligations, but not its investments through cash flows from operations based on the historical data.

Using the information from the financial analysis, we estimated a core value of Scatec Solar's common equity using the FCFF model. The result was a share price of NOK 48.92 as of March 31, 2017. This estimate has worked as a foundation considering the implementation of the sensitivity and scenario analysis. The sensitivity analysis revealed that Scatec's share price was highly affected by the core profit margin. In addition, the pretax cost of debt and tax rate showed to be very influential, an expected result given the high financial leverage of the firm.

The scenario analysis showed that Scatec's share price is quite sensitive to the expected future capacity. If the Upington project in the company's backlog is not realized, given that Eskom backs out of the REIPPP program, share price drops considerably to NOK 33.23. This is due to the project's high capacity and production potential. On the other hand, if all projects in backlog, in addition to 15% of the pipeline, are realized the share price increases to NOK 51.14. As we believe that both of these scenarios are realistic, we find it necessary to present Scatec Solar's estimated share price as an interval. Based on the core valuation and sensitivity- and scenario analysis, we believe that this interval should be between NOK 33.23 and 51.14. This interval covers the value estimated in the core valuation, in addition to including both the potential downside and upside. It is also worth noting that the market price at the valuation date was equal to NOK 38.30.

In order to conclude the thesis, we have included a table that summarizes the elements that we believe significantly affected the estimated valuation of Scatec Solar ASA. The table is divided into the financial and strategic drivers that influenced our view on the future of Scatec Solar.

Table 12.1: Key factors affecting the share price.

Financial Analysis	Strategic Analysis
+ Solid and stable profit margin	+ Growth industry
+ Stable and fixed revenue streams	+ Increased focus on renewables
+ Positive trend in ROIC and ROCE	+ Integrated business model
	+ Experience and network
- High financial leverage	- Project delays and uncertainty
- High cost of debt financing	- Risk of Upington not being realized
- High capital expenditures	- Risk of not winning auctions

Source: Authors' own compilation

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Appendices

Appendix 1 - List of Abbreviations and Definitions

Sources are citet in the main text.

Backlog - Project in backlog are projects with a secure off-take agreement assessed to have more than 90% likelihood of reaching financial close and subsequent realization.

EPC - Engineering and procurement services at a solar PV plant.

FiP - A feed-in premium is similar to a FiT but provides the power producer with a premium on top of electricity sales prices determined by the market.

FiT - A feed-in tariff is a predetermined price for every unit of electricity generated by a solar PV power plant, paid through a long-term contract.

GW - Gigawatt is a unit of power and equals 10^9 watt.

GWh - A gigawatt hour is the unit of converted energy per hour.

IPP - Independent power producer.

ITC - Investment tax credit on capital expenditures of a solar PV project.

LCOE - Levelized cost of electricity is a metric for the total system cost of generating electricity.

MENA - Middle East and North Africa region.

MW - Megawatt is a unit of power and equals 10^6 watt.

Pipeline - Projects in pipeline are projects assessed to have more than 50% likelihood of reaching financial close and subsequent realization.

PPA - A power purchase agreement secures the feed-in tariff between the solar producer and the off-taker.

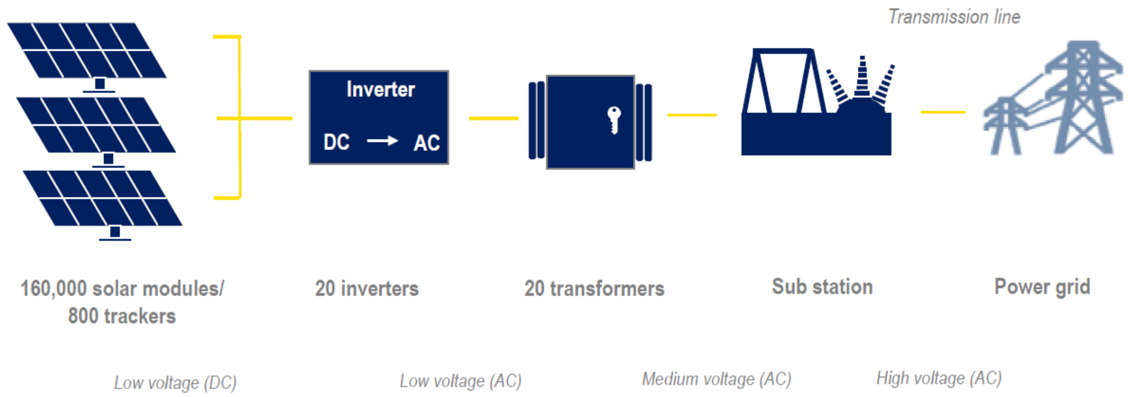
PV - Photovoltaic is a technology that allows solar modules to convert solar radiation into electricity.

SPV - A single purpose vehicle is a legal entity created for a particular task, such as a solar PV project.

SOTP - Sum-of-the-parts. An approach to forecast each business segment separately.

Appendix 2 - Process of Electricity Generation

Components necessary to transform solar power into electricity.



Source: Scatec Solar (2017b)

Appendix 3 - Project Timeline

Estimated timeline of Scatec Solar's projects in operation and backlog, 2009-2019.

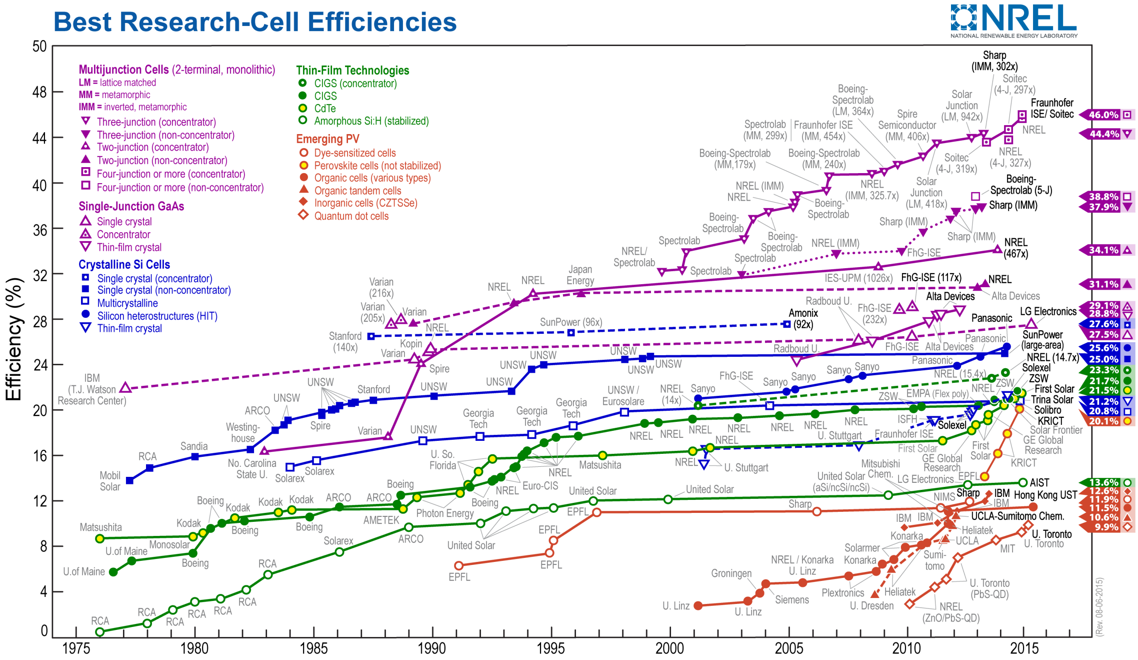
Group	Solar plant	Country	MW	2009	2010	2011	2012	2013	2014	2015	2016	2017E	2018E	2019E
Operation	Czech portfolio	Czech Republic	20	PPA	Construction	Operation								
	Kalkbult	South Africa	75			PPA		Construction	Operation					
	Linde	South Africa	40					PPA / Construction	Operation					
	Dreunberg	South Africa	75			PPA		Construction	Operation					
	ASYV	Rwanda	8.5					PPA	Construction / Operation					
	Agua Fria	Honduras	60						PPA	Construction / Operation	Operation			
	Red Hills	USA	104						PPA	Construction	Operation / Sold			
	Oryx	Jordan	10						PPA	Construction	Operation			
	EJRE and GLAE	Jordan	33						PPA	Construction	Operation			
Backlog	Los Prados	Honduras	53							PPA		Construction	Construction / Operation	
	Segou	Mali	33							PPA		Construction	Construction / Operation	
	Malaysia	Malaysia	197								PPA	Construction	Construction / Operation	
	Mocuba	Mozambique	40								PPA	Construction	Construction / Operation	
	Brazil	Brazil	150								PPA		Construction	Operation
	Upington	South Africa	258									PPA	Construction	Construction / Operation

Source: Authors' own compilation / Scatec Solar (2017a) and statements from the company

* The timeline is based on annual reports and unofficial statements from Scatec Solar. As projects in backlog are dependent on several factors and stakeholders, the timeline serve only as a prediction, and future changes might occur.

Appendix 4 - Solar Cells Efficiency

Solar cells efficiencies by technology.



Source: NREL (2015)

Appendix 5 - Reformulated Income Sheet

Table 12.2: Reformulated Income Statement

NOK THOUSAND	2013	2014	2015	2016
Revenues	132,163	455,098	867,714	1,012,938
Operating expenses				
Personell expenses	-50,886	-69,686	-70,543	-86,199
Other operating expenses	-94,938	-108,736	-112,027	-165,713
Depreciation, amortization, and impairment	-57,836	-101,859	-175,609	-270,083
Operating lease expense		8,347	25,724	22,052
Lease depreciation		-11,917	-12,500	-10,235
Core operating income from sales (before tax)	-71,497	171,247	522,759	502,760
Taxes				
Tax as reported	-25,603	-11,062	-83,970	-28,410
Tax benefit from net financial expenses	-43,902	-32,239	-133,286	-131,419
Tax on unusual items and other operating income	179,963	8,154	16,635	17,414
Core operating income from sales (after tax)	38,962	136,099	322,137	360,345
Core other operating income/expense				
Net income /(loss) from associated companies, net of tax	-7,717	-1,403	-1,196	-4,369
Core operating income	31,245	134,697	320,942	355,976
Unusual items				
Net gain/loss from sale of project assets	-	17,393	14,112	75,405
Foreign exchange gain/(loss)	64,242	62,310	40,514	-10,052
Gain on sale of financial investment	-	-	-	-
Forward exchange contracts, net	76,090	-46,744	-2,954	-
Other income	7,523	20,786	534	357
Operating expenses	-24,163	-11,011	-9,559	-8,484
Tax on unusual items and other operating income	-175,438	-7,934	-16,304	-16,439
Other operating income/expense, after tax items				
Net movement of cash flow hedges	125,280	-86,997	142,713	-114,582
Income tax effect	-35,079	24,359	-39,959	32,084
Foreign currency translation differences	-53,560	117,750	44,576	5,341
Comprehensive operating income (after-tax)	16,140	224,609	494,615	319,606
Financial income (expense)				
Interest Income	13,845	34,013	63,868	50,439
Interest Expense	-44,798	-190,802	-395,541	-496,317
Operating lease interest, after tax		-16,854	-16,971	-11,599
Net financial expense before tax	-30,953	-173,643	-348,644	-457,477
Tax shield	43,902	32,239	133,286	131,419
Net financial expense after tax	12,949	-141,404	-215,358	-326,059
Minority interest	77,120	29,180	94,063	62,446
Comprehensive income to common	-48,029	54,024	185,194	-68,899

Source: Authors' own compilation / Company reports

Appendix 6 - Reformulated Balance Sheet

Table 12.3: Reformulated Balance Sheet - Net Operating Assets

Amounts in TNOK	2013	2014	2015	2016
Cash, restricted to operations	380,935	529,913	813,429	715,466
Trade and other receivables	25,472	126,122	221,382	231,484
Other current assets	105,237	82,897	251,892	114,104
Non-current assets held for sale	-	-	26,427	-
Financial assets - current	50,552	2,946	1,086	1,289
Total Current Operating Assets	**562,196**	**741,878**	**1,314,216**	**1,062,343**
Deferred tax assets	313,644	402,011	340,670	327,456
Property, plant and equipment - in solar projects	1,857,294	3,049,193	5,196,298	5,059,802
Property, plant and equipment - other	8,715	13,231	19,891	21,465
Goodwill	20,566	22,169	23,595	22,289
Investments in an associated companies	6,321	25,841	-	-
Financial assets - non-current	79,921	23,868	126,810	18,237
Capitalized operating leases	134,078	297,934	299,997	204,710
Total Non-current Operating Assets	**2,420,540**	**3,834,247**	**6,007,261**	**5,653,959**
Total Operating Assets	**2,982,736**	**4,576,125**	**7,321,477**	**6,716,302**
Trade and other payables	441,811	69,947	154,154	29,346
Income tax payable	91,881	41,543	23,508	10,680
Financial liabilities - current	16,298	25,773	6,184	6,584
Other current liabilities	92,834	145,717	364,794	183,166
Total Current Operating Liabilities	**642,824**	**282,980**	**548,640**	**229,776**
Deferred tax liabilities	80,894	82,640	203,436	127,508
Financial liabilities - non-current	-	14,886	-	7,330
Total Non-Current Operating Liabilities	**80,894**	**97,526**	**203,436**	**134,838**
Total Operating Liabilities	**723,718**	**380,506**	**752,076**	**364,614**
Net Operating Assets	**2,259,018**	**4,195,619**	**6,569,401**	**6,351,688**

Source: Authors' own compilation / Company reports

Appendix 7 - Reformulated Invested Capital

Reformulation of balance sheet.

Amounts in TNOK	2013	2014	2015	2016
Cash and cash equivalents	644,427	498,768	821,853	421,974
Other non-current assets	31,397	214,401	136,543	141,789
Financial Assets (interest-bearing)	**675,824**	**713,169**	**958,396**	**563,763**
Non-recourse project financing - current	21,572	112,786	166,789	279,473
Non-recourse project financing - non-current	2,376,968	3,337,265	4,799,828	4,304,098
Bonds	-	-	492,917	495,417
Other non-current financial liabilities	3,608	4,646	346,616	318,798
Capitalized operating leases	134,078	297,934	299,997	204,710
Financial Obligations (interest-bearing)	**2,536,226**	**3,752,631**	**6,106,147**	**5,602,496**
Net Financial Obligations	**1,860,402**	**3,039,461**	**5,147,751**	**5,038,733**
Share capital	1,624	2,345	2,345	2,345
Share premium	301,286	794,142	807,903	819,053
Retained earnings	-147,074	-227,652	-168,656	-221,761
Other reserves	-51,860	40,511	161,803	85,309
Common Shareholder's Equity	**103,976**	**609,346**	**803,395**	**684,946**
Non-controlling interests	294,640	546,811	618,255	628,009
Invested Capital	**2,259,018**	**4,195,619**	**6,569,401**	**6,351,688**

Source: Authors' own compilation / Company reports

Appendix 8 - Reformulated Statement of Stockholder's Equity

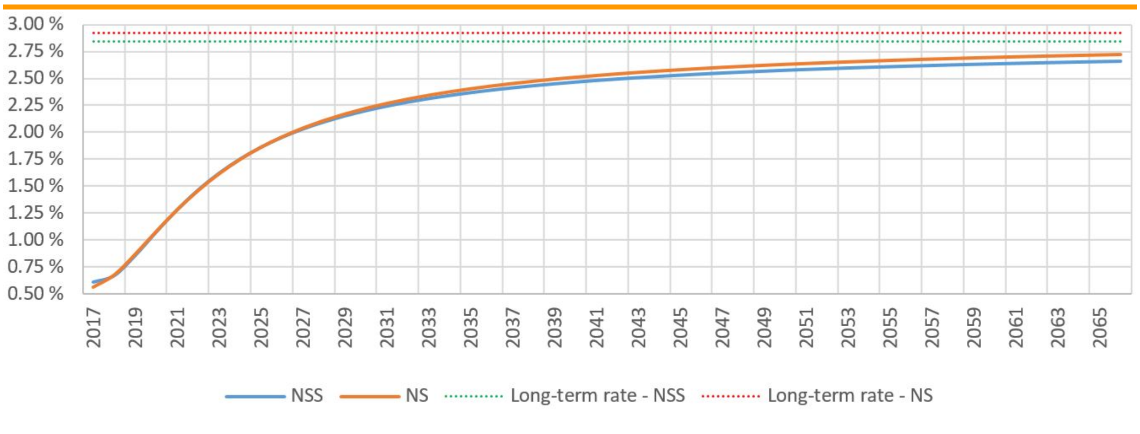
Reformulated Statement of Stockholder's Equity

Amounts in thousands	**2013**	**2014**	**2015**	**2016**
Shareholder's Equity 01.01.xx	162,522	398,616	1,176,582	1,425,397
- Non-controlling interest	10,517	294,640	546,811	618,255
Common Shareholder's Equity 01.01.xx	**152,005**	**103,976**	**629,771**	**807,142**
Transactions with common shareholders				
Transactions with non-controlling interest				
Share capital increase	-	499,201	-	-
Transaction cost, net after tax	-	-14,607	-	-
Share-based payment	-	8,982	13,761	10,975
Dividend to equity holders of the company	-	-42,230	-25,331	-61,196
Capital increase from non-controlling interests	-	-	-	-13,381
Distribution to NCI loan	-	-	-	10,304
Net transactions with common shareholders	-	451,346	-11,570	-53,298
Comprehensive income attr. Scatec Solar AS				
Profit for the period	-7,551	48,517	135,674	70,487
- Non-controlling interest from earnings	27,127	66,440	68,023	66,986
+/- Foreign currency trainslation	-48,554	116,801	82,261	-43,749
+/- Cash Flow Hedges	35,203	-24,429	39,031	-32,745
+/- Net other comprehensive income	-	-	-	3,878
Total comprehensive income to common in the period	-48,029	74,449	188,941	-69,114
Common Shareholder's Equity 31.12.xx	**103,976**	**629,771**	**807,142**	**684,730**

Source: Authors' own compilation / Company reports

Appendix 9 - Term Structure

Term structure of Norwegian bonds.



Source: Authors' own compilation / Norges Bank (2017)

Appendix 10 - Default Spreads

Default spreads for companies with market cap below $5 billion.

For smaller non-financial service companies with market cap < $ 5 billion

If interest coverage ratio is	*Column1*	*Column2*	*Column3*
>	≤ to	*Rating is*	*Spread is*
12.5	100000	Aaa/AAA	0.60%
9.5	12.499999	Aa2/AA	0.80%
7.5	9.499999	A1/A+	1.00%
6	7.499999	A2/A	1.10%
4.5	5.999999	A3/A-	1.25%
4	4.499999	Baa2/BBB	1.60%
3.5	3.9999999	Ba1/BB+	2.50%
3	3.499999	Ba2/BB	3.00%
2.5	2.999999	B1/B+	3.75%
2	2.499999	B2/B	4.50%
1.5	1.999999	B3/B-	5.50%
1.25	1.499999	Caa/CCC	6.50%
0.8	1.249999	Ca2/CC	8.00%
0.5	0.799999	C2/C	10.50%
-100000	0.499999	D2/D	14.00%

Source: Damodaran (2017d)

Appendix 11 - Capital Structure of Scatec Solar, 2016

Scatec Solar's capital structure.

(in thousands)	
Net operating assets	6,351,688
Book value of equity	1,312,739
Net financial obligations	5,038,949
Debt ratio	**0.79**
Equity ratio	**0.21**

Source: Authors' own compilation / Scatec Solar (2017a)

Appendix 12 - Funding

Funding needed for Scatec Solar's operations in the nearest future.

Backlog and capital expenditure

Capital Expenditure					NOKm	
Project	Capacity (MW)	Local FX (millions)		FX	**2017**	**2018**
Los Prados, Honduras	53	100	USD	8.6052	861	
Segou, Mali	33	52	EUR	9.1714	477	
Malaysia	197	1,240	MYR	1.9384	2,404	
Mocuba, Mozambiqu	40	80	USD	8.6052	688	
Brazil	150	720	BRL	2.7389		1,972
Uppington, South Afri	258	4,600	ZAR	0.6405		2,946
Total expected CAPEX	731				**4,429**	**4,918**
			Sum			**9,348**
			Estimated cost per MW			12.79

Funding	NOKm	
	2017	**2018**
Equity (25%)	1,107	1,230
Debt (75%)	3,322	3,689
CAPEX	4,429	4,918

Scatec equity share	NOKm	
	2017	**2018**
Scatec Solar (55%)	609	676
Equity co-investors	498	553
Equity stake	1,107	1,230
Required equity investment	609	676

Cash flows and available cash

Power Production	NOKm
	2017
Cash flow from Power Production	149
- Dividends	75
CF to SSO equity share, excl. NWC & CAPEX	**75**

Operation and Maintenance	NOKm
	2017
Cash flow from O&M	30
CF to SSO equity share	**30**

Corporate	NOKm
	2017
Cash flow from Corporate	- 16
CF to SSO equity share	**- 16**

Development and Construction	NOKm
Project	**2017**
Los Prados, Honduras	-
Segou, Mali	382
Malaysia	1,923
Mocuba, Mozambique	551
Brazil	
Uppington, Soth Africa	
EPC Revenue (80% of CAPEX)	**2,855**
Gross margin acquired by Scatec Solar (15%)	428
EBITDA (60% of gross margin)	257
EBITDA (after-tax, 25%)	193
CF to SSO equity share	**193**

		NOKm
Cash	**2016**	**2016**
Un-restricted cash	422	
Overdraft facility (30 USDm)	258	
Available cash and cash flow	680	282
Cash - Investment	**71**	**-394**
Excess cash (Funding needed)		(323)

Source: Authors' own compilation / Nordea (2016)

Appendix 13 - Stable Period Production

Estimated production beyond 2020.

				Production (MWh)								
	Plant	**Capacity (MW)**	**Stated production**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**
Operation	Czech Republic	20	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500
	Kalkbult, South Africa	75	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Linde, South Africa	40	94,000	162,686	162,686	162,686	162,686	162,686	162,686	162,686	162,686
	Dreunberg, South Africa	75	178,000	178,000	178,000	178,000	178,000	178,000	178,000	178,000	178,000
	Asyv, Rwanda	9	15,500	15,500	15,500	15,500	15,500	15,500	15,500	15,500	15,500
	Agua Fria, Honduras	60	103,000	103,000	103,000	103,000	103,000	103,000	103,000	103,000	103,000
	Jordan	43	43,000	93,874	93,874	93,874	93,874	93,874	93,874	93,874	93,874
Backlog	Los Prados, Honduras	53	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000
	Segou, Mali	33	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Malaysia	197	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000	285,000
	Mocuba, Mozambique	40	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000
	Brazil	150	305,000	305,000	305,000	305,000	305,000	305,000	305,000	305,000	305,000
	Upington, South Africa	258	645,000	645,000	645,000	645,000	645,000	645,000	645,000	645,000	645,000
	Projects in operation	**322**	**604,000**	**723,560**	**723,560**	**723,560**	**723,560**	**723,560**	**723,560**	**723,560**	**723,560**
	Projects in backlog	**731**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**	**1,482,000**
	Sum	**1,053**	**2,086,000**	**2,205,560**	**2,205,560**	**2,205,560**	**2,205,560**	**2,205,560**	**2,205,560**	**2,205,560**	**2,205,560**

Source: Authors' own compilation / Company reports

Appendix 14 - Core Valuation, FCFF

Forecast - Core Valuation.

		Growth Period				Stable Period							
		Beta Equity	0.93		Beta Assets	0.19		Risk Premium	5.00 %		Tax	25 %	
Year	**2016**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**
Risk free rate (Term structure)		0.61 %	0.67 %	0.85 %	1.07 %	1.28 %	1.46 %	1.62 %	1.75 %	1.86 %	1.95 %	2.03 %	2.10 %
Cost of Debt	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %	10.72 %
Cost of Equity	5.25 %	9.76 %	13.20 %	16.10 %	15.11 %	13.94 %	12.45 %	10.89 %	9.41 %	8.12 %	7.05 %	6.18 %	5.48 %
Beta Equity	0.93	1.55	2.51	3.05	2.81	2.53	2.20	1.85	1.53	1.25	1.02	0.83	0.68
Pre-Tax WACC	9.59 %	10.60 %	10.91 %	11.06 %	11.02 %	10.96 %	10.87 %	10.74 %	10.56 %	10.32 %	10.03 %	9.67 %	9.23 %
After-tax WACC	7.46 %	8.25 %	8.44 %	8.55 %	8.52 %	8.49 %	8.43 %	8.34 %	8.21 %	8.05 %	7.85 %	7.61 %	7.31 %
ROIC	5.67 %	2.87 %	2.65 %	5.24 %	7.79 %	8.65 %	8.98 %	9.33 %	9.69 %	10.07 %	10.46 %	10.87 %	11.29 %
Profit Margin	35.57 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %	35.00 %
E/E+D	21 %	12 %	8 %	6 %	7 %	8 %	9 %	10 %	13 %	15 %	19 %	23 %	28 %
D/E+D	79 %	88 %	92 %	94 %	93 %	92 %	91 %	90 %	87 %	85 %	81 %	77 %	72 %
D/E	384 %	706 %	1203 %	1487 %	1360 %	1217 %	1043 %	864 %	697 %	552 %	430 %	331 %	251 %

NOK in thousands

Production		623,163	827,854	1,522,683	2,121,565	2,205,560	2,205,560	2,205,560	2,205,560	2,205,560	2,205,560	2,205,560	2,205,560
Revenues	1,012,938	995,842	1,322,102	2,512,054	3,596,781	3,842,336	3,842,336	3,842,336	3,842,336	3,842,336	3,842,336	3,842,336	3,842,336
Operating Income	360,345	348,545	462,736	879,219	1,258,873	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818	1,344,818
Net Operating Assets	6,351,688	12,138,250	17,435,710	16,783,226	16,155,385	15,551,256	14,969,944	14,410,588	13,872,358	13,354,456	12,856,114	12,376,594	11,915,185
Delta NOA		5,786,562	5,297,460	-652,485	-627,841	-604,129	-581,312	-559,356	-538,230	-517,902	-498,342	-479,520	-461,409
Free Cash Flow to the Firm		**-5,438,018**	**-4,834,724**	**1,531,704**	**1,886,715**	**1,948,946**	**1,926,129**	**1,904,174**	**1,883,048**	**1,862,720**	**1,843,159**	**1,824,338**	**1,806,227**

Source: Authors' own compilation