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Valuation of Nel Hydrogen ASA

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NORWEGIAN SCHOOL OF ECONOMICS

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Abstract

With today's problem of Global Emission and rise in Greenhouse gas, they way how economy depends on conventional sources of energy must change. To solve this problem several governments and NGOs are shifting focus on green and renewable technology. One of several clean energy companies, Nel Hydrogen ASA is a Norwegian company manufacturing technology, plants, service and solution focused on production of Hydrogen using renewable source of energy.

Aim of this this study is to fairly value Nel Hydrogen equity using three stage DCF-model through weighted average cost of capital. Several assumptions are made based on its historical performance and thorough analysis of fuel cell industry and markets. Its market positioning is in strong position due to its long expertise and control of value chain. It is a fast-growing company with high growth ambition and fulfilling it by two major acquisition in 2015 and 2017.

Estimation of its future free cashflows and Net Present value shows that Nel Hydrogen equity is not fairly priced in the market. DCF three stage model price its share at Kr 10,06 whereas market price is Kr 2.99. Relative valuation using EV/Revenue multiple supports the DCF estimates. But sensitivity analysis reveals that the company is highly sensitive to growth rate and discount rate. Study concludes that one should invest in Nel hydrogen to get good return in the future.

Acknowledgement

I would like to thank Professor Xunhua Su for his supervision and guidance from the beginning of this thesis. He suggested me with topic on hydrogen that is unknown to so many of us, especially people from developing and under developed economies. I came to learn about so many challenges economy and world presents to one another. And I came to learn about so many companies like Nel are trying to soothe these challenges.

This thesis tested my understanding of theories and its shaped my knowledge about how tedious application of these known theories are in real world. with is so many complexities

Finally, I would like to thank my wife, Reshma Shakya, who helped me with her great knowledge in Microsoft Excel and my daughter who refreshed me when I was stuck or tired.

Strømmen, 20 June 2018

Ravi Kumar Shah

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1. Introduction

Several international agreements are being placed to tackle climate change like Paris agreement, climate focus etc. main goal of Paris agreement is to limit planet's temperature growth below 2 degrees. Many countries have pledged their individual commitment on carbon emission reduction UNFCCC (2018). All the sectors in economy contributes in greenhouse emissions. Transportation sector is responsible for 14% of global greenhouse emission after electricity ang heating 25% and industry, 21% (EPA, 2018). Most of these emissions are result of burning fossil fuel and coal. And to address the need of renewable source of energy to tackle climate change, several applied researches are being carried out. These researches are done, not only on new renewable resources but also new methods of energy storage of access capacity. For example, solar energy is of abundant supply, but storage has always been the problem. It is same with hydroelectricity, it has constant supply but, need of electricity varies during pick and low time and season. One could argue that battery could be a solution to iron out the peaks and troughs on daily basis, but energy requirements are skewed based on local season. For example, in Mumbai, India, energy demand peaks and so it in London in the coldest winter days (Rathi, 2017). So, an efficient source that can store any amount of excess energy could be in form of fuel cell to meet different types of energy demands.

Hydrogen, in form of fuel cell can be used as energy carrier. Fuel cell, through hydro chemical reaction, produces electricity which is considered as highly sustainable process of exploitation of energy (Belmonte et. al., 2017). Japanese Prime Minister, Shinzo Abe, (Financial Times, 2017) favours hydrogen saying:

''*Hydrogen energy holds the trump card for energy security and measures to address global warming*''

Shinzo Abe, Prime Minister of Japan

To combat global warming, there is need of transformation of the energy sector. This will require development of huge infrastructure and technology with expected investment of 13.5 trillion USD from 2015-2030 (IEA, 2015). Bloomberg (2018) sates that shift to hydrogen could meet 20% of global energy needs and this shift require investments up to 25 billion USD.

Considering above situation and importance of alternative energy, this thesis will address key characteristics and drivers of fuel cell in valuing Nel hydrogen group ASA.

1.1 Structure of the Thesis

The thesis is divided in to 13 chapters, this being chapter 1. Chapter 2 gives brief introduction of Nel Hydrogen and its structure and value chain. Chapter 3 & 4 discusses several valuation methods and their suitability for estimating value of Nel Hydrogen. Chapter 5 digs into hydrogen industry outlook with details in fuel cell development, policies and support mechanism for the development. Later it concludes with comparing fuel cell vs conventional source of energy. Later, chapter 6, assess the strategic positioning of Nel hydrogen and chapter 7, 8, 9 and 10 analyse financial statements, models the assumptions, calculate cost of capital and values the company. Chapter 11 uses market-based approach for relative valuation and chapter 12 conducts a sensitivity analysis.

2. NEL hydrogen

2.1 About

Nel Hydrogen was found in 1927 as part of Norsk Hydro, which produced hydrogen for fertilizers. In 2003 Nel Hydrogen opened its first hydrogen fuelling station in Reykjavik, Iceland. In 2014, Nel was publicly floated company on Oslo Stock Exchange. In 90 years Nel is developed to the extent that it has set bench mark for other companies in production, storage and filling stations. Today Nel is global company, entirely dedicated hydrogen company that produce, store and distribute hydrogen from renewal energy and also manufacture electrolysers and sell to other companies. Vision of Nel is, *"Empowering generations with clean energy forever"* (Nel, 2017)

2.2 Corporate Structure

The company consist of three main functions, Electrolysers, Fuelling and Solution. As mentioned above, in 90 years of producing hydrogen, the company has acquired vast methods and resources in the field. The company manufactures electrolysers for various industrial needs. It also manufactures and installs fuelling stations for cars and heavy-duty machineries. And it provides solutions to its clients as shown in the Figure 1.

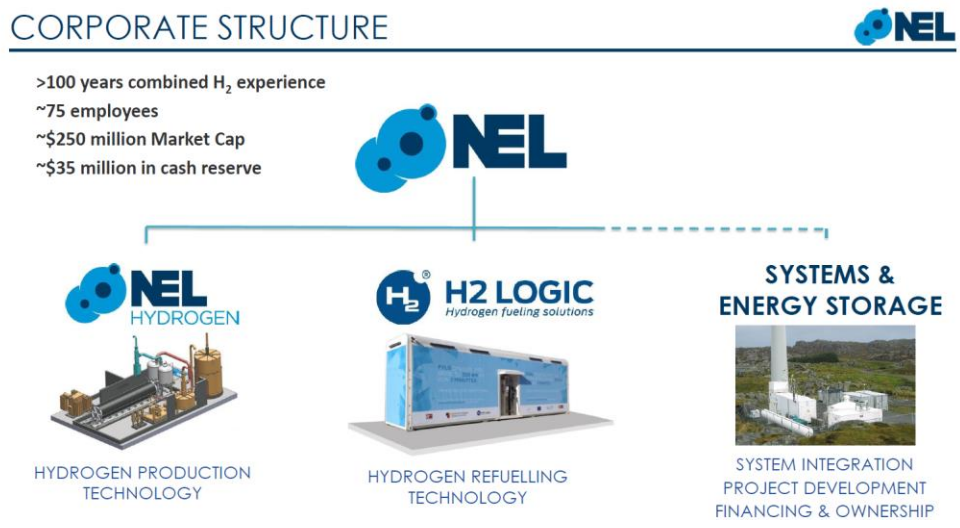

Figure 1: Corporate Structure of Nel Hydrogen

2.3 Value Chain

Value chain is description of product or service, from development of concept to consumption and final disposal after use. Value chain of Nel Hydrogen Group covers from hydrogen production technology to manufacturing of hydrogen fuelling stations for cars. Components of Value Chain of NEL hydro is broadly discussed below.

2.3.1 Hydrogen Production Division

Nel claims to be global leader as manufacturer of large scale electrolyser plant. It has adopted latest production technologies like pressurized electrolyser and rotolyser. It has also optimised its delivery and reduced assembly time through containerized solution and pre-assembly. It has supplied more than 500 large scale electrolysers in more than 50 countries.

2.3.2 Refuelling Division

Nel Hydrogen is a leading supplier of hydrogen refuelling stations ensuring they have relative low ownership cost. H2Station CAR-100 is single module system for refuelling cars. It can refuel 400 cars per day. H2Station MH-100 is system for refuelling large vehicles. Its hydrogen refuelling division is known as H2Logic, which has installed more than 29 stations across Europe.

2.3.3 System Division

NEL does not only supply electrolyser and fuelling stations. It is also actively involved in system integration and project development. It helps with operation, maintenance, ownership and financing. It provides energy storage solution and production solution based on renewable sources, like wind and solar.

To summarise, Nel Hydrogen is a pure-play hydrogen company. It provides solutions to industries, energy and gas companies to produce, store and distribute hydrogen from renewable energy. It covers entire value chain from production hydrogen production technology to hydrogen fuelling solution.

3. Valuation Methods

Valuation is heart of most works done in finance. Valuation is important when we are studying market efficiency, making investment decisions, of facing issues related to corporate governance (Damodaran, 2007). In the field of corporate finance, understanding the mechanism of company valuation is very important as it helps to recognise the areas of value creation and destruction (Fernandez, 2013). There are several valuations available to value a firm. All of them differs in terms of assumptions and complexities. However, all of them aims for similar or consistent results, hence share some features. Damodaran (2012), recognises three general approaches to valuation; 1. Discounted Cash Flow Valuation, 2. Relative valuation and 3. Contingent claim valuation. Different valuation methods are suitable depending upon the nature of the company and availability relevant data.

Fernandez (2013), says*, "... nowadays, the cash flow discounting method is generally used because it is the only conceptually correct valuation method. In these methods, the company is viewed as a cash flow generator and the company's value is obtained by calculating these flows' present value using a suitable discount rate*"

Brief discussions about several methods of valuation and their relevance to different cases are presented below.

3.1 Discounted Cash Flow (DCF)

Discounted cash flow method (DCF) of valuation is based on present value of the firm in terms of its cash flows. It discounts all its future cash flows, weather in or out and with a given discount rate to find out intrinsic value of a company. It is based on careful forecast for each period where each item related to cashflows are carefully are treated in terms of forecast and estimates, for example, sales estimate, personnel, expenses, inventories, interest payments and taxes. In this method discount rate for each type of cashflows are carefully determined. Discount rate is set based on risk and volatilities (Damodaran, 2012)

General expression of cash flow discounting is

$$V = \frac{CF_1}{1+k} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{(1+k)^3} + \ldots + \frac{CF_n + VR_n}{(1+k)^n}$$

Damodaran, (2012) argues that DCF is the foundation on which other two methods of valuation; Relative and Contingent methods are based. He also states that DCF is suitable for valuing companies with positive cashflows. this means that there can be challenges in Valuing firms which has negative cashflows can result in negative equity valuation, but in long run it might survive. Valuing firms that are cyclical in nature and tends to follow economy, will highly depend on the analyst understanding of the economic outlook. Life cycle of a firm also influence DCF valuation as growth level are different in each life cycle. But these challenges do not make DCF invalid rather questions its flexibility and adaptation with new information and inputs in different models of DCF.

Fernandez (2013), discusses stages in performing valuation using cashflow discounting. A company is valued in different stages of its life cycle. Foe example a new company has high growth potential and ambitions, initial stage of growth will be marked by high growth and negative earning, second stage will have growth but in smoothed manner and in there is stability stage where the company growths are stable, i.e. long-run.

DCF have several models for valuation. Each model is separated depending on its estimation of cashflows and discount rates. Three models of DCF-model are discussed below.

3.1.1 Weighted Average Cost of Capital (WACC)

WACC is the most commonly used method to value a company. WACC is discount rate or value weighted average that discounts all the cashflows available to all investors in present value. WACC estimates firm's leveraged value by discounting operating free cashflow at weighted average cost of capital, (WACC), (Cooper & Nyborg, 2007).

$$\text{Enterprise Value} = \sum_{t=1}^{t=n} \frac{Free\ Cash\ Flow\ to\ Firm_t}{(1 + WACC)^t}$$

Enterprise value is underlying value of business /firm & Free cash flow is the cash generated before any payments, either to debt or equity holders.

Free Cash Flow to Firm =EBIT*(1 - t_c) + Depreciation – CAPEX – Increase in NWC

One challenge with this method is that it assumes that in long run, the firm will have certain target level of debt and its quite unreasonable to assume that the firm's capital structure will remain same over the years and this method can give some misleading result (Parrino, 2005). Damodaran (2012) also states that WACC model is best suited when firms have high or low level of debt.

3.1.2 Free Cash Flow to Equity - FCFE

FCFE model of valuation estimates firm's worth based on cashflows available to equity holder in form or dividend or repurchases after meeting all financial obligations to all the parties. FCFE is money that are available from firm's cashflow for shareholders after covering fixed assets investments and working capital requirements and after paying financial charges and repaying debts (Fernandez 2008). Then the investors required rate of return is used to discount the cashflows, i.e. required rate to equity (Ke). It can be formulated in following expressions:

$$\text{Value of Equity} = \sum_{t=1}^{t=n} \frac{Free\ Cash\ Flow\ to\ Equity_t}{(1+k_e)^t}$$

Value of equity in the above expression represents the value of company available to shareholders. Free Cash Flow to equity is what we stated above and Ke iS the required rate of investor. Investors prefer payments of dividends and share repurchases is fully financed through FCFE. This method is relevant and often found advantageous when the structure of company is complex, and no adjustments are required for other claims. It is viewed as more transparent estimate of shareholder's benefit (Berk & DeMarzo, 2014). Even though FCFE is good measure for shareholder's value, it has some complications. Future debt capacity should be estimated for future interest payments. This means it is highly sensitive to debt-to-

equity ratio (d/e). there are different models of FCFE estimation depending on the growth rate i.e. one stage, two stage and three stage models (Damodaran, 2007)

3.1.3 Adjusted Present Value

Adjusted Present Value (APV) represents net value of a firm/company/ project that is financed by equity and present value of any financing source. On one hand, firm without any debt is assumed and on other hand value tax shield is estimated assuming that that company is fully financed with debt (Fernandez, 2008). The calculation is done in several steps. It considers tax shields and bankruptcy cost to estimate the value of the firm. Damodaran (2012), states three steps in estimating value. Initially firm's value is obtained without any leverage, then calculation of present value of interest tax saving is done and finally effect of borrowing is evaluated with highest probability assuming that firm can go bankrupt.

$$\text{Value of Unlevered Firm} = \sum_{t=1}^{t=n} \frac{Free\ Cash\ Flow\ to\ Firm_t}{(1+r_u)^t}$$

Value of unlevered firm is estimated using equity rate of return to discount cashflows assuming there is no debt. Ku is unlevered rate of or required rate of return to asset (Fernandez, 2008).

In second step benefits of leverage is calculated. Benefit of Leverage is present value of all tax shields. Firm's tax shield influenced by firm's debt level, tax rate and cost of debt.

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

In third step cost of borrowing is calculated. It includes calculation of cost of bankruptcy in extreme situation. Present value of bankruptcy is calculated using probability of going bankrupt as well as its direct and indirect cost. Damodaran (2012) states that estimation of such probability has several errors and thus suggests approaches that are based on credit rating agencies on such debts and its estimation of probability of bankruptcy on such debts.

Finally using all three steps stated above is used to calculate levered value of company:

Value of Levered firm = Value of Unlevered Firm + PV*(Tax Shields) – PV*(Bankruptcy Cost)

In theoretical sense APV method provides greater flexibility in compared to other traditional method of classical cashflow valuation. But Damodaran (2012) argues that APV method may have positive aspects but it is not free from flaws. He argues that most economist ignore bankruptcy cost, which is very significant cost and could result upto 30% of firm's total value in terms of indirect costs.. He also says that at very high debt ratios, tax benefit could be overstated as in some cases cost of bankruptcy is higher that benefit obtained through tax shields.

3.2 Relative Valuation

Relative Valuation method estimates firm's value using value of its competitors. Comparable firms are selected, and its assets are compared to calculate the firm's worth. Comparable assets are identified, and their market value is calculated. The market value is converted into standardized values and these standardized values or multiples are compared to standardized value of comparable assets. Damodaran (2012) considers variables such as, earning multiples, book value multiples and Revenues. Earnings Multiples includes Price/earnings ratio, Value/EBIT, Value/EBITDA and Value/Cash Flows. Book Value Multiples are Price/Book Value, Value/Book Value of Assets and Value/Replacement Cost (Tobin's Q) and Revenues consists Price/Sales per Share and Value/Sales. The value obtained using relative valuation is more of market value rather than firm's intrinsic value.

This method has several benefits, such as it provides simplicity compared to other forms of valuation, hence requiring less information compared to DCF-method. Multiples are easy to obtain if large number of comparable firms are traded.

3.3 Contigent Claim Valuation

The last valuation approach, contingent claim valuation is application option pricing models to value assets that shares characteristics of options (Damodaran, 2012). To be valued as option the assets must share features of option. Such as the assets/firms/security has fixed life, the value derived is dependent on other value of other assets and payoff occurs as call or put if value of underlying assets is greater or less than exercise price at given point of time. Contingent claim valuation is used assuming the argument that DCF model may undervalue assets whose value may be contingent on future events.

Advantages of using option models is that it allows to value assets that otherwise would not be valued. For example, equity valuation of highly distressed firms or stock of small bio-tech firms without any cashflows but have high growth potential in future. In this scenario its impossible to use DCF models due to lack of cash flows. This method also provides fresh insights in drivers of value, for example risk or volatility may increase value of assets instead of decreasing it.

This method also comes with some disadvantages as it may require some inputs are not available. This method uses value of other underlying assets, so the other assets should also be valued to do valuation.

4. Choice of Model and Method

Chapter 3. briefly discussed various methods of valuations with its benefits and limitations in different scenarios and availability of information and inputs for application of valuation methods. This chapter will analyze NEL hydrogen's key features and assess which method of valuation could be best suited. All three methods are analyzed against information available.

Nel Hydrogen is traded on Oslo stock exchange. Annual & Quarterly reports are available in properly audited format which gives proper information of its accounts, finances, operation and thus fundamentals needed for DCF analysis are obtainable. The company floated on Oslo stock exchange in 2014, so obtaining historical data beyond 2014 is not possible. Hydrogen industry itself is a very old yet, very new industry in the market with very few companies producing hydrogen in form of fuel cell. However, information from other institutions, firms are obtained that provides base of information that are needed to analyze firm's performance. Below discussed are valuation methods and its suitability for valuing Nel Hydrogen.

DCF model assesses cashflows of company's lifecycle in present value. Nel hydrogen is a young firm with high growth potential. The company's revenue increased by 160% in 2017(Nel annual report, 2017). US department of energy in 2011 estimated that hydrogen industry will mature between 2021 to 2031 (US department of Energy, 2011). Due to new company with unlimited possibility and its aggressive forward thinking, it is assumed that the revenue will grow with same pace until next three years, until the company reaches a steady growth level. But, again this high growth will be powered by large investment expenditure resulting in negative free cash flows.

WACC-model would be more suitable method for the valuation of the firm as the capital structure consists of both equity and debt. Equity ratio is around 82%. However, FCFE method could also be an option but due to its capital structure and acquisition of other firms recently could complicate equity valuation method in this case. So DCF using WACC could be best option.

Relative valuation method could also be a method of valuation in this case, but it would be too simplistic approach. And lack of comparable firms in Norwegian market, on other hand could not give proper valuation. However, this paper will use relative approach to test the findings using DCF method, which in return will provide robustness. Due to limitations and complications, contingent claim valuation will not be used in Nel hydrogen valuation.

To sum up, Nel hydrogen will be valued based on fundamental analysis of whole enterprise. Three stage of growth model will be used to forecast the free cash flow. Then the free cash flow will be discounted using weighted average cost of all types of capital, the WACC. At the end, the results will be then compared to other similar firms using relative valuation.

5. Hydrogen Industy Outlook

The hydrogen energy, in form of fuel cell technology is more than 200 years old. The concept was first coined by Humphry Davy in 1801 A.D. But it was in 1960, when NASA used hydrogen fuel cell as source of energy for its space shuttles, (Fuelcell, 2018). Hydrogen are used for various purposes, like making fertilizers, fats, cooking or heating (Valladares, 2017). But this paper is examining Nel Hydrogen, which manufactures technology, plants and solutions helps other companies produces fuel cells to be used as fuel for vehicles and hydrogen for industrial purposes. This paper will examine hydrogen industry but with more focus on Fuel Cells. Fuel cell as source of energy is inexhaustible and environmentally safe. Despite this, one could argue why is it not used in daily life? Hydrogen being lightest element, is hard to store and ship but more than any other elements. Development of technologies to produce liquified hydrogen is very old but not totally developed. Hydrogen as source of power has great potential, but it will require large infrastructural attention from both governments and companies. This paper will further elaborate about this in later chapters.

The hydrogen cell until recent was very expensive to produce, but now due to development in technology fuel cell is becoming cheaper. this chapter will discuss about recent developments about hydrogen as source of energy. This chapter will also look at policies and support mechanism by USA, EU and Norway towards development in fuel cell-based economy.

5.1 Recent Development

5.1.1 Cost & Technology

Although the concept of fuel cell has been so old, but due to cost, and lack of technology its potential has not been realized as discussed above. Hydrogen is quite costly to produce as it needs electricity for production, storage and transfer and then in form of fuel cell it produces electricity. So, if hydrogen is produced using conventional source of energy, like oil or coal, then it is not efficient. But if renewables like solar, hydro-electricity or geo-thermal are used to produce, then only hydrogen can be source of clean and green energy. There is continuous

development in technology that is bringing down the cost of fuel cell manufacturing. In the figure below, it can be clearly seen reduction of cost of fuel cell system have more than halved just in eight yeas and projected to go down by more in coming years.

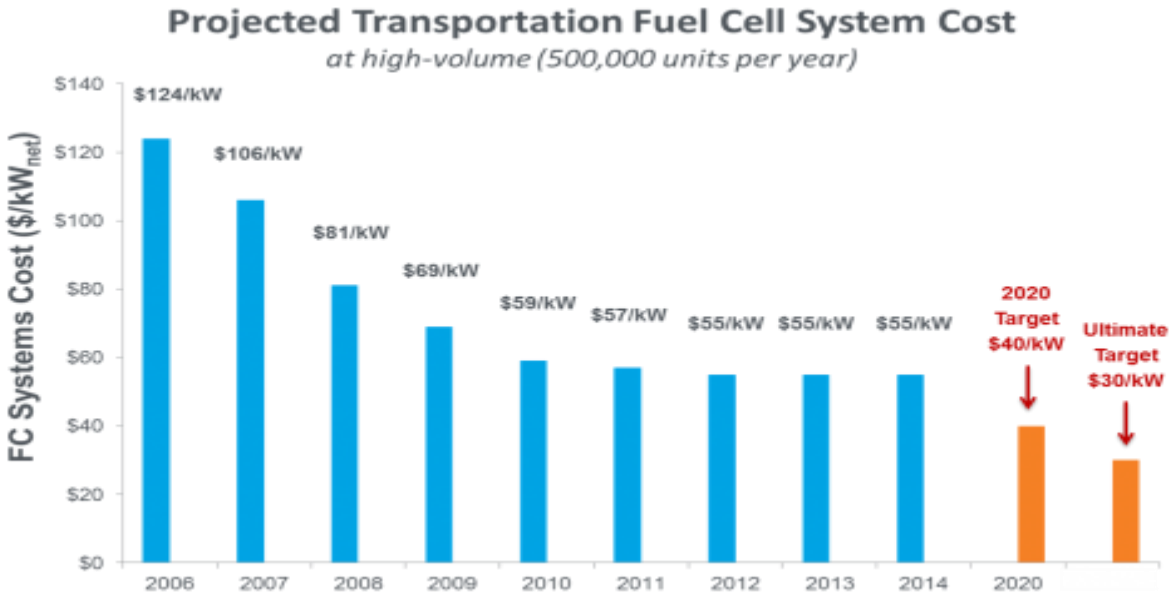

Figure 2: Projected Transportation Fuel Cell System Cost, Source: Clean Technica (2014)

Nel Hydrogen states that due to use of renewables for production of fuel cell has enabled operating expenditure of hydrogen on par with fossil fuel and capital expenditure is to reduce by more than 60% by year 2025 (Nel, 1st quarterly report, 2018)

5.1.2 Geographical Expansion and cumulative growth

North America and Europe has always been pioneering development and innovation, and fuel cell cannot be an exception. But Asia has always been major player when it comes to bringing down the cost and boosting the consumption. In geographical expansion, this paper will examine three markets, North America, Europe and Asia.

Global shipment of fuel cell exceeded 500 megawatts whereas the number was less than 200 megawatts in 2014. Transportation industry was the largest sector seeing the use of hydrogen, from less than 25 megawatts in 2014 to about 300 megawatts in 2016. This can be seen in the graph below.

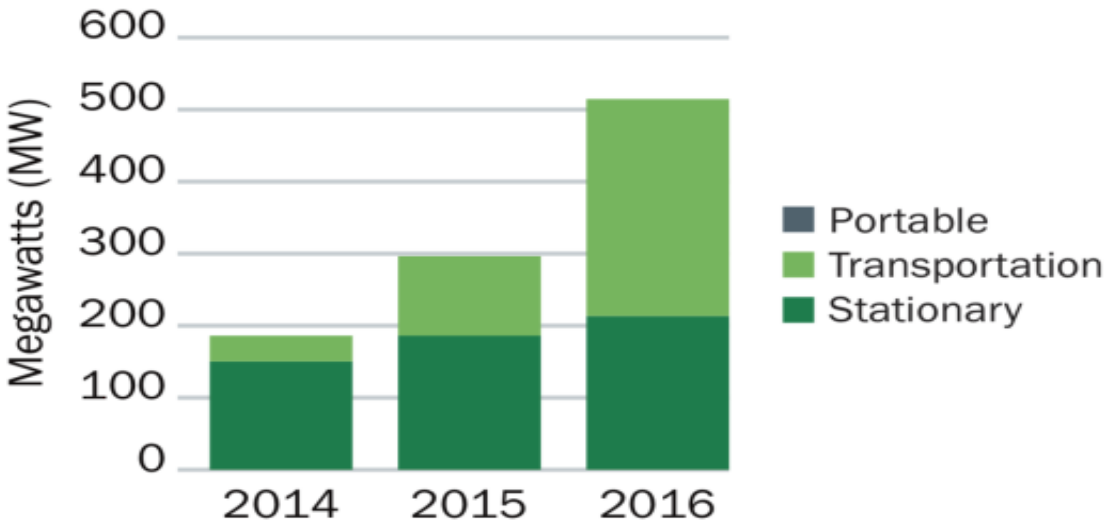

Figure 3: fuel cells shipped worldwide by application. Source: US DOE, 2016

5.1.3 Government policies and support mechanism

Recent development in fuel cell technology and increase in global demand have lowered the cost while increasing efficiency. This phenomenon has increased interest in investment from private sector. However, it is always financial return that private sector is interested while investing. So, policies and government support are motivating factors for investment in fuel cell.

The United States and Europe

In the US, the government cut its research funding from $101 million in 2017 to $45 million for 2018. But, states like California, New Jersey, Washington, New York and few others have their own support programs for fossil fuel. In Europe, the European commission has fuel cell and hydrogen undertaking, The FCH JU: a public and private partnership between Europe's fuel cell industry and research communities on one hand European commission in the other. FCH JU has played vital role in developing and commercializing fuel cell technology through strategic agreements and long-term funding commitment. The funding from 2007 to 2020 is 1.2 billion euros for research and development and deployment of projects (E4tech, 2017)

Asia

Asia has always been main driver of most of the renewable energy source, from solar to fuel cells and hydrogen. In Japan, fuel cells and hydrogen remain focus of the government. In 2017, Japanese government had budget of US$335 million and consistent in 2018. These funding are directed towards 2020 Tokyo Olympics, where Japan plans to show its fuel cell and hydrogen capability. But, it is China which has largest ambition in fuel cells. It aims to use fuel cell to drive its transportation sector. China has provided deep federal and local subsidies for fuel cell development. China's desire to cleans its urban smog and reduce its reliance on fossil fuel have played role in its attention towards fuel cell. China has set 5-yr plan to renovate its transportation system in form of New Energy Vehicle (NEV). This initiative combines regulatory pressure, development financing, manufacturing incentives and purchase subsidies. China in investing huge money in development of infrastructure that will support fuel cell transportation (E4tech, 2017).

Above mentioned are actual government initiative in fuel cell development. There are also other instruments that government can use for further encourage fuel cell development. They are:

Feed in Tariffs (FiTs): Long term contractual agreement to purchase power with adjusted inflation (IFC, 2015). Fuel cells, as energy carrier, can be used to produce electricity and the government can use this mechanism to support the power producers. This is common tool used for solar power producer.

Reverse auction and tenders: In contrast to FiTs, where the price is initially agreed, in reverse auction and tenders, the developers go through bidding contest and best price bidder gets the contract (IFC, 2015). Reverse auctions and tenders has been successful in developing countries while allocating development of solar or hydroelectricity. This could also be used to develop fuel cell production.

Tax Incentive: R&D tax credit, tax credit for capital expenditure, rebate in corporate income tax, accelerated depreciation, reduced Value added Tax (VAT) can be motivating factors to fuel cells producers that governments can provide.

5.2 Fuel Cell/Hydrogen Market Outlook

The industry outlook clearly shows huge growth in fuel cells industry in recent years. And as we discussed increase in demand has been fuelled by several sectors that plans to shift to green power. This chapter will analyse sectors that will continue to drive growth of fuel cell. This section will explicitly use materials from reports of hydrogen council to analyse different sectors that will serve as future market for fuel cells. Hydrogen council is group of world's leading energy, transportation and industries company with common vision and ambition for hydrogen to foster energy transmission (The Hydrogen Council, 2018). Current global market consumption of hydrogen in different forms equals to 22 Mt. hydrogen council estimates that demand of hydrogen could increase by 10-fold by 2050. And the highest increase would be in transportation sector as shown in figure below.

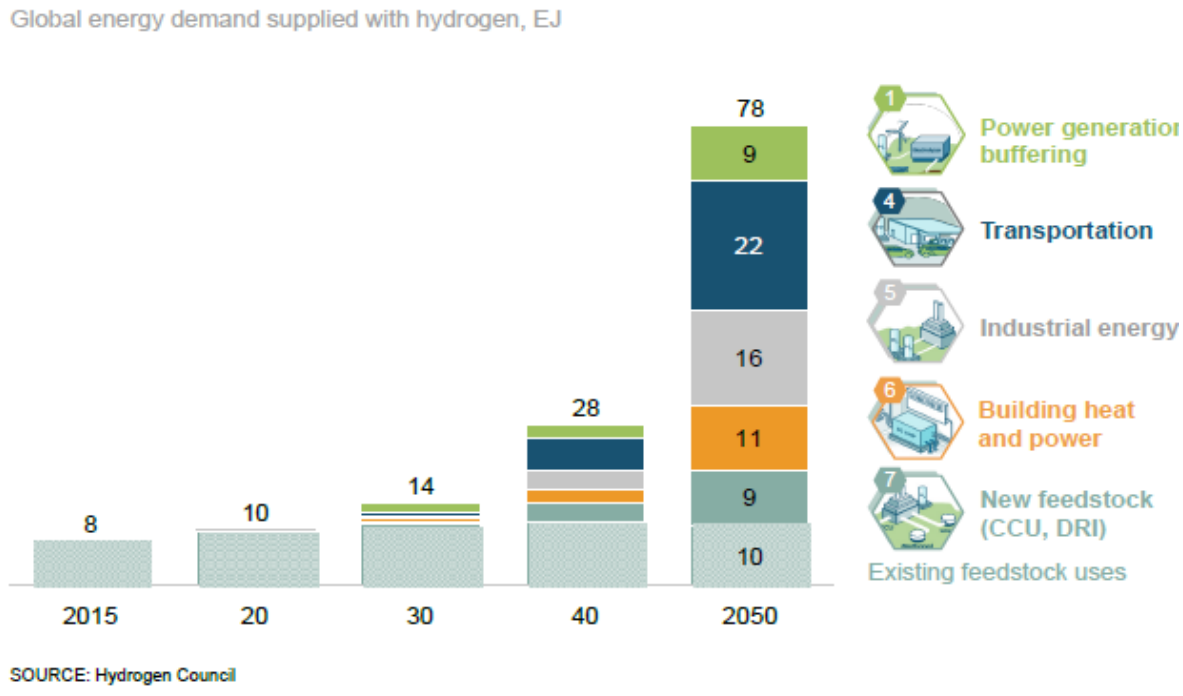

Fig:4 Global energy demand supplied with hydrogen, (Hydrogen Council, 2018)

5.2.1 Transportation

Transportation is one of the most carbon emitting sector. Decarbonization of this sector very crucial for meeting global climate goals. FCEVs can be a major element to meet these goals. FCEVs in form of cars are commercially available now and soon vans, buses, trams and light

rail will be in the market. In 30 years, Hydrogen council expects, 1 in 12 cars in Germany, Japan, South Korea and California will be powered by hydrogen. Hydrogen powered Trains and passenger ships will be in service. By 2050 up to 400 million passenger vehicles will run on hydrogen. This will replace 20 million barrels of oil per day and 3.2 Gt Co2 will be abated each year. This will be fuelled by lowered cost of fuel cell. Fuel cell cost is estimated to fall by 20% to 35% by 2030. More than 5000 hydrogen refuelling stations has been already announced and hydrogen council road map expects the numbers to be more than 15,000 in Scandinavia, Japan, Korea, China, Germany and other European countries. This would allow sales of 12,000 tons of hydrogen each day.

5.2.2 Energy System

As discussed in previous chapter, hydrogen is versatile energy carrier. It can act as storage for energy obtained through renewables. Hydrogen council expects 250 to 300 TWh of excess solar and wind energy to be converted in hydrogen and this number is expected to be 500 TWh by 2050. More than 20 hydrogen-based power plants are expected to be in operation by 2030.

5.2.3 Industry Feedstock

55 million tons of hydrogen are used as industrial feed stock to manufacture fertilizers, refining and chemical production. Most of these hydrogens are fossil fuel-based feed stock and can be replaced clean production pathways.

5.2.4 Building and Heat

Hydrogen can be option for decarbonization of building heat and power. By 2030, 6.5 million house holds are expected to use blended or pure hydrogen for heating. By 2050 8% of worlds building may use hydrogen for heat and gas.

5.2.5 Industry Energy

Hydrogen can be used as source of decarbonized high heat for industrial processes. Hydrogen council expects one in 10 steel factory and chemical plant in the US, Europe and japan will use hydrogen for low carbon production.

5.3 Summary of Investment in Hydrogen – Sector Wise

Today, the world already invests US$1.7+ trillion each year in energy each year. Annual Investment of US$20 to 25 billion will be required as investment for transition into hydrogen economy by 2030 as shown in the figure 5 below. Apart from investment, there is strong requirement of cooperation between governments and private sectors. Government policies and support mechanism in form of subsidies in tax can be one and other could be building infrastructures that can support hydrogen-based economy. Countries like china and japan, as stated above are already making considerable investment and support system to transit from fossil fuel to fuel cell. As the industry matures, dependency on these support systems automatically reduces.

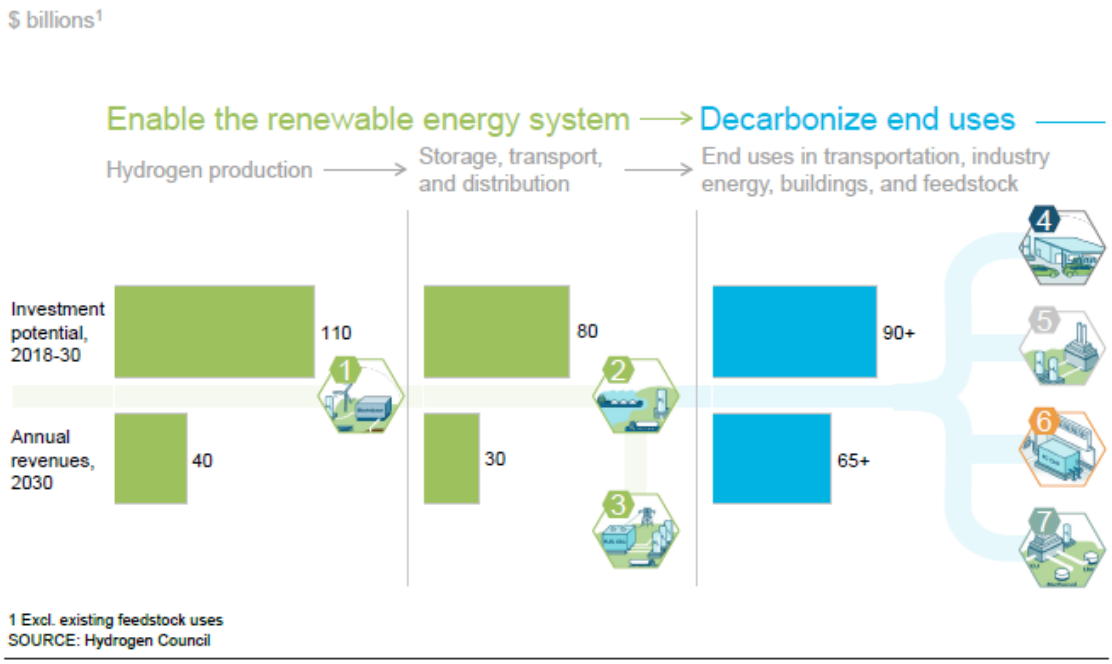

Figure 5: Required Investment in Hydrogen in each Sector (Hydrogen Council)

5.4 Fossil fuel VS Fuel cell (using renewables)

Last section of the Industry Outlook looks fossil fuel vs fuel cells from renewables. Exploitation of fossil fuels is moving to its limit as several oil rigs/wells are going dry and companies are exploring in deep sea and ocean including artic. And the demand for energy is increasing every day. To meet growing demand and save the environment, future

environmental-friendly energy alternatives must be developed (Boudghene & Traversa, 2002). Fossil fuels and fuel cells differs greatly in terms of production, cost, efficiency, emissions and their future (Sen, 2018)

5.4.1 Production

Fossil fuels are non-renewable sources of energy that comes in form of crude and gas. They refined to produce diesel, petrol and other different types of fuel. Whereas Fuel cells are produced by splitting hydrogen atoms from other compounds like water using electricity. So, fuels to be green source of energy, it must be produced using power from renewables, like solar, wind etc.

5.4.2 Emissions

It is discussed many times in the previous chapters that fossil fuel is the main source of pollution. They produce greenhouse gas while used in transportation, power or any other sectors. Whereas fuel cells produced from renewables emit no greenhouse gas or other pollutants. It only emits water vapor.

5.4.3 Efficiency and Cost

Fuel cell is highly efficient compared to fossil fuels. More energy can be generated using fuel cells than using same amount of fossil fuels.

Cost of producing, storing and transporting fossil fuel have advantage over fuel cells. However, due to technological development the total cost of fuel cells is expected to out compete fossil fuels in near future as discussed in industry outlook.

5.4.4 Future

Fossil fuel still serves as a primary source of global energy needs. As mentioned above, the reserves of fossil fuels are depleting. On the other hand, fuel cell is in it’s primary life cycle with great potential ahead.

6. Strategic Analysis

After looking at Fuel Cell industry and its market in the previous chapter, this chapter will shed light on strategic elements that are critical for a survival of a company. The strategic analysis is split in two parts. First part will analyze market, its structure and level of competition at the industry level. The second part will more focus on firm-specific analysis which will show Nel hydrogen's position in future. These analyses are important as it will help to make assumptions while estimating Nel Hydrogen's prospects.

6.1 Porter's five forces

The structure-conduct-performance (SCP) framework states that the structure of an industry influences the conduct of the competitors, which in turn drives performance of the companies in the industry (Koller, Goedhart & Wessels 2015). The most influential work on SCP is Michael Porter's Competitive Strategy from 1980 and will be the basis for this analysis of the intensity of competition in the hydrogen / fuel cells industry. To be able to understand the industry competition and profitability, one must analyze the industry's underlying structure in terms of five forces (Porter, 2008). Competition for profits exceeds the existing industry rivals to include customers, suppliers, potential entrants and substitute products as illustrated in Figure 6. Together these five forces set the industry structure which drives competition and profitability.

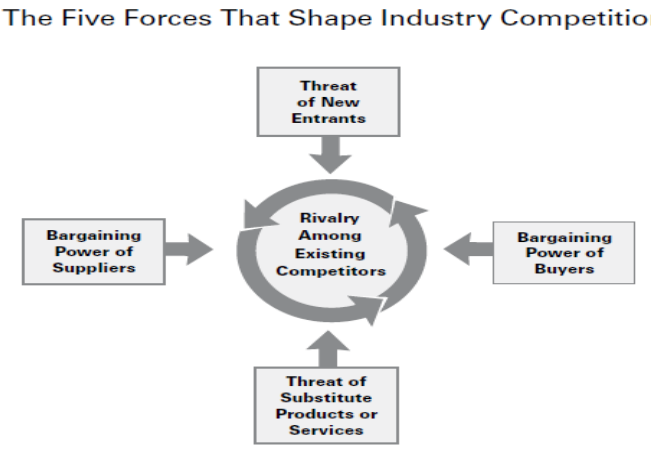

Figure 6: Porter's Five Forces (Porter, 2008)

6.1.1 The threat of new entrants

Through additional capacity and increased fight for market share, new entrants affect prices, costs and the need for capital expenditures. Entrants from other markets might also leverage its other business areas to shock the competition. In this way, the threat of new entry sets a roof on potential profits of an industry. Porter (2008) emphasize that it is not whether the entry occurs, but the threat of it that holds down profitability.

Investment has been the major entry barrier in the fuel cell market. Until recently as a rule of thumb, a fuel cell system required investment of at least US$1 billion for research and development and commercialization. Further barriers to entry are incumbency advantages like the cumulative experience in developing hydrogen electrolyser, fueling stations, storage and transportation. Large-scale manufacturers usually have extensive permits and licensing requirements, determined at a regional or national level.

Despite of these barriers to entry, fuel cell industry is gaining support of several governments around the world in form of tax credit and R&D grants. But as the industry matures these lucrative support mechanisms are phased out.

6.1.2 The power of suppliers

Powerful suppliers can make an impact on the competitiveness of industry participants by increasing prices, limit quality or shift costs to their customers. All actions are methods in which suppliers can pressure the profits out of an industry if the participants are unable to pass on the costs to their customers. Almost all the companies in any industry has numerous suppliers supplying raw materials to industries. If suppliers are in dominant position, then margin from the market for industry is reduced. Fuel cells industry is a new sector in energy and there are few suppliers that yet make near to perfect components required for fuel cell technology (E4Tech, 2016). Few suppliers mean that they have capacity to squeeze profit from manufacturer by raising prices of raw materials needed to facilitate fuel cell technology. Main raw material for fuel cell is water, electricity and high-tech components needed for manufacturing electrolysers and solutions. Water is nearly abundant, and electricity is driven by market prices. So, in case of fuel cell industry suppliers have capacity

to hinder technological advancement, which is offset by government driven fuel cell technology development initiatives.

6.1.3 The power of buyers

Along with the suppliers, customers of the industry are also able to capture value from participants. The power is often represented through negotiating leverage on participants, setting them up against each other to push down prices, requesting better quality or more service. Just like supplier power this squeezes the profitability out of the industry. The buyers of fuel cells/hydrogen can different sectors such as transportation, other industries (like fertilizer, iron, chemical) as mentioned in previous chapter. Buyers of fuel cells are very small in numbers and hence they can easily intimidate fuel cell companies for lower price.

6.1.4 Threats of Subsitutes

A substitute performs the same or similar function as an industry's product by a different means (HBR, 2008). As the number of substitutes for a product grows, the elasticity of demand increases. With elastic demand comes price sensitivity which in turn press down prices. Thus, an industry who is not able to differentiate their products from its substitutes will experience both a fall in profitability and often reduced growth potential. The substitutes of fuel cells for usage as energy and transportation fuel, are numerous. Both in terms of other renewable sources like wind power, hydro power and bio energy and the conventional sources of energy; coal, natural gas and nuclear power. This could be one of the reason for fuel cell sector lagging. Due to its high costs in the past, other conventional sources of energy were chosen. However, recent years' steep decline in prices of fuel cells and environmental concern has pushed its demand and is expected to outperform other alternatives in future. The pressure from both renewable and conventional power will affect the profits of the fuel cell industry in years to come.

6.1.5 The rivalry among existing competitors

Rivalry among existing competitors takes place in the most common ways. It pressures prices, drives innovation, advertising and service/product improvements. A high degree of

rivalry pushes the industry towards “perfect” competition where prices equal marginal costs and profits vanish. Thus, the rivalry among developers in the industry is mainly concentrated around price competition. A significant factor affecting the intensity of the competition is the cost.

6.1.6 Conclusion

Having gone through the five competitive forces of Porter, defining the industry structure, it is time to determine the long-run profit potential of the fuel cell industry. The strength of the forces reveals how the economic value created by the industry is divided. Strongest of the five is the threat of substitutes. Competing both against other renewables and conventional. The third and last strong competitive force in the industry is the power of buyers. Concluding, the economic value generated in the utility-scale fuel cell industry looks to be limited by its competing substitutes and bargained away by buyers. Intense rivalry prevents existing companies to retain too much value, while the threat of new entrants does not represent any constraint on profits. Neither does the fragmented power of suppliers. With the development of the industry moving towards less support mechanisms and more marked-based frameworks, prospects for profitability does not seem to be improving any time soon.

6.2 SWOT – Analysis

SWOT stands for Strength, Weaknesses, Opportunities and Threats. SWOT analysis was first coined by Albert Humphery during 60s. SWOT analysis is a tool to analyse the environment. It allows segregation of environment in to internal strength and weaknesses and external opportunities and threats (Duarte et al, 2006). This analysis aims to examine potential drivers for growth and sources of risk that could foster or hinder its growth.

6.2.1 Strength.

Strength of Nel Hydrogen are factors that gives it competitive advantage over its competitors. Fuel cell industry is in its initial phase and there are not so many competitors but again, the market is not so big either. Strength of Nel Hydrogen are pointed out below.

- Extensive experience in Hydrogen Industry and extensive offering of product and services to industrial and general consumers
- Better financial and investment position crucial for rapid growth and development.
- Partnerships with several industries and governments for development for development of hydrogen-based infrastructure and several high value business contracts.
- Perceived as driver for clean energy.

6.2.2 Weaknesses

Opposites of strengths, weaknesses of a company result in losing its competitive positions. Nel do seem to have so many weaknesses except that it has initiated operation in several emerging economies with high volatility. Like India, China and Middle East.

6.2.3 Opportinities

Opportunities are external environment offering that a firm can exploit it to its advantage. Opportunities for Nel are tremendous.

- Large unexploited markets that gives big growth opportunities.
- Government and industrial support in form of cash benefits and flexible policies.
- Decreasing capital and operational expenditures due to development in technology.
- Cheap energy price due to high growth in renewables-based energy production like solar, hydro and wind.

6.2.4 Threats

Threats are externalities that challenge the growth and development of a company. Like opportunities, Nel Hydrogen is exposed to several threats as mentioned below.

- Low acceptance of hydrogen as source of energy due to lack of awareness and security concerns in public.
- Undeveloped Fuel Cell infrastructure.
- New competitors from China, Japan, India and South Korea.

7. Financial Statement Analysis

Last chapters looked in to fuel cell industry outlook and strategic analysis at industry and company level. These are crucial factors that affects any company's future forecast, thus must be taken into consideration. This chapter will deeply investigate NEL hydro's historical financial statements to forecast future performance of the company.

Nel hydro is newly listed company, dating back to 2014. So, there is limited historic data, which is one weakness in applying DCF method. As stated in first chapter, Nel hydro has history of more than ninety years, but it was part of another company and later it became integrated and independent company (Nel Hydrogen, 2018). So, this chapter will look at statements after it was listed on the Oslo Stock Exchange.

7.1 Historical Performance

Nel hydrogen, from 2014 to 2016 maintained its accounts in two separate division, Nel AS and Nel Hydrogen Group ASA. Nel group financial statements constitute accounting/ financing statements of all the business operations as single entity. For the sake of simplicity, this report looks at Nel Hydrogen as a single entity and consider annual report of Nel Hydrogen Group

Income statements from 2014 to 2017 of Nel Hydrogen is presented in Table 1. From the very beginning of its establishment, Nel Hydrogen has going through very high growth, yet volatile. The growth of revenue does not follow uniformity. From 2014 to 2015, growth in total revenue was very high but again in 2016 high volatility was seen. And again in 2017, total revenue growth saw more than 100%. This shows that, in growth stage of business life cycle sales increases rapidly. In 2015, Nel Hydrogen acquired H2 logic, a leading refuelling station company, which resulted in high revenue growth for the company. In 2017, Nel acquires Proton OnSite to become world's largest electrolyser company. Effects of this acquisition can be seen on the revenue growth in 2017.

Consolidated Income Statement	2014	2015	2016	2017
Sales revenue	kr 12 066 638,00	kr 88 539 241,00	kr 98 446 407,00	kr 286 365 000,00
Growth		*634 %*	*11 %*	*191 %*
Other operating income	kr -	kr 11 385 889,00	kr 16 032 287,00	kr 12 061 000,00
Total revenues	**kr 12 066 638,00**	**kr 99 925 130,00**	**kr 114 478 694,00**	**kr 298 426 000,00**
Growth		*728 %*	*15 %*	*161 %*
Cost of Goods sold	kr 3 360 943,00	kr 42 116 302,00	kr 60 840 526,00	kr 163 638 000,00
Salaries/Personnel Expences	kr 7 342 310,00	kr 29 890 749,00	kr 60 265 624,00	kr 130 021 000,00
Depriciation, amortisation and impairment	kr 3 651 095,00	kr 15 563 960,00	kr 10 430 799,00	kr 35 968 000,00
Other operating expences	kr 10 884 828,00	kr 30 612 933,00	kr 38 253 486,00	kr 85 961 000,00
Total operating expences	**kr 25 239 176,00**	**kr 118 183 944,00**	**kr 169 790 435,00**	**kr 415 588 000,00**
EBIT	**kr -13 172 538,00**	**kr -18 258 814,00**	**kr -55 311 741,00**	**kr -117 162 000,00**
Margin	*-109 %*	*-18 %*	*-48 %*	*-39 %*

Table 1: Historical Operational Income Statement, (Source: Annual Reports)

Although the revenue has been increasing rapidly, margin have been more stable after 2016.

Table 2 shows assets of Nel Hydrogen with % columns. % columns show percentage of each assets to total assets. Non-current assets proportion in increasing each year, which shows that Nel is making significant investments in its business. In 2015 Nel made several successful equity offerings and generated more than Kr 300 million in cash. And it repeated in 2016 to raise Kr 127 million in cash. All other line items have little fluctuations as percentage of total assets. Nel held financial assets only in 2015.

ASSETS	2 014	%	2 015	%	2 016	%	2 017	%
Non Current assets								
Intangible assets	108 948 914	46 %	411 171 995	50 %	403 343 588	53 %	1 018 150 000	59 %
Tangible fixed assets	5 066 736	2 %	16 529 478	2 %	45 803 552	6 %	96 198 000	6 %
Financial assets	262 750	0 %	7 296 958	1 %	13 708 242	2 %	27 026 000	2 %
Total Non Current asstes	**114 278 400**	48 %	**434 998 431**	53 %	**462 855 382**	61 %	**1 141 374 000**	66 %
Current Assets								
Inventory	6 071 115	3 %	15 022 578	2 %	36 265 934	5 %	138 723 000	8 %
Total receivable	20 332 341	9 %	51 078 593	6 %	38 286 518	5 %	150 560 000	9 %
Financial Current assets	0	0 %	1 506 715	0 %	0	0 %	0	0 %

Cash and cash equivalent	98 497 355	41 %	313 042 472	38 %	225 466 740	30 %	295 000 000	17 %
Total Current asset	**124 900 811**	52 %	**380 650 358**	47 %	**300 019 192**	39 %	**584 283 000**	**34 %**
Total Assets	**239 179 211**	**100 %**	**815 648 789**	**100 %**	**762 874 574**	**100 %**	**1 725 657 000**	**100 %**

Table 2: Historical Assets (Source: Annual Reports)

Intangible assets dominate the company's assets. Good will and technology makes the highest proportion of it. Where as in Table 3, other current liabilities, deferred tax and account payables dominates the total liabilities. Current liabilities hold the largest proportion meaning that the company has less debt in its capital structure as long-term debt constitutes only 22%. Percentage growth line shows that there is controlled growth in line with Nel's financing principle. Accounts payable have been increasing, which states that Nel's purchasing from its supplier is increasing, meaning growth in operations.

LIABILITIES	**2 014**		**2 015**		**2 016**		**2 017**	
Non Current Liabilities								
Deferred Tax	15 983 733	37 %	21 027 472	25 %	13 551 937	15 %	68 273 000	22 %
Total Provision	**15 983 733**	**37 %**	**21 027 472**	**25 %**	**13 551 937**	**15 %**	**68 273 000**	**22 %**
Long term debt								
Other long term debt	7 577 784	18 %	14 640 642		12 550 252	14 %	34 123 000	11 %
Total Non current liabilities	**7 577 784**	18 %	**14 640 642**	**0 %**	**12 550 252**	**14 %**	**34 123 000**	**11 %**
Current Liabilities								
Accounts payable	3 099 501	7 %	16 759 614	20 %	16 789 938	18 %	64 857 000	21 %
Taxes payable	0	0 %	374 980	0 %	370 195	0 %	0	0 %
Public duties payable	1 734 666	4 %	3 185 473	4 %	1 346 945	1 %	3 060 000	1 %
Other current liabilities	14 846 534	34 %	28 652 180	34 %	47 046 020	51 %	145 957 000	46 %
Total Current libilities	**19 680 701**	**46 %**	**48 972 247**	**58 %**	**65 553 098**	**72 %**	**213 874 000**	**68 %**
Total Liabilities	**43 242 218**	**100 %**	**84 640 361**	**83 %**	**91 655 287**	**100 %**	**316 270 000**	**100 %**

Table 3: Historical Liabilities (Source: Annual Reports)

Table 4 shows historical equity level of Nel hydrogen. In 2015 total paid up capital has increased by more than three folds. That is due to the IPO in 2015 to raise more than Kr 300 million. Again in 2017, paid up capital doubles up because of acquisition of Proton Onsite as mentioned previously. Retained earnings is negative due to high growth in early phase of the company. Construction and high activity level compared to production and sales of fuel cell

and production of electrolysers, is much higher at this stage. But eventually in later growth stage when capital expenditure stabilises, retained earnings should not be negative.

EQUITY	2 014		2 015		2 016		2 017	
Paid in Capital								
Share capital	67 785 821	35 %	136 120 265	19 %	136 735 650	20 %	199 743 000	14 %
Treasuary Shares	0	0 %	0	0 %	-1 376 715	-0,2051 %	-4 405 000	-0,3125 %
share premium	133 462 534	68 %	601 710 080	82 %	608 213 164	91 %	1 289 233 000	91 %
Other capital reserves	1 200 000	1 %	1 200 000	0 %	11 115 587	2 %	19 188 000	1 %
Total paid in Capital	**202 448 355**	103 %	**739 030 345**	**101 %**	**754 687 686**	**112 %**	**1 503 759 000**	**107 %**
Other Equity								
Retained Earnings	-6 511 362	-3 %	-8 021 917	-1 %	-83 468 401	-12 %	-94 373 000	-7 %
Total Other Equity	**-6 511 362**	-3 %	**-8 021 917**	**-1 %**	**-83 468 401**	**-12 %**	**-94 373 000**	**-7 %**
Total Equity	**195 936 993**	**100 %**	**731 008 428**	**100 %**	**671 219 285**	**100 %**	**1 409 386 000**	**100 %**

Table 4: Historical Equity Levels (Source: Annual Reports)

This section of chapter highlighted important factors of company's historical financial statements. Next section will normalize and reorganise the financial statements to represent the core operations of Nel Hydrogen.

7.2 Normalizing Financial Statements

Normalizing financial statements means making adjustments that eliminate one-time gains or losses, other unusual items such as non-reoccurring items to derive core operational income, cost and balance sheet. This section will look at non-reoccurring items in Income Statement, Capital Expenditures, and Working Capital. And finally, reformulation of balance sheet will be done.

7.2.1 Operating Expenses

In its growth phase, Nel hydrogen's operating expenses is highly unstable because it includes several one-time costs related to acquisition, patents, PPE, technology etc. In first quarterly report, 2018, non-recurring item cost, ramp up and option cost more than Kr 17 million and total figures for 2017 have been close to Kr 50 million (Nel Hydrogen 1st Quarterly Reports, 2018). By 2019 total production capacity is projected to be 250 MW with production cost reduction by 30%. Normalizing operating expenses seems quite tricky in the sense that at

least until 2019, expects to reduce total operating expenses by 30%. However, OPEX can be predicted in the sense that after Nel Hydrogen runs in full capacity, it will mostly incur cost related personnel, COGS and maintenance. 70% of revenue will be other operating expenses excluding depreciation and personnel until 2020. This includes COGS and other expenses from income statement. Gradually it will be decreased to 60% by end of second phase. And as company plans to use autamation to reduce the cost of personnel. Personnel expenses at the end of 2017 is 45% of total sales and will be reduced by at least 30% and gradually it will be constant at 15% at the end of phase two. Depreciation, and amortisation will be covered in section discussing capital expenditure.

Other incomes are part of government and private grants, so it will not be considered while valuation. Further forecast of revenue will be only based on company's production capacity.

7.2.2 Capital Expenditure – CAPEX

Nel hydrogen has made significant capital expenditure to facilitate its growth phase. Capital expenditure consists of all the investment activities in developing and maintaining tangible non-current assets. In 2017 acquired Proton OnSite and this led to high capital expenditure. Growth in fixed tangible assets of the company has increased by seventeen times from 2014 to 2017. With volatile CAPEX in the past, it is necessary to smooth CAPEX for future investment forecast. Damodaran (2012), suggests considering average of historical CAPEX or industry average as percentage of a base input. Due high growth ambition, smoothing CAPEX does not seem suitable before the company reaches steady state. So, CAPEX until 2020 will be increased with proportion to average yearly growth and after 2020, the CAPEX forecast will be smoothed towards two last stages of the model, where existing facilities will support the growth.

Depreciation amortisation and impairment will follow CAPEX. Due to acquisition, the company has added substantial amount of assets, complicating calculation of depreciation. 3% of Net PPE will be depreciation amount each year following its historical pattern. Plant property and equipment's have useful life from 3 to 40 years. Intangible assets are major chunk of total assets in form of goodwill, R&D, Patents, customer relationships and customers contracts. So, impairment of these assets must be considered.

7.2.3 Working Capital

Working Capital is difference between current assets and current liabilities (Damodaran, 2012) Working capital measures company's operational efficiency and its short-term financial health. Current assets are cash, accounts receivables, inventories and finished goods whereas current liabilities are account payables, outstanding taxes and other current payables (Investopedia, 2018). Thus, Net Working Capital (NWC) is

NWC = Accounts Receivables + Operating Cash – Accounts Payables

Changes in Net Working Capital has effects on free cash flows to the firm as increasing NWC holds more cash leading to re investment needs (Damodaran, 2012). Damodaran also states that estimating future NWC is quite difficult because they are unstable and hard to normalize. To normalize it should either be tied up to expected revenue or each item should be analysed in detail.

Since Nel hydrogen's working capital are tied into several activities and accounts, it makes sense to detail each item for better forecast. Table 5 shows each item's ratio.

NOK	2 014	2 015	2 016	2 017	Norm. Ratio
Operating Cash	98 497 355	313 042 472	225 466 740	295 000 000	
% of Net PPE	1944 %	1894 %	492 %	307 %	**100 %**
Recivables and Inventory	26 403 456	66 101 171	74 552 452	289 283 000	
% of revenues	219 %	75 %	76 %	101 %	**35 %**
Operating Current Assets	**124 900 811**	**379 143 643**	**300 019 192**	**584 283 000**	
Payables	3 099 501	16 759 614	16 789 938	64 857 000	
% of revenues	26 %	19 %	17 %	23 %	22 %
Tax Payable& public duties payable	1 734 666	3 560 453	1 717 140	3 060 000	
% of revenues	**14 %**	**4 %**	**2 %**	**1 %**	**1 %**
Other current liabilities	14 846 534	28 652 180	47 046 020	145 957 000	
% of revenues	123 %	32 %	48 %	51 %	**43 %**
Operating Current Liabilities	**19 680 701**	**48 972 247**	**65 553 098**	**213 874 000**	
Net Operating WC	**105 220 110**	**330 171 396**	**234 466 094**	**370 409 000**	

Table 5: Historical Net Operating Working Capital

The operating cash is tied to net PPE, rather than revenues. It shows that in growth stage cash are tied up in different projects and developments, therefore it is more affected by

assets, than by the revenues. When the company matures ratio of operating cash will move towards revenue. NWC in table 5 shows that the company is in much better liquidity position and can smoothly supports its growth phase. Table 7 also presents normalised ratio based on last 3 years with some adjustments which will be used to calculate working capital for the firm.

7.3 Reformulated Balance Sheet

Reformulation of balance sheet is the last element in financial assets analysis. It is allocated into operating current assets, operating current liabilities, invested capital equity & equivalents and debt and equivalents for last 4 years as shown in the table below. Reformulated balance sheet clearly shows how the capital and used and its sources.

Uses	**2 014**	**2 015**	**2 016**	**2 017**
Cash and cash equivalent	98 497 355	313 042 472	225 466 740	295 000 000
Receivables	20 332 341	51 078 593	38 286 518	150 560 000
Inventory	6 071 115	15 022 578	36 265 934	138 723 000
Operating Current Assets	**124 900 811**	**379 143 643**	**300 019 192**	**584 283 000**
Accounts Payable	3 099 501	16 759 614	16 789 938	64 857 000
Taxes Payables	0	374 980	370 195	0
Public Duties Payables	1 734 666	3 185 473	1 346 945	3 060 000
Other Current Liabilities	14 846 534	28 652 180	47 046 020	145 957 000
Operating Current Liabilities	**19 680 701**	**48 972 247**	**65 553 098**	**213 874 000**
Operating Working Capital	105 220 110	330 171 396	234 466 094	370 409 000
Net PPE	5 066 736	16 529 478	45 803 552	96 198 000
Invested Capital (excluding intangible assets)	**110 286 846**	**346 700 874**	**280 269 646**	**466 607 000**
Intangible Assets	108 948 914	411 171 995	403 343 588	1 018 150 000
Invested Capital (including intangible assets)	**219 235 760**	**757 872 869**	**683 613 234**	**1 484 757 000**
Net Financial Assets	262 750	0	8 803 673	0
Net non Operating Assets	0	8 803 673	4 904 567	27 025 000
Total Funds Invested	**219 498 510**	**766 676 542**	**697 321 474**	**1 511 782 000**
Sources	**2 014**	**2 015**	**2 016**	**2 017**
Deffered Tax Assets	0	0	0	0
Deffered Tax Liabilities	15 983 733	21 027 472	13 551 937	68 273 000
Share Holders equity	195 936 993	731 008 428	671 219 285	1 409 386 000
Equity and Equivalents	**211 920 726**	**752 035 900**	**684 771 222**	**1 477 659 000**

Long Term Debt	7 577 784	14 640 642	12 550 252	34 123 000
Debt and Equivalents	**7 577 784**	**14 640 642**	**12 550 252**	**34 123 000**
Total Funds Invested	**219 498 510**	**766 676 542**	**697 321 474**	**1 511 782 000**

Table 6: Reformulated Balance Sheet

8. Driver Assumption

Chapter 8 will analyse factors that drive value of Nel Hydrogen. This chapter will assess future growth of the company. Income forecast and other components of free cash flow to the firm will be thoroughly analysed.

8.1 Production

Nel Hydrogen business is divided in to three segments, Hydrogen Fuelling, Hydrogen Electrolyser and Hydrogen Solution. Financials from fuelling and solution are reported as one segment. It operates in several countries with only information about total revenue it generates.

The revenues of each segment in corresponding country is given in Table 6 below. This paper will use this base revenue and determine growth of revenue by looking in to backlog. After 2020, the company will enter stable growth phase and follow the industry forecast discussed in chapter 5.

2017	Business Segments		
Revenues By Customer Location	**Fueling and solution**	**Electrolyser**	**Other**
Europe	74 903 000	61 072 000	338 000
North America	25 333 000	72 539 000	0
Asia	1 073 000	46 131 000	0
Middle East	-	10 377 000	0
Africa	-	3 132 000	0
South America	-	3 202 000	0
Oceania	-	326 000	0
Total Revenue	**101 309 000**	**196 779 000**	**338 000**

Table 6: Revenue generated in each country by each segment (Source: Annual Reports)

Backlog by 1st quarter of 2018 is about Kr 410 million, assuming at 90% realization rate (410*0.9), the revenue by end of 2018 should be Kr 369 million. This is increase of at least 77% from 2017. But assuming its historical growth rate from 2016, 2017 and expected growth rate by end of 2018, this paper will grow revenue by 84% annually until 2020. This growth rate justifies industry and market estimated growth rate of fuel cells. After

considering these inputs, Table 7 shoes expected revenue until 2020 aligned with company's growth ambitions.

Year	2017	2018E	2019E	2020E
Revenue	286 365 000	369 000 000	678 960 000	1 249 286 400

Table 7: Predicted Revenue Growth

8.1.1 2021 – 2025 Stabilizing Growth

After expected increase of revenue from Kr 286 365 000 to Kr 1249 268 400 in 2020, Nel Hydrogen will enter mature phase from 2021. Due to increased competition, the company is expected to industry trend. Cost and efficiency optimization and maintenance will be focus. However, the company may install new capacity, but it will not be like high growth phase.

Due to several possible uncertainty, and risk factors, the company's revenue is expected to grow at 30%. Slide from 84% to 30% seems quite low, but for smoothing purpose and sake of simplicity this growth rate will follow from 2021 to 2025 as shown in Table 8.

Year	2021E	2022E	2023E	2024E	2025E
Revenue	1 624 072 320	2 111 294 016	2 744 682 221	3 568 086 887	4 638 512 953

Table 8: Predicted Revenue Growth

8.1.2 Steady State

This is final stage of DCF-model. Here Nel Hydrogen has reached a stage where it may not grow revenue at high rate. Most of the installation will aim at maintaining its current level of business.

There is lack of several information, like quantitative details of its PPA, pipelines, detailed information about projects under construction or financial details about future contracts. These factors limited technically accurate forecast of revenues. So, details like country's inflation rate, interest rates and exchange rates could not be considered while making revenue forecast.

8.2 Capital Expenditure (investment in PPE)

Capital expenditure is money spent by company in process of acquiring and organizing land, building, machinery and equipment. In chapter 7, Financial Statement Analysis, there have been large investment in PPE to accommodate growth of the company. Capex growth is highly correlated to sales revenue growth as seen in Table 9 below. Due to lack of historical data determining future CAPEX is tricky, so the paper will stick to Damodaran and follow the same three stage model for revenue growth.

Calculation of CAPEX				
	2014	2015	2016	2017
PPE(current)	5 066 736	16 529 478	45 803 552	96 198 000
PPE(Prior)	0	5 066 736	16 529 478	45 803 552
Depreciation	0	16 529 478	1 685 000	19 730 000
CAPEX	**0**	**27 992 220**	**30 959 074**	**70 124 448**
Revenue Growth		*634 %*	*11 %*	*191 %*
CAPEX Growth			11 %	127 %

Table 9: Estimating CAPEX and Comparing it to Sales Revenue Growth Rate.

From 2018 to 2020, high growth phase will require large amount of investment in PPE, next five years from 2021 to 2025 will see moderate growth and in steady phase CAPEX is assumed to equal depreciation in long run. Projected CAPEX shown in Table 10 below.

	2 017	**2018E**	**2019E**	**2020E**
CAPEX	70 124 448	91 161 782	118 510 317	136 286 865

2021E	**2022E**	**2023E**	**2024E**	**2025E**
170 358 581	195 912 368	166 525 513	149 872 962	134 885 665

Table 10: Expected Capex Levels

The estimated CAPEX levels now contain uncertainty. But it will follow the developments in cost and technology. Chapter 5 shows that there will be huge decrease in CAPEX levels in fuel cell industry powered by technology. It could be automation or any other.

8.3 Conclusion

Chapter 7 and this chapter Assumption on Value Drivers analysis gives forecast of future revenue, future CAPEX level, OPEX, Depreciation and NWC. These estimates will be used as input to derive free cash flows to the form in later chapter. Table 11 below shows summary of future estimates.

	2018E	2019E	2020E	2021E
CAPEX	91 161 782	118 510 317	136 286 865	170 358 581
Total Revenue	369 000 000	678 960 000	1 249 286 400	1 624 072 320
Personnel expenses	166 050 000	213 872 400	393 525 216	324 814 464
Other Opex	387 450 000	712 908 000	1 186 822 080	1 461 665 088
Depriciation	6 672 660	12 531 233	21 243 424	33 329 501
NWC	675 270 000	1 242 496 800	2 286 194 112	2 674 847 111

2022E	2023E	2024E	2025E
195 912 368	166 525 513	149 872 962	134 885 665
2 111 294 016	2 744 682 221	3 568 086 887	4 638 512 953
316 694 102	411 702 333	535 213 033	695 776 943
1 794 599 914	2 195 745 777	2 497 660 821	3 246 959 067
48 870 010	62 290 264	72 330 640	78 497 079
3 090 934 439	3 515 937 925	3 917 759 402	4 244 239 352

Table 11: Summarized Assumptions

Appendix 1 shows forecast of Net PPE.

9. The Cost of Capital

Cost of Capital, in valuation, plays role of discount rate to discount the cash flow. Cost of Capital is weighted average cost of funding an investment or business, either in form of equity, debt or both (Damodaran, 2016). Nel Hydrogen capital structure consist of both equity and debt. There are investors who have invested in the company in form of equity and lenders. Both parties require return on their investments. To adjust these returns on investment, the cash flows are discounted using weighted average cost of equity and the cost of debt. The WACC is:

$$WACC = D/V*k_d*(1-T_m) + E/V*k_e$$

9.1 Cost of Equity

Damodaran (2012) states cost of equity as return compensated against risk shareholders undertake through investment. These risks can be diversifiable and non-diversifiable. Non-diversifiable risk are market risks that the company cannot diversify. To obtain cost of equity several inputs are required along the calculation. To measure market risk, mostly used model is Capital Assets Pricing Model (CAPM).

$$CAPM = r_f + beta(r_m - r_f)$$

r_f is Risk-free assets, $(r_m - r_f)$ is market premium, and ***beta*** is risk that cannot be diversified.

9.1.1 Risk-free rate

Risk-free rate is the rate that guarantees expected return on investment. Damodaran (2016) argues that risk free rate can be estimated by sticking to long-term rate either 10- 40-year government bonds. In agreement with Damodaran, 10-yr Norwegian Government zero-coupon rate is used as risk-free rate. Rate of 10-year bond on 13th of June 2018 is used. The rate is 1.86% (Norges Bank, 2018)

Fig (number) is illustration of 10- year Norwegian Government bond and its future forecast. The rate in either condition will remain below 3 percent in near future and deceasing as seen in the figure below.

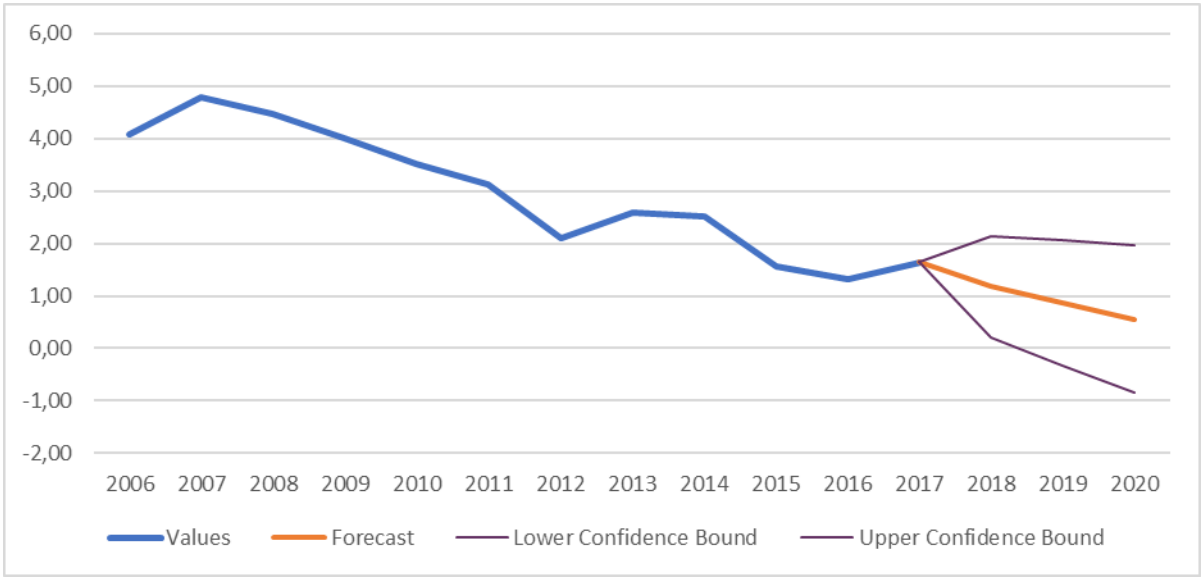

Fig (Number): Avg. Interest rate on 10-year Norwegian Government bond with forecast (Source: Norges Bank, 2018)

9.1.2 Beta – Relative Risk Measure

Not all investments are equally risky, therefore there is need to measure relative risk of business/investment compared to the market risk (Damodaran, 2016).

$$Beta = Covariance\ of\ Assets\ with\ Market\ Portfolio / Variance\ of\ Market\ Portfolio$$

This gives rise to three scenarios, assets beta > 1, indicates that assets are riskier, assets beta < 1, indicates assets are less risky compared to market and assets beta =1, means assets have average risk.

This paper uses historical Market beta of Oslo Børs (OSEX) and S&P 500 as shown in Table 12. Oslo børs are top 5 companies traded on Oslo Stock Exchange, and some of these

companies have investments in Nel hydrogen, therefore beta on Oslo Børs could be suitable. Nel has operations in USA, it will be subject to risk given by industry in the US market. Damodaran (2018) calculates industry beta for green and renewable energy in the US market to be 1.20. Considering NEL's operations in the US and international peers, equal beta weight from OSEX and green and renewable industry will be considered. So, this paper will use is (1.2+0.62)/2= 0.91 as beta coefficient. This can be justified by Damodaran's (2012) view about beta always tries to move towards 1.

Index	OSEBX	OSEX	S&P 500
Beta	0,56	0.6201	0,4096

Table 12: Beta for diff. indexes

9.1.3 Market Risk Premium

Market Risk Premium is difference between expected return on market and risk-free rate. There can be two ways to estimate market risk premiums. One can be looking at historical returns from the stock market and subtract historical risk-free rate in that market. This approach has its own limitations such as historical risk premiums are sensitive to time frame used. This is because investor's risk aversion changes with time. Another approach is to use implied equity premium. This method assumes that market is correctly priced, and risk associated to it reflects market risk premium. Damodaran (2016) agrees with this argument and hence states choosing any approach should reflect market views and valuation mission

After acquisition of Proton OnSite, Nel Hydrogen's business operations are divided mainly into two location, USA and Norway. So, both Norway and USA market risk premiums are relevant. But most of the peers of Nel hydrogen are international companies. Considering geographical proximity and availability of peers, MRP of Sweden, Denmark, Finland will be used, which is approx.5.08% for calculating equity cost of capital. USA and Norway's MRP also is 5.08%.

9.2 Cost of Debt

Cost of debt is the interest that a company pays to its lenders. Risk-free rate, default risk and tax saving/shield are three main elements of debt. Company borrowing history can show

spread charged by the lenders. Synthetic rating can also be used to estimate default risk premium in the interest rate. It uses company's interest coverage ratio.

Interest coverage ratio of Nel hydrogen turns to be negative due to negative EBIT, thus, cannot be used. So, this paper has estimated pre-tax cost of net debt in 2017 as shown in Table 13.

Debt(long term)	Maturity	Interest rate	Value at 2017
DNB Bank AS	July/2024	**6,25 %**	-
Innovasjon Norge	July/2019	5,75 %	1 250 000
Nykredit	2 028	1,18 %	5 288 000
Long term warranties	12-24 months after delivery		7 868 000
Other long term debt			19 717 000
Total Long term debt			**34 123 000**
Total Interest payments			**399 000**
Cost of debt (pre-tax)			**1,17 %**

Table 13: Average Cost of Debt (Source: Annual Report, 2017)

9.2.1 Marginal Tax Rate

Tax rate is important element that is used to calculate tax saving due to interest payments. Damodaran (2016), suggests usage of marginal tax rate as it will help save tax on last dollor of income. Nel Hydrogen operates in several countries and it is exposed to tax rates in those country. Table 14 shows revenues of Nel hydrogen across different countries and corresponding tax rates for 2017.

2017	Business Segments						
Revenues By Customer Location	**Fueling and solution**	**Electrolyser**	**Other**	Total	**%of TR**	**Marginal Tax**	**Country**
Europe	74903000	61072000	338000	136313000	45,68 %	27 %	Norway
North America	25 333 000	72 539 000	-	97872000	32,80 %	40 %	USA
Asia	1073000	46131000	0	47204000	15,82 %	25 %	China
Middle East	0	10377000	0	10377000	3,48 %		
Africa	0	3132000	0	3132000	1,05 %		
South America	0	3202000	0	3202000	1,07 %		
Oceania	0	326000	0	326000	0,11 %		
Total Revenue	**101309000**	**196779000**	**338000**	**298426000**	**100,00 %**		

Average Marginal Tax Rate	30,67 %

Note: Country specific revenues are not given, so countries where Nel Hydrogen primarily operates are given.

Table 14: Average Marginal Tax Rate Calculation.

9.3 Target Capital Structure

To obtain Target Capital Structure, Net debt is to be calculated through total interest-bearing debt minus excess cash. And outstanding shares multiplied by current share price. And the ratio can be calculated and assumed target capital structure. But Nel Hydrogen retains enough excess cash to pay all the debt. So, using this method is not so relevant. Current Equity ratio of the company is 82% even after acquisition of Proton OnSite and the company plans to maintain its equity ratio (Nel Annual Report, 2017). Thus, the target capital structure will remain same for calculation of cost of capital. The report has no information on Excess Cash, so, total long-term debt will be considered as net debt for further calculation.

9.4 Results

Cost of Equity		**WACC**	
Risk-free rate	1,86 %	Cost of Debt	1,17 %
Market Premium	5,08 %	Cost of equity	4,79 %
beta	0,91	Tax Rate	30,67 %
		Debt Ratio	18 %
		Equity Ratio	82 %
CAPM	**4,79 %**	**WACC**	**4,07 %**

Table 15: Cost of Capital calculation.

10. Free Cash Flow to Firm

All the previous chapters set foundation and made several assumptions based on formation from market, industry and the company itself for estimating future income of Nel Hydrogen. This chapter will forecast future operational income for Nel Hydrogen and free cash flows. Later valuation of the firm based on future income will be done using DCF-model discussed in chapter 4.

Operational income statement can be seen in appendix 2. Based on operating income, Table 15 and 16 shows forecasted final free cash flows to Nel Hydrogen. Nel hydrogen is growing with growth in the fuel cell industry. To find out the synergy of Nel Hydrogen, DCF analysis in multi growth model seems quite important. Free cash flows are negative for next 6 years due to high growth of the company. With maturity, Nel Hydrogen is expected to generate positive operating income, hence supporting its solid growth in long run.

Free Cash Flow(NOK)	**2018**	**2019**	**2020**	**2021**
EBIT	**-60 970 793**	**-19 191 879**	**-31 565 157**	**226 059 006**
Tax	0	0	0	0
Depreciation	5 620 793	9 007 479	12 825 861	17 551 842
Gross Cash Flow	-55 350 000	-10 184 400	-18 739 296	243 610 848
Change in Operating NWC	304 791 000	567 226 800	1 043 697 312	388 652 999
Investment in PPE	91 161 782	118 510 317	136 286 865	170 358 581
Free Cash Flow to the Firm	-451 302 782	-695 921 517	-1 198 723 473	-315 400 732

Table 15: Stage 1 Free Cash Flow to Firm

Free Cash Flow(NOK)	**2022**	**2023**	**2024**	**2025**
EBIT	**399 356 145**	**521 725 100**	**861 130 529**	**1 125 617 212**
Tax	0	160013088,3	264108733,4	345 226 799
Depreciation	22 902 658	27 211 344	30 891 192	34 011 026
Gross Cash Flow	422 258 803	388 923 356	627 912 988	814 401 439
Change in Operating NWC	416 087 328	425 003 485	401 821 477	326 479 950
Investment in PPE	195 912 368	166 525 513	149 872 962	134 885 665
Free Cash Flow to the Firm	-189 740 893	-202 605 642	76 218 550	353 035 824

Table 16: Stage 2 Free Cash Flow to the Firm

If the assumptions are held true, from 2024, Nel Hydrogen will have positive cash flows. The next step of valuation is to calculate terminal value in the last stage of the DCF-Model. Long term growth rate is assumed to be 2%. Terminal value is calculated using Gordon Growth Model, if the company will be in operation after projection window. Table 17 presents the estimated Terminal Value and Enterprise Value. The table also shows Equity Value of shareholders. Due to lack of information about excess cash and non-controlling interest, these elements are not included to derive equity value of the company. One more assumption about debt is that total long-term debt equalled to Net debt due to lack of information about interest rates on its long-term debts. Except interest on 2 types of long term debt, no information about other long-term debt were given.

NOK	**2018**	**2019**	**2020**	**...**	**2025**
Free Cash Flow to the Firm	-451 302 782	-695 921 517	-1 198 723 473	...	353 035 824
Terminal Value					17 395 968 134
Total	-451 302 782	-695 921 517	-1 198 723 473	..	17 749 003 958
Discount factor	0,96	0,92	0,88		0,72
	-432 934 759	-640 426 293	-1 058 235 540	...	12 729 447 142
Enterprise Value	**10 075 684 144**				
Net Debt	31 942 260				
Shareholder's Equity	**10 043 741 884**				
Outsatnding Share	998 714 952				
Share Price	**10,06**				

Table 17: Calculation of Final Price per Share

Shareholder's equity is divided by number of outstanding shares to obtain the valuation. The price per share is Kr 10,06. This states that the share price of Nel Hydrogen is undervalued at Kr 2,99 (June 15, 2018).

Three stage DCF-modelled analysis for Nel Hydrogen points out some critical information. Due to high investment in the early stage, it has negative earning in the initial phase. Later as the company matures, earning are positive.

The company has huge amount of cash at hand which is being helpful in facilitating its growth despite negative earnings. Equity ratio of 82% shows that it has better confidence in the market. This is critical success factor for such high growth firm.

Future growth of the company seems won't be hindered as it can raise substantial amount of debt at very low interest rates and current its leverage ratio is quite low. Investors in the company are big enterprise and banks, which further strengthen its prospects.

11. Relative Valuation- Market Based Approach

Previous chapter revealed that the share price of Nel Hydrogen is undervalued. Market based approach will compare the finding from previous chapter with the market to increase robustness of the result. To conduct relative valuation, there are some prerequisites. Since it's market-based approach, peers companies of Nel Hydrogen are to be recognised and market prices needs to be standardised in to multiples.

Damodaran (2018) suggests several multiples can be used. For example, Earning multiples, book value multiples or revenues. Most commonly used multiples are earning multiples. But with Nel hydrogen, application of earing multiples is complicated as chosen multiples should not have negative value. This chapter will use EV/revenues multiple and EV/EBITDA multiple for relative valuation. Nel Hydrogen's EBITDA is negative hence EV/EBITDA multiples will also be negative, but due to availability of comparable firms EV/EBITDA multiple will also be used.

Nel Hydrogen is a pure play fuel cell company with very few competitors in Norwegian Market. Most of the companies producing fuel cells are scattered around the world. And very few of them covers business segments like Nel Hydrogen does. Despite this limitation, four comparable firms are recognised. Power Cell AB, Plug Power, Ballard and Fuel Cell Energy. All these firms are producing fuel cells technologies and solutions. Ballard is the largest among selected peers, with wide range of services.

All information needed to conduct relative valuation is obtained from Yahoo Finance (2018). Table 18 presents information on multiples from peers and relative valuation. Nel's share is trading below the price it should be.

Ignoring EV/EBITDA result due negative value, EV/Revenue valuation shows that the price of share is undervalued. This result aligns with the finding in valuation from previous chapter.

	Nel(NOK)	Power Cell(SEK)	Plug Power(USD)	Ballard (CAD)	Fuel cell energy(USD)
EV	2 860 000 000	1 110 000 000	498 580 000	663 510 000	144 420 000
EBIDTA	-83 980 000	-60 580 000	-60 980 000	-4 400 000	-30 960 000

EV/EBITDA	-34,06	-18,32	-8,18	-150,80	-4,66
Revenue	363 260 000				
Average (EV/EBITDA)	**-54,00**				
Median	18,32				
EV/revenue	7,89	30,18	3,40	5,59	1,50
Average (EV/revenue)	**9,71**				
Using EV/EBITDA multiples					
EV	4 535 280 813				
Debt	31 942 260				
Shareholder equity	4 503 338 553				
Outstanding share	998 714 952				
Share Price	**4,51**				
Using EV/Revenue multiple					
EV	3 527 981 120				
Debt	31 942 260				
Share holders equity	3 496 038 860				
outstanding Share	998 714 952				
Price per share	**3,50**				

Table 18: Valuation by EV/EBITDA and EV/EBITDA

DCF and Relative valuation techniques showed similar result. However, one can be critical about the relative valuation techniques as the selected firms due to not being perfect peer, may not reflect the market perception. Results using negative EV/EBITDA can be ignored, though the result supported the finding.

12. Sensitivity Analysis and Risk Factors

Sensitivity analysis in finance is what if scenario in finance. It checks sensitivity of any financial values changes with changes in key assumptions. Scenario analysis measures changes in variables in best case and worst case. This method is quite useful in the sense that it relates financial performance changes with changes in macro-economic factors (Damodaran, 2018). This chapter will conduct sensitivity analysis of change share price due to changes in long term growth rate and WACC. Later this chapter will also pint out risk factors that can have impact on growth and development of Nel Hydrogen.

12.1 Sensitivity

Terminal value, in valuation chapter, had large impact on the value of company. Most of thee value for company was derived from terminal value. As stated above, this chapter checks how sensitive share price is to change in cost of capital and long-term growth rate. Table 19 presents the result if sensitivity.

It can be seen in the table that change in growth rate and cost of capital have significant impact on share price. So small adjustment in growth rate can have high impact on the value of the company.

	2,07 %	3,07 %	4,07 %	5,07 %	5,07 %
1,50 %	42,71	13,95	7,58	4,77	4,77
1,75 %	78,18	17,11	8,68	5,33	5,33
2,00 %	366,98	21,73	10,06	5,99	5,99
2,25 %	-146,45	29,18	11,81	6,76	6,76
2,50 %	-62,87	43,15	14,12	7,68	7,68

Table 19: Terminal Value Sensitivity to WACC and Long-term Growth Rate

Next segment of this chapter will analyse key risk factors, that the company is exposed to.

12.2 Risk Factors

Nel Hydrogen, like any other business, is exposed to several risks. These risks can arise from within the firm (internal) or outside the firm (external). Business risk are factors that can affect expected growth, revenue, profits, reputation etc adversely (Investopedia, 2018). Nel is growing fast and moving too fast to capture market growth need, it may have downfalls. Risk for Nel Hydrogen are categorised in to Operational Risk, Financial Risk and Market Risk.

12.2.1 Operational Risk Factors

Operational risk can result from personnel, procedures and system inside the firm and change technology from outside of the firm. Nel is more exposed to technological risk. Radical change in technology could make other source of energy more efficient compared to hydrogen, this could bring significant amount of risk to Nel. Nel's products and services are subject to technological change. Competitors can have access to better technology or Nel's failure to follow technological change can brig risk to the company. Suppliers of components could give rise to risks. Supplier monopoly, unethical source of raw material, low quality components are risk that comes from suppliers of Nel Hydrogen. These risks can affect over all business.

12.2.2 Financial Risk Factors

Financial risk factors are liquidity risk, currency risk, and interest rate risks. Nel Hydrogen is exposed to all these risks. Nel is operating in several regions on the world, this gives rise to currency risk in form of fluctuation of exchange rates. Depreciation on NOK compared to currency of other country can have serious impact on shareholders value. Liquidity can also be one of the concern. Nel has strong liquid position but also it has very high growth ambition. Nel should be able to come up with new sources of financing to match its liquidity with the growth ambition.

12.2.3 Market Risk

Risks related to market can have huge impact on business. Market risks are mostly external and tests the strengths of a business. Regulatory issues, risk from competitors and country

risk are risk related to market. Nel is highly exposed to country risks. It has several initiatives in emerging economies. And to stay ahead and meet its needs to grow it will invest in countries that are classified as risky due to political, economic reasons. These risks may substantially affect Nel's revenues.

Competitors are also source of risk to Nel's business. Most of the revenues for Nel comes from European countries, USA and China. Many other company are investing in this market and given their ability to compete, they can narrow down slice of the pie for Nel hydrogen.

13. Conclusion

Finally, this is the conclusion chapter of this thesis. Main objective of this thesis has been to value Nel Hydrogen fairly and derive actual value of its equity. So, the question is what is the fair value of the equity share? And the answer is I don't know. DCF multi stage valuation model gave share price of Nel hydrogen which is lower than the market. Relative valuation gave another share price, which is again higher than the market price. Only thing I could assume is that the company is undervalued. But I may be wrong again due to the assumptions I made for changes, normalization for several variables that could affect the results. I took some short cuts in form of general assumption to avoid rigorous calculations. To conclude I would briefly go through my work so far in this thesis.

Fuel Cell/ Hydrogen have very high potential in the future as it deemed as clean energy and can cut emissions to reduce greenhouse gas. Many countries are supporting hydrogen industry with favourable policies and regulation to use hydrogen to cut down emissions. Hydrogen industry is expected to go through very high growth in next 10-20 years. Aligned with industry, Nel Hydrogen is a firm going through very high growth.

Nel hydrogen's revenues have been growing by more than 100% each year. It has signed up various contracts with other companies and countries to sell its product and services. Due to initial phase, earnings of Nel are negative. This is common with the firms in energy sector. They always tend to create value in long run.

Valuation through DCF reveals different picture than the market perception of Nel Hydrogen. Fair value of share obtained is Kr 10,06 where as it is traded for Kr 2,99 in the market. Relative valuation using EV/Revenue reveals its fair share price to be Kr 3,5/share. Most of the values comes from terminal value of the company. Sensitivity analysis shows that growth rates and cost of capital have great effect on its long run position. Last but not the least several key risks are pointed out which can adversely affect Nel's over all business.

To sum up, Nel is in its high growth phase. It is exposed to several opportunism and threats ahead. Valuation of Nel Hydrogen in form of this thesis should not be seen conclusive rather source of learning errors and weaknesses one can face while conducting valuations. Several

assumptions can have weaknesses of its own. Estimating long run scenario is a fool’s work as no one know what future holds.

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15. Appendix

15.1 Appendix 1

Calulation of depriciation	2 018	2019	2020	2021
Net PPE	187 359 782	300 249 306	427 528 692	585 061 412
depriciation(3%)	5 620 793	9 007 479	12 825 861	17 551 842

2022	2023	2024	2025
763 421 937	907 044 792	1 029 706 410	1 133 700 883
22 902 658	27 211 344	30 891 192	34 011 026

15.2 Appendix 2

Consolidated Income Statement	2018	2019	2020
Total revenues and other income	369 000 000	678 960 000	1 249 286 400
Personnel Expences	166 050 000	213 872 400	393 525 216
Other operating expences	258 300 000	475 272 000	874 500 480
EBITDA	**-55 350 000**	**-10 184 400**	**-18 739 296**
Depriciation Amortisation and Impairment	5 620 793	9 007 479	12 825 861
EBIT	**-60 970 793**	**-19 191 879**	**-31 565 157**

2021	2022	2023	2024	2025
1 624 072 320	2 111 294 016	2 744 682 221	3 568 086 887	4 638 512 953
324 814 464	316 694 102	411 702 333	535 213 033	695 776 943
1 055 647 008	1 372 341 110	1 784 043 444	2 140 852 132	2 783 107 772
243 610 848	**422 258 803**	**548 936 444**	**892 021 722**	**1 159 628 238**
17 551 842	22 902 658	27 211 344	30 891 192	34 011 026
226 059 006	**399 356 145**	**521 725 100**	**861 130 529**	**1 125 617 212**