

**The impact of newer renewables and disruptive innovations on hydropower**

- *A case study of BKK's, business units; Innovasjon og Utvikling, and Forretningsutvikling og Innovasjon*

**Msc in Innovation and Entrepreneurship**

Maria Monero  
22.05.2018



**Høgskulen  
på Vestlandet**

<b>Oppgavens tittel:</b>	<b>The impact of newer renewables and disruptive innovations on hydropower - A case study of BKK's, business units; Innovasjon og Utvikling, and Forretningsutvikling og Innovasjon</b>	<b>Leveret dato: 22.05.2018</b>
<b>Forfatter:</b>	Maria Monero	
<b>Mastergrad:</b>	Master of Science in Innovation and Entrepreneurship	<b>Tall sider u/vedlegg: 101</b>
<b>Veileder:</b>	Ole Andreas Brekke	<b>Tall sider m/vedlegg: 125</b>
<b>Studieobjekt:</b>	Innovasjon og Utvikling, og Forretningsutvikling og Innovasjon	
<b>Metodevalg:</b>	Explorative embedded single case study	
<p><b>Sammendrag:</b>  The Increase of greenhouse gasses in the atmosphere has led to intensified initiatives towards pollution reduction. Governments have altered policies and regulations to this effect, which has enhanced investments in green sustainable energies. Innovative technological developments within newer renewables has led to their increased competitive advantage, which has imposed a challenge to incumbents whose core business is centered around hydropower. This thesis has been an explorative embedded single case study of BKK's Innovasjon og Utvikling(IoU), and Forretningsutvikling og Innovasjon(FUoI) with the intent of understanding the impact of newer renewables on hydropower incumbents, as well as their response to them as disruptive innovations. The aim of this research study has been therefore to; (1) Reveal the rationale behind the establishment of both the IoU, and FUoI units, (2) Examine the impact newer renewables have had on hydropower and the extent of disruptiveness, (3) Investigate how BKK, through the IoU, and FUoI units has addressed innovations that are disruptive relative to the hydropower business, (4) Investigate how the organizational elements within the analysis units have facilitated, or inhibited BKK's ability to reap from potential disruptive innovations. This thesis has shown that wind energy can be perceived as either disruptive or sustaining to BKK's hydropower, and solar energy as disruptive. When confronted by renewables and other disruptive innovations, BKK's strategy was the establishment of both ambidextrous, and autonomous units, in addition to closing growth gaps. The IoU unit was particularly found to constitute organizational elements that are key to successful responses to disruptive innovations, unlike the FUoI unit whose organizational elements were found to be characterized with a hierarchy culture which inhibits a successful response to disruptive innovations.</p>		
<p><b>Stikkord for bibliotek:</b> Disruptive innovations, disruptive business models, Growth gaps</p>		

© Maria Monero

2018

*The impact of newer renewables and disruptive innovations on hydropower - A case study of BKK's, business units; Innovasjon og Utvikling, and Forretningsutvikling og Innovasjon*

Maria Monero

<http://www.duo.uio.no/>

Reprosentralen, Universitetet i Oslo

*“The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking.”*

*—Albert Einstein*

## ACKNOWLEDGEMENTS

This thesis concludes two incredibly exciting and educative years of a Master of science in Innovation and Entrepreneurship conducted at Oslo University, in collaboration with Western Norway University of Applied Sciences.

I would like to express my gratitude to everyone who has helped me through the processes of conducting this thesis. A special thanks to the respondents, as well as my colleagues in BKK who did not have to use so much of their time on ensuring that I got all the information I needed. I am particularly indebted to Monika Inde Zsak for bearing with me and for such invaluable information. Am similarly indebted to Inger Lundetræ who with calm and patience provided me with an in-depth understanding of the hydropower market. A special thanks to Ingrid Von Streng Velken for her time, and prompt responses to my queries.

Special gratitude goes to my former boss Magne Harkestad. Thank you for believing in me and encouraging me to reach to the heights. Your patience and guidance through my professional journey has been invaluable.

I would like to give a special thank you to Robert Fischer, for his invaluable input and guidance to this thesis. I am indebted to my supervisor Ole Andreas Brekke, at Western Norway University of Applied Sciences for the patience and tireless guidance he has awarded me. Your supervision has been educative and has challenged me throughout this research study.

My deepest gratitude is to my family. – My husband David and children; Michelle, Kevin, and baby Maia. They have supported me with unhesitating faith and patience amidst hospital runs for baby Maia, and countless other family demands. Thank you for the time I have taken away from you during the thesis period, as well as bearing with my long evenings bent over the computer. I am forever grateful for your love and support through a time that has been demanding emotionally, psychologically, and mentally. I love you.

## **List of figures and tables:**

<b>FIGURE 1:</b> THE TREND OF SOLAR ENERGY PV MODULE PRICES FROM 2010-2015(SOURCE: INTERNATIONAL RENEWABLE ENERGY AGENCY)	15
<b>FIGURE 2:</b> POWER PRODUCTION UNDER CONSTRUCTION AT THE END OF THE YEAR, FROM 2012 TO 2017(SOURCE NVE.NO; NYKRAFTPRODUKSJON).	16
<b>FIGURE 3:</b> TIMELINE OF EVOLUTION OF DISRUPTIVE INNOVATION THEORY. SUMMARIZED BASED ON THE EARLY LITERATURE OF TECHNOLOGY DISCONTINUITY AS WELL AS ON THE PAPERS AND BOOKS OF CHRISTENSEN (SOURCE; YU AND HANG (2010))	22
<b>FIGURE 4:</b> THE IMPACT OF SUSTAINING AND DISRUPTIVE TECHNOLOGICAL CHANGE (SOURCE CHRISTENSEN (2013, P.XX)	23
<b>FIGURE 5:</b> THE SIMPLE 2- DIMENSIONED DISRUPTIVE INNOVATION MODEL (SOURCE: CHRISTENSEN AND RAYNOR 2013, P.33)	25
<b>FIGURE 6:</b> THE THIRD DIMENSION OF THE DISRUPTIVE INNOVATION MODEL INCLUDING LOW-END AND NEW MARKET DISRUPTIONS (SOURCE: CHRISTENSEN AND RAYNOR (2013, P.44))	27
<b>FIGURE 7:</b> SUMMARY OF HOW INCUMBENTS RESPOND TO DISRUPTIVE INNOVATIONS (SOURCE; CHARITOU & MARKIDES (2003))	33
<b>FIGURE 8:</b> A MODEL OF ORGANIZATIONAL CULTURE TYPES AS ADAPTED FROM (Deshpandé et al., 1993)	38
<b>FIGURE 9:</b> INNOVATION STRATEGY MAP AS ADOPTED FROM CHESBROUGH AND CROWTHER (2006)	41
<b>FIGURE 10:</b> A FRAMEWORK FOR FITTING AN INNOVATION'S REQUIREMENTS WITH THE ORGANIZATION'S CAPABILITIES(Christensen and Raynor, 2013)	43
<b>FIGURE 11:</b> THE THEORETICAL FRAMEWORK WHICH WAS USED AS A GUIDE FOR THE ANALYSIS, AND DISCUSSION WITH THE PURPOSE OF FINDING ANSWERS TO THE RESEARCH QUESTIONS	48
<b>FIGURE 12:</b> BASIC TYPES OF DESIGNS FOR CASE STUDIES(Yin, 2012)P.8)	50
<b>FIGURE 13:</b> AN OVERVIEW OF THE THEORETICAL BASIS UPON WHICH RESEARCH QUESTIONS WERE FORMED AFTER RE-ASSESSMENT WITH COLLECTED DATA	51
<b>TABLE 1:</b> OVERVIEW OF TYPES AND SOURCES OF DATA USED IN THIS STUDY	53
<b>TABLE 2:</b> AN OVERVIEW OF INTERVIEW SUBJECTS CHOSEN FROM MANAGEMENT IN THE	

ANALYSIS UNITS	54
<b>TABLE 3:</b> OVERVIEW OVER PRIMARY BKK DOCUMENTS USED IN THE RESEARCH STUDY	55
<b>FIGURE 14:</b> ORGANIZATIONAL STRUCTURE OF THE BKK CORPORATION SHOWING THE NEWLY ESTABLISHED UNIT INNOVASJON OG UTVIKLING (SOURCE; INTERNAL BKK DOCUMENTS)	60
<b>FIGURE 15:</b> ORGANIZATIONAL STRUCTURE OF BKK-PRODUKSJON SHOWING FORRETNINGSUTVIKLING OG INNOVASJON TOGETHER WITH OTHER BUSINESS DOMAINS UNDER THE SUBSIDIARY COMPANY.	62
<b>FIGURE 16:</b> INCREASE IN WIND ENERGY PRODUCTION IN THE NORDIC COUNTRIES. (SOURCE, NVE REPORT- KRAFTSITUASJON 2017)	66
<b>FIGURE 17:</b> SHOWING THE TREND OF RENEWABLE ENERGIES.(SOURCE: INTERNATIONAL RENEWABLE ENERGY AGENCY)	69
<b>FIGURE 18:</b> STRATEGIC DIRECTION OF THE BKK CORPORATION AND THE "GAP" EFFORTS IT MUST IMPLEMENT TO ACHIEVE ITS ORGANIZATIONAL GOALS.	73

### **Abbreviations:**

BCS	Bergen Carbon solutions
BKK	Bergenshalvøens Kommunale Kraftselskap
BKK-D	BKK Document
CO <sub>2</sub>	Carbondioxide
FUol	Forretningsutvikling og Innovasjon
GW	Giga Watt
GWh	Giga Watt hour
IoU	Innovasjon og Utvikling
Kwh	Kilo Watt hour
NVE	Norges Vassdrags- og Energidirektorat
PV	Photovoltaic
SSB	Statistisk Sentralbyrå
Twh	Tera Watt hour

UN United Nations  
UNEP United Nations Environmental Program  
@ Each



## Table of contents

1.	Introduction .....	11
1.1	General Background .....	11
1.2	Technical Background .....	13
1.2.1	Hydropower .....	13
1.2.2	Solar energy .....	14
1.2.3	Wind Energy .....	15
1.3	Thesis Aim, Research questions & Approach .....	16
1.4	The case .....	18
1.5	Thesis structure .....	18
2	Theory .....	20
2.1	Innovation within Organizations .....	20
2.2	Disruptive technologies and innovations .....	21
2.2.1	<i>Conceptual framework of disruptive technologies, and sustaining technologies</i> .....	21
2.2.2	<i>New-market, high-end, and low-end disruptions</i> .....	27
2.2.3	<i>Disruptive business models</i> .....	29
2.3	Strategic options in managing disruptive Innovations .....	31
2.3.1	<i>Factors inhibiting incumbent response to disruptions</i> .....	32
2.3.2	<i>Harnessing the fundamental laws of disruptive technologies</i> .....	34
2.3.3	<i>Strategic responses to disruptive business models</i> .....	34
2.4	Organizational responses to disruptive innovations .....	36
2.4.1	<i>Organizational Culture</i> .....	36
2.4.2	<i>Organizational Structure</i> .....	39
2.4.3	<i>Human Resource Management</i> .....	46
2.5	Theoretical framework .....	47
3.	Method .....	49
3.1	Research Method .....	49
3.2	Research design .....	52
3.2.1	<i>Data sources and Collection methods</i> .....	52
3.3	Validity and Reliability .....	57
4.	Analysis and Discussion .....	59
4.1	Rationale for the establishment of BKK's IoU, and Fuol .....	59
4.2	The impact of newer renewables on BKK's established business .....	62
4.2.1	<i>Solar and Wind energy as disruptive innovations</i> .....	63
4.2.2	<i>Trend of newer renewables' competitive advantage</i> .....	68
4.3	BKK's strategic choices regarding disruptive innovations .....	72

4.3.1	<i>Factors inhibiting BKK's response to newer renewables</i> .....	72
4.3.2	<i>Innovation within BKK</i> .....	76
4.3.3	<i>BKK's strategic options to address disruptive innovations</i> .....	79
4.4	<b>BKK's Organizational responses to disruptive innovations</b> .....	93
4.4.1	<i>Organizational Structure</i> .....	94
4.4.2	<i>Organizational Culture</i> .....	100
4.4.3	<i>Human Resource management</i> .....	102
5.	<b>Analytical summary</b> .....	105
6.	<b>Conclusion and practical implications</b> .....	108
6.1	<b>Practical implications</b> .....	108
6.2	<b>Conclusion</b> .....	108
7.	<b>Limitations and Commended future studies</b> .....	110
7.1	<b>Limitations</b> .....	110
7.2	<b>Commended future studies</b> .....	110
8.	<b>Sources</b> .....	111
8.1	<b>Web Sources:</b> .....	112
	<b>APPENDICES I – Interview guide</b> .....	115
	<b>APPENDICES II – Consent Form</b> .....	125

## 1. Introduction

Previous research has shown that the source of an incumbent's dilemma is that sustaining innovations tend to be more important and attractive, compared to disruptive innovations, and that the established companies that are very good at sustaining technologies ignore the disruptive threats, and opportunities, until it is too late (Christensen and Raynor, 2013). This thesis aims to gain a deeper understanding of the consistent patterns in business that are the cause for failure for leading companies to keep their leading position in the face of changing technologies, and markets. Furthermore, the thesis' purpose is to understand incumbents' organizational and strategic choices and responses to disruptive innovations, in addition to reasons why they decide to invest in sustaining innovations contra adopting the disruptive technologies. The study specifically focuses therefore on whether solar, and wind energy as newer renewables, are disruptive, or sustaining innovations relative to hydropower businesses, as well as the impact the newer renewables have had on hydropower incumbents, and their response to disruptions. The case organization chosen for analysis is BKK AS, one of the leading energy companies in the west of Norway, and one of Norway's main distributors of hydro-electrical power.

### 1.1 General Background

Greenhouse gasses have dramatically increased in the earth atmosphere over the last decades since the age of industrialization. According to UN reports (UNEP.org) energy production and consumption is the main contributor to global warming, accounting for roughly two-thirds of human-induced greenhouse gas emissions, where global energy and electrical generation contributes about 60% of the greenhouse gas emissions that are responsible for global warming. In December 2017, the executive director of the United Nations Environment program submitted a report entitled "*Towards a pollution-free planet*" to the United Nations Environment Assembly. The report details challenges posed by the pollution of the environment on a global scale and goes on to outline efforts in addition to proposing measures to tackle the pollution problem. The report declares investments in green sustainable energies as a strategy for long-term profitability, and prosperity for all. More importantly, the report states;

*“..The energy revolution currently unfolding is a game changer, as is the increased mobilization and awareness around climate. The rapidly falling cost of energy from renewable sources, such as wind and solar power, means that the countries that lead the shift away from fossil fuels will reap the greatest economic and environmental benefits” (UNEP REPORT, p.1).*

Due to the incentive to reap great economic and environmental benefits, governments have recognized the energy revolution unfolding on a global scale and have therefore intensified efforts towards clean and sustainable energy. According to an NVE report (NVE, 2017, p.11), the transport sector contributes about 14% of the global greenhouse pollution, hence, the electrification of transport vehicles is a measure towards zero pollution in the transport sector. As such, the need to counter high concentrations of greenhouse gases and the increase in energy demand has not only led to considerable attention and discussions about renewable energy sources, it has also led to governmental energy policies that favor less pollution, and a sustainable future. According to NVE reports, solar and wind energy have particularly had a remarkable growth both in the Nordic countries, with solar energy having an installed capacity of 14GWh, and wind energy having installed capacity of a little over 1 GW in Norway alone the last year. The newer renewables have become competitive due to cheaper prices of clean energy technology and have consequently become more appealing to new entrants in the energy industry. On the 14th of January 2018, the Norwegian government exhibited the political platform on which it will base its policies for the next four years. Under the section for renewable energy, the following quote focuses on low CO<sub>2</sub> emissions, and the future government's efforts towards renewable energy sources;

*“...Med omstillingen til et lavutslippssamfunn vil fornybare energikilder i fremtiden spille en enda større rolle enn tidligere og gi nye muligheter for fornybarnæringene i Norge, både nasjonalt og internasjonalt. Regjeringen vil legge til rette for at norsk industri kan dra nytte av våre fornybare ressurser.”*

The political platform emphasizes the government's role in ensuring that the Norwegian society, and energy industry increases its efforts on the production of renewables, in addition to investments in new innovations that shall contribute to the reduction of

greenhouse gas emissions. Government policies recognizing the revolution in the energy industry and intensifying efforts towards newer renewables to enable economic and environmental gains have served as a huge incentive to new market entrants with revolutionary innovations within newer renewables, that many established companies whose core activities are based on hydropower may view as disruptive to their businesses. In the Nordic region, governments have increased funding of newer renewables, in addition to issuing green certificates to sustainable energy producers (*NVE.no*), and as a result, given rise to competitive business models, and new innovative technologies as well as new market dynamics. For this study, the reference to newer renewables will be towards wind, and solar energy.

## **1.2 Technical Background**

Renewable energy sources provide cleaner sources of energy that fend off the effects of greenhouse gas pollution in the environment. The technics of generating this energy are renewable because they do not draw on finite natural resources that will eventually run out. This sub-chapter gives brief background information about the old and established hydro-power source, and the two newer renewables that are to be focused upon in this thesis.

### **1.2.1 Hydropower**

Historically, Norway has over many years had the natural advantage of various watercourses with numerous waterfalls, which has not only facilitated the tremendous growth of hydropower but has also ensured that this renewable energy source became the most established in the country. As the largest producer of hydropower in Europe, with 96% of all domestic electricity stemming from hydropower, many organizations have built their businesses centered on this energy source. As Norway's largest renewable source, hydropower is the generation of power by using the gravitational force of falling or flowing water, and Norway is one of the largest hydropower producers on a global scale (*WorldEnergy.org*). Hydropower production is dependent upon the height of fall, and the amount of water. In 2016 alone, hydropower production was about 144 Twh (*NVE.no*). The first Norwegian municipal with an electricity mechanism based on hydropower was commissioned in Hammerfest in 1891. The town became the first in Norway with electric

street lighting. In 1900, Hammeren power station in Maridalen was built. As is typical the steadfastness of hydropower plants, this over-a-century old power plant, is still operational today(regjeringen.no). According to NVE's reports, on average hydropower production yearly is approximately 130 TWh, which is about 96% of the total electricity production capacity in Norway(ssb.no). The ratio of the production capacity to consumption varies from region to region. The biggest percentage of hydropower is produced in the west of Norway, and in the north(lvk.no).

### **1.2.2 Solar energy**

Solar energy, an energy harnessed from the energy of the sun to produce electricity, according to NVE, has the potential to become the most important sustainable and clean energy in the future, on a global scale. Numerous technological developments in solar installations the last decade have contributed to the growth of this sustainable energy. It is mainly the degree of latitude that determines the intensity of the sunrays as well as other factors like the season, variations in the 24 hours, and the weather conditions (temperature, wind, snow, clouds, etc). In addition, the specification of the solar installations like inclination angles, cardinal point, screening from buildings, vegetation, mountains, type of technology, have a say in how much energy is produced from solar energy installations. On a global scale, the PV modules have become cheaper over the last few years as shown in

figure 1

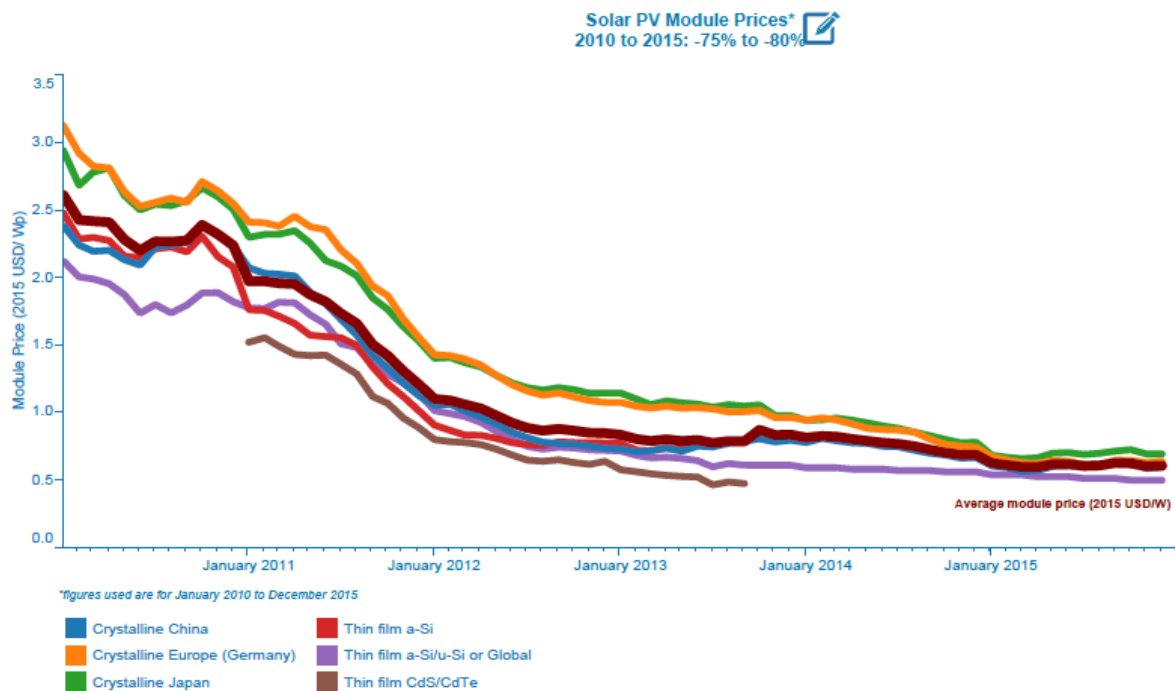


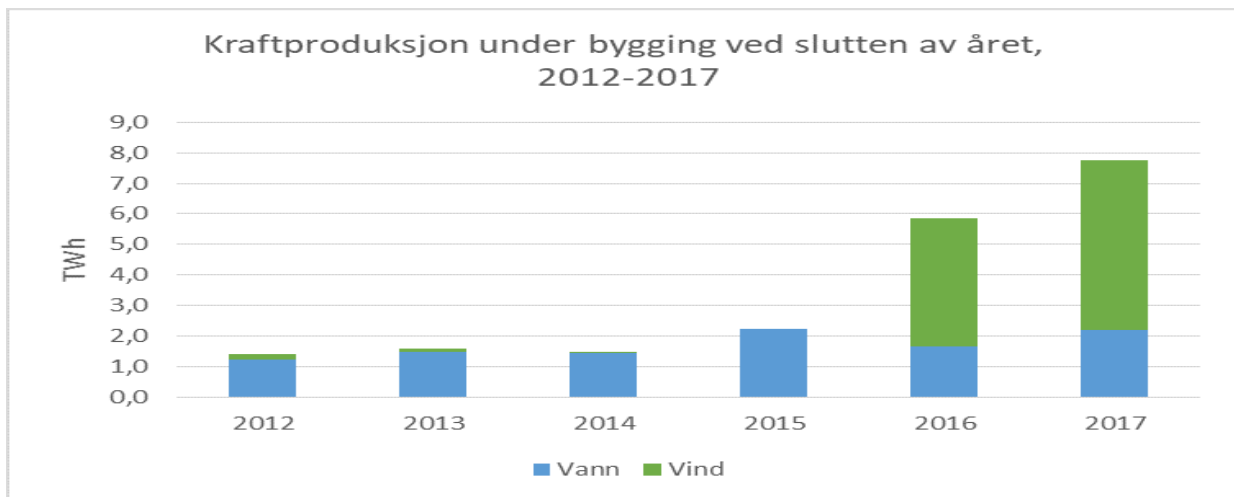
Figure 1: The trend of Solar energy PV module prices from 2010-2015(Source: International Renewable Energy Agency)

In Norway, to harness solar electricity, a solar photovoltaic installation produces approximately 700-950 kWh/kWp per year which is equivalent to about 140-150 kWh/m<sup>2</sup> year in the south of Norway and approximately 90 – 110 kWh/m<sup>2</sup> year in northern Norway(NVE.no). The rest installation costs in Norway are higher than for example Germany([Levelized cost of electricity, renewable energy technology study \(LCOE\), Fraunhofer ISE, 2013](#)), and this, according to NVE publications is due to an immature solar energy market. The installation costs are however expected to drop as the solar energy market matures, and more installations are constructed.

### 1.2.3 Wind Energy

In 2017, a total power of 2,85 TWh harnessed from wind energy was produced in Norway. The total installed power was 1188 MW divided between 468 turbines. Wind power stood for 1,9% of the total power production in the country(NVE.no). According to information gathered from NVE's website, NVE's report shows that there was three times as much

renewable energy that was under construction at the end of 2017 compared to that at the end of 2015. By the end of 2017, new Power production totaling to 7,7TWh was under construction, of which 5,5 TWh of the total was wind power production as illustrated in *figure 2*. Furthermore, construction of power production of about 16,3 TWh has been approved.



*Figure 2: Power production under construction at the end of the year, from 2012 to 2017(Source NVE.no; Nykraftproduksjon).*

Towards the end of 2017, construction of wind power plants was kicked off at Marker, Kvitfjell/Raudfjell, and Hitra 2 which would give a total production of 1,6 TWh(NVE-*Nykraftproduksjon*). There has, in general been a 58,6% increase in wind power production alone in the Nordic countries in the last five years.

### 1.3 Thesis Aim, Research questions & Approach

The objective of this study is to gain an understanding of how newer renewables have impacted incumbents whose businesses are centered around hydro power, the strategic responses, and options of these established firms to tackle disruptive innovations and business models within renewable energies. To understand the responses taken by incumbents, the first part of this study aims to find answers as to the rationale of establishing the analysis units, BKK's *Innovasjon og Utvikling*, and BKK Produksjon's *Forretningsutvikling og Innovasjon* unit. This leads me to the thesis' next aim which is seeking to understand how the two units FUoI, and IoU are addressing the potential threat



of newer renewables, as well as new innovations out in the market that could be disruptive to the incumbent's established business. The next part in the study aims to analyze how specifically, newer renewables have impacted the established hydro power, and whether the top management's conceptions of events unfolding in the renewable energy industry are in line with the theoretical framework compiled in this thesis. Finally, the thesis aims to analyze the organizational factors within the analysis units, that are facilitating the company's ability to successfully confront disruptive innovations, maintain a competitive advantage, as well as cater for the growth of the company.

To gain an in-depth understanding, an explorative and inductive approach investigating the innovation-oriented business units IoU, and FUoI was taken. Hence, an embedded single case-study research became the most viable alternative for this study attempting to answer the following questions;

- 1) What was the rationale BKK's IoU, and FUoI under BKK Production established?
- 2) How have newer renewables like solar and wind energy impacted BKK's established business, and to what extent have they been disruptive to BKK's established business?
- 3) How has BKK(IoU, and FUoI) addressed the various innovations and technologies that are perceived as disruptive to the established business?
- 4) What organizational factors are facilitating BKK's response to disruptive innovations and business models?

The aim of this thesis is not to find one definite answer to the above questions. The research study aims to uncover the impact of newer renewables on hydropower incumbents, the organizational barriers met by the established firms, as well as how well the established firms are responding to a fast-evolving energy industry with continuously new disruptive technologies being introduced into the market.

## 1.4 The case

BKK AS is the biggest energy company in the west of Norway, and one of Norway's main distributors of hydro-electrical power. The company was established June of 1920, with its core activities centered around the production, trading and transmission of electrical power, in addition to telecom services, district heating and meter measurements of energy. The corporation employs over 1100 employees and owns 28 hydro power plants which have an average production of about 6,9Twh. To gain a deeper understanding of how newer renewables have affected hydropower incumbents, it was chosen for this thesis to study the innovation-oriented unit *Forretningsutvikling og Innovasjon*, under the subsidiary company BKK Produksjon, that was perceived to feel the biggest impact of newer renewables on its established business model based on the production and sale of renewable hydro power energy. With the purpose of gaining an even broader understanding of the BKK innovation strategy and strategic responses to disruptive innovations, it became necessary to analyze the *Innovasjon og Utvikling* unit, under the mother company, in conjunction with the FUol unit. The case study thus evolved into an embedded single case study, with two units of analysis, IoU, and FUol, under the BKK organization.

## 1.5 Thesis structure

Chapter 2 provides a theoretical foundation and review of literature from which the theoretical framework will be drawn. The first section of this chapter will give the theoretical framework of innovation within organizations, disruptive technologies and innovations, important characteristics and types of such innovations, as well as a theoretical review of disruptive models. The next sub-chapter presents a theoretical framework of factors that are inhibiting incumbents to respond to disruptive innovations, followed by a presentation of how incumbents can utilize the principles of disruptive technologies to respond to disruptive innovations, and finalized by strategic responses to disruptive business models. The last and third section focuses on a theoretical review of key organizational elements that play a role in either inhibiting or facilitating incumbent firms to successfully respond to disruptive innovations.

Chapter 3, describes and evaluates the research design, and the different methods that were used to collect data.

Chapter 4 presents the analytical framework addressing and discussing the research questions. The first sub-chapter discusses the rationale for the establishment of the FUoI and the IoU units with the intention of finding answers to the first research question. This is then followed by an analysis and discussion about the impact of newer renewables on BKK's established hydropower with the purpose of addressing the second research question. The first section of this subchapter presents an evaluation of solar and wind energy as disruptive innovations, followed by a presentation of the trend of newer renewables' competitive advantage. The next sub-chapter presents BKK's strategic options for disruptive innovations with the purpose of addressing the third research question. The first section presents an analysis of factors inhibiting BKK from responding to disruptive innovations, followed an analysis of Innovation within BKK, and finalized with BKK's strategic options to disruptive innovations. The last sub-chapter of this chapter addresses the last research question analyzing aspects of the organizational elements, and the role they play as enablers or inhibitors to BKK 's response to disruptive business models, and innovations.

Chapters 5 presents an analytical summary of this study considering the presented theoretical framework, aiming to answer the research questions more directly.

Chapter 6 presents the conclusions and practical implications.

Chapter 7 presents limitations of this study and commendations for future studies

## 2 Theory

Before reviewing the strategic responses and choices of incumbents when confronted with disruptive technologies, this chapter begins by highlighting innovation within organizations as theorized by Paul Trott, and then goes on to lay out a conceptual framework of sustaining technologies, disruptive technologies, and innovations. The literature review then focuses on different types of disruptions, and a theoretical review of disruptive business models. The final part of the chapter presents organizational factors which are essential in either inhibiting or facilitating incumbents' responses to disruptive innovations in a constantly evolving industry.

### 2.1 Innovation within Organizations

In order to gain some understanding of what characterizes an organization that is innovative, for the purpose of this thesis this sub-chapter is going to give a brief theoretical overview of innovation within organizations, as laid out by Paul Trott(2012).

To understand innovation, (Trott, 2012) argues that innovation is a very broad concept that can be understood in a variety of ways. He then offers one of the more comprehensive definitions of innovation offered by Myers and Marquis(1969);

*"Innovation is not a single action but a total process of interrelated sub processes. It is not just the conception of a new idea, nor the invention of a new device, nor the development of a new market. The process is all these things acting in an integrated fashion."*(Trott, 2012)(p.15)

P.Trott himself describes innovation as; *"The management of all activities involved in the process of idea generation, technology development, manufacturing and marketing of a new(or improved) product or manufacturing process or equipment."*(Trott, 2012)(p.15)

Furthermore, the author explains that innovation in an organization can easily be identified by the organizational characteristics that facilitate innovation, the value chain of the organization, and how the organization is structured(Trott, 2012).

Trott argues that within almost every organization, there is a fundamental tension between the need for stability, and the need for creativity despite the company's requirement to be stable with static routines to accomplish daily tasks efficiently, and quickly. The author claims that a common dilemma in the management of innovation is managing the tension between efficiency, and creativity (innovativeness), and that an organization that focuses on efficiency improvement of the day-to-day operations within an organization acquires efficiency gains. The writer goes on to explain that a company which focuses on the development of new products and services in an environment where creativity and room to try out new ideas is permitted, acquires creativity gains. The author argues further that if firms wish to improve innovation performance, it is necessary to put in place, and then develop factors that stimulate innovation such as appropriate leadership, R&D projects, as well as creativity (Trott, 2012) (p.84-85).

## **2.2 Disruptive technologies and innovations**

To gain a deeper understanding of the critical elements that play a hand in responding to disruptive technologies, and innovations, this chapter is going to present a theoretical framework of disrupting technologies in conjunction with sustaining technologies. A conceptual framework of definitions and theories of disruptive technologies, and innovations from different scholars and academics will be given, including types of disruptions as identified in previous research including the assessment of disruptive innovations.

### ***2.2.1 Conceptual framework of disruptive technologies, and sustaining technologies***

Giving a comprehensive review of disruptive innovation, (Yu and Hang, 2010) clarified the basic concept of disruptive innovation, including some common misinterpretations of the concept. The disruptive innovation theory was advanced by Christensen's *Innovator's dilemma* (Christensen, 2013) originally published in 1997; Christensen and Bower's *Customer Power, Strategic Investment, and the failure of leading firms* (Christensen and Bower, 1996); and Christensen and Raynor's *Innovator's solution* (Christensen and Raynor, 2013) originally published in 2003. (Yu and Hang, 2010)'s illustration was built based upon previous major technological research among them, Christensen's works as shown in *figure 3*.

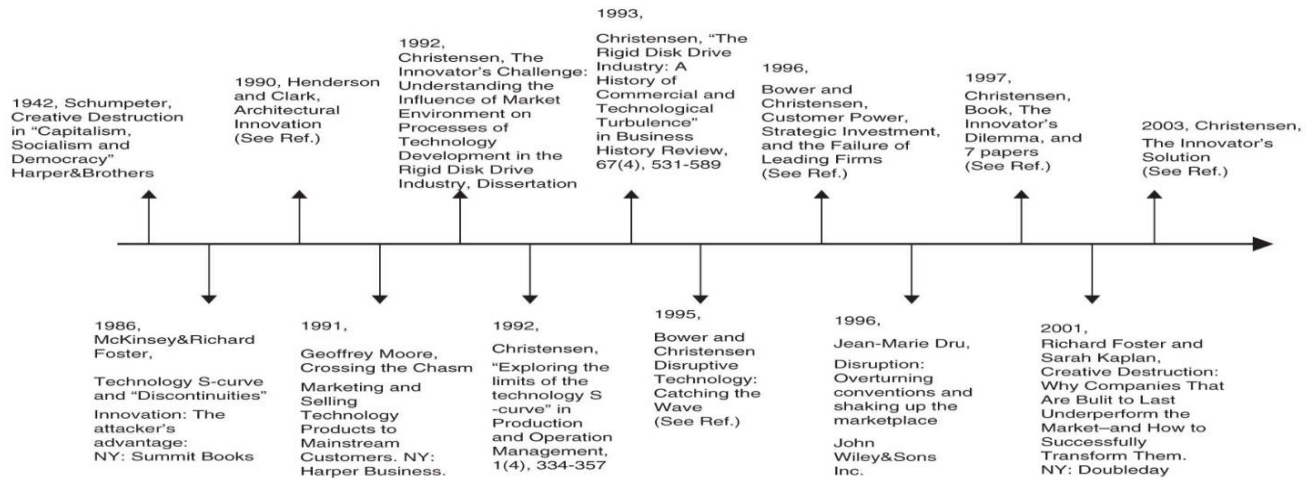


Figure 3: Timeline of evolution of Disruptive Innovation Theory. Summarized based on the early literature of technology discontinuity as well as on the papers and books of Christensen (Source; Yu and Hang(2010))

Clayton Christensen and Joseph Bower defined "disruptive technologies", and "disruptive innovations" in their article (Bower and Christensen, 1995) that addressed the failure of leading companies to stay at the top of their industries when technologies and markets change. This was elaborated upon by introducing the concept of "disruptive technologies" as "...New technologies that don't initially meet the needs of mainstream(Bower and Christensen, 1995).

In his book "The Innovator's Dilemma", originally published in 1997, Christensen (2013) popularized the disruptive innovation theory in which he addressed the circumstances under which new technologies caused great firms to fail, in addition to managerial solutions about how managers can simultaneously do what is right for the survival of their established businesses while focusing adequate resources on the disruptive technologies that ultimately lead to their downfall. According to Christensen's definition, disruptive technologies are commercial disruptions in an existing marketplace in which a new technology, product or service is introduced. As conveyed in his book, the author developed and built a failure framework for why leading firms fail. In his first finding, he made a strategic and important distinction between sustaining technologies, and those that are disruptive. The author describes *sustaining technologies* as new technologies which foster improved product performance. He states that these technologies, can be discontinuous or radical in character,

while other are of an incremental nature. He further elaborates that all sustaining technologies have in common is that they *improve the performance of established products*, along the dimensions of performance that mainstream customers in major markets have historically valued(Christensen, 2013)(p.xix).

Christensen (2013,p.xx) discusses the second element of the failure framework as the observation that sustaining technologies have the ability to progress faster than the market demand. *Figure 4* shows the impact of sustaining and disruptive technological change. The figure shows that as management makes efforts to put out improved products compared to their competitors, with a purpose of gaining higher margins, suppliers tend to give customers more than they need, or are basically willing to pay for. Furthermore, this implies that the disruptive technologies that

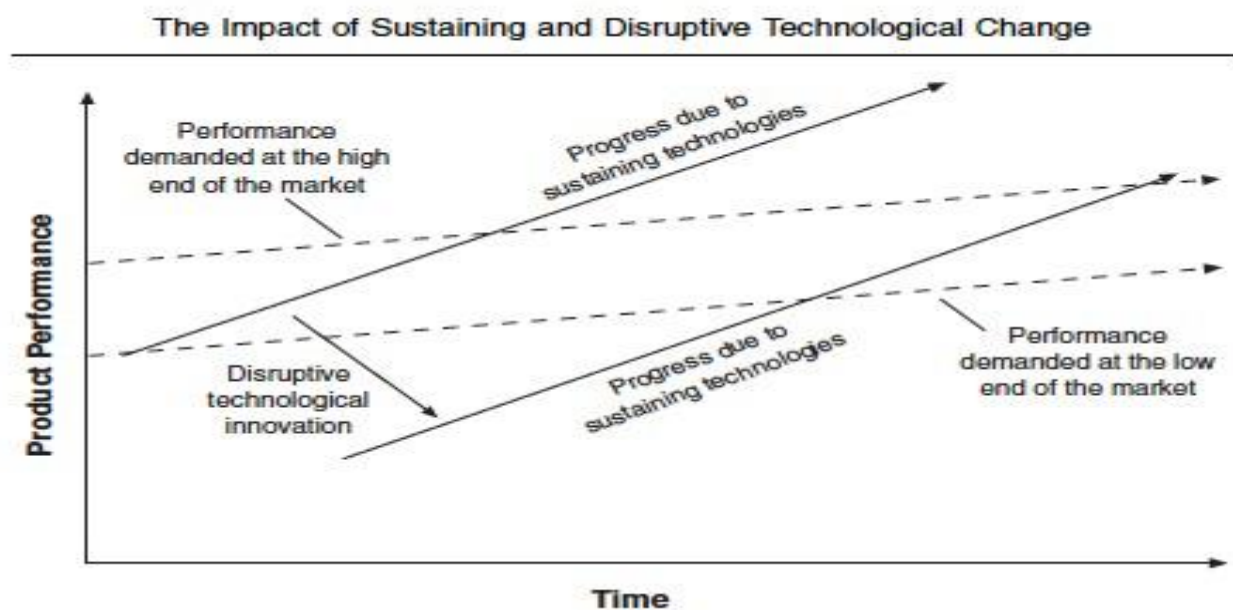


Figure 4: The impact of sustaining and disruptive technological change(Source Christensen(2013,p.xx)

may underperform today, relative to what customers in the market demand, may very well be performance-competitive in the very same market tomorrow(Christensen, 2013).

Tushman and Anderson(1986) refer to disruptive technologies as *competence-destroying* because they require new skills, abilities, and knowledge in the development and production of the product, and they refer to sustaining technologies as competence-enhancing because these technologies improve the quality of competences in existing firms(Tushman and Anderson, 1986).

Christensen and Raynor(2013,p.40) point out that the source of the incumbent firm's dilemma is that sustaining innovations tend to be more important and attractive, compared to disruptive innovations, and that the established companies that are very good at sustaining technologies ignore the disruptive threats, and opportunities, until it is too late(Christensen and Raynor, 2013). In the final element of the failure framework, Christensen(2013,p.xxi) points to four aspects as basis for managers' deductions that investing aggressively in disruptive technologies is not a rational financial decision; a) Simpler, cheaper, and lower performing, b) They generally promise lower margins, not higher profits, c) Leading firms' most profitable customers generally cannot use and don't want them, d) They are first commercialized in emerging or insignificant markets. Disruptive technologies are generally closely tied to disruptive innovation(Christensen, 2013). Christensen(2013,P.190) mentions two other consistent characteristics that consistently affect product life cycles, and competitive dynamics;

*"...First, the attributes that make disruptive products worthless in mainstream markets typically become their strongest selling points in emerging markets; and Second, disruptive products tend to be simpler, cheaper, and more reliable and convenient than established products."*(Christensen, 2013).

Based on Christensen's explanations, Yu and Hang(2010) elaborate on the disruptive innovation theory stating that, while improved, the performance of the disruptive technology remains inferior compared with the performance offered by the established mainstream technology, which itself is improving as well. According to the authors, the market disruption occurs when, despite its inferior performance on focal attributes valued by existing customers, the new product displaces the mainstream product in the mainstream market(Yu and Hang, 2010). Christensen(2006) calls attention to the importance of relativity as a crucial concept in the theory of disruption by stating that; *"...Another improvement in the definition of the phenomena has been in understanding that disruptiveness is not an absolute phenomenon but can only be measured relative to the business model of another firm."*(Christensen, 2006). This implies that an innovation that is considered disruptive relative to the business model of one firm can be sustaining relative to the business model of another firm. Consequently, an idea that is disruptive to one business, may be sustaining to another(Christensen and Raynor, 2013).



Christensen's works in *The Innovator's Dilemma* (Christensen, 2013) , *The Innovators Solution* (Christensen and Raynor, 2013), and *Seeing What's Next* (Christensen et al., 2004) outline the essence of what a disruptive innovation is. It is basically described as a new product that underperforms with regard to the primary performance dimension most appreciated by mainstream customers of the old product. (Danneels, 2004) explains that although disruptive technologies initially underperform established ones in serving the mainstream market, they eventually displace the established technologies. Initially, disruptive technologies do not satisfy the minimum requirement along the performance metric most valued by customers in the mainstream segment and thus are considered inappropriate by incumbents in the mainstream market for satisfying the needs of their customers(Danneels, 2004).

According to Christensen and Raynor(2013,p.33-34), when the disruptive product gains a foothold in new or low-end markets, the improvement cycle begins. The authors go on to explain that because the pace of technological progress overtakes the customers' abilities to use it, the technology that was supposedly not good enough before, eventually improves well enough to intersect with the needs of the mainstream customers. It is when this happens that disruptors are set on a path to win over incumbents. This is shown in *figure 5*.

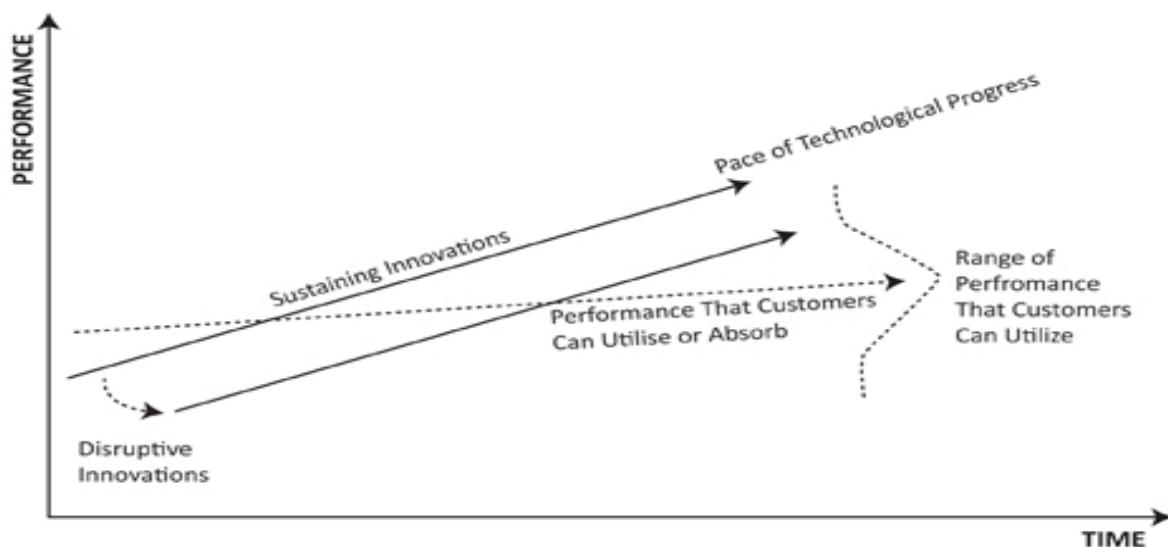


Figure 5: The simple 2- dimensional disruptive Innovation Model(Source: Christensen and Raynor 2013, p.33)

The dotted line sloping gently upward illustrates the rate of improvement that customers can utilize or absorb. The more steeply sloping lines illustrates a distinct and different trajectory of improvement that innovating companies provide as they introduce new and improved products or services represents the pace of the technological progress. According to the authors, a firm whose products are squarely positioned on mainstream customers' current needs today will probably overshoot what those same customers are able to use tomorrow, and this is mainly because companies keep striving to make better products that they can sell for higher profit margins to the best customers in more demanding classes of the market(Christensen and Raynor, 2013).

The model shows a clear distinction between sustaining, and disruptive innovations, where sustaining innovation targets demanding, high-end customers with better performance than what was available previously, and disruptive innovations that disrupt and redefine that trajectory, by introducing products that are not as good as the currently available products, but rather offer other benefits like being simpler, cheaper, or even more convenient, and generally appeal to new or less-demanding customers. Christensen and his colleagues' works reveal that over time the disruptive innovation improves on the primary dimension to the extent that it eventually appeals to the very mainstream customers that initially disregarded it. It is noteworthy that the new product could perform better on a different dimension and may thus open a new market(Christensen and Raynor, 2013)(p.33-34). Even more positive, is that firms that can create and exploit emerging technologies, capturing or creating markets, can add significant value to their bottom line (Christensen et al., 2004)

Yu and Hang(2010) argue that a real disruptive innovation should be examined through different aspects, and highlight three important aspects to clarify potential misunderstandings about disruptive innovation; that disruption is a relative phenomenon; That disruptive innovation does not always imply that entrants will replace traditional established businesses, nor does it imply that disruptors are necessarily start-ups; That a disruptive innovation is not necessarily a *destructive* innovation(Yu and Hang, 2010). (Christensen and Raynor, 2013) identify two types of disruptions; New-market disruption where a new customer segment sees value in the disruptive innovation; Low-end disruption

where the more price-sensitive mainstream customers may see value in the disruptive innovation

### 2.2.2 New-market, high-end, and low-end disruptions

(Christensen and Raynor, 2013) replaced the term disruptive *technologies* with disruptive *innovations*. Additionally, they widened the concept of disruptive innovations to include both services and business models in addition to technological products. Here they used the terms disruptive innovations to refer to disruptive technologies, disruptive products, and disruptive business models.

Christensen and Raynor(2013,p.44) elaborate on disruptions by presenting two different types of disruptions as illustrated in *figure 6* with a third axis representing new customers, and new contexts of consumption and competition.

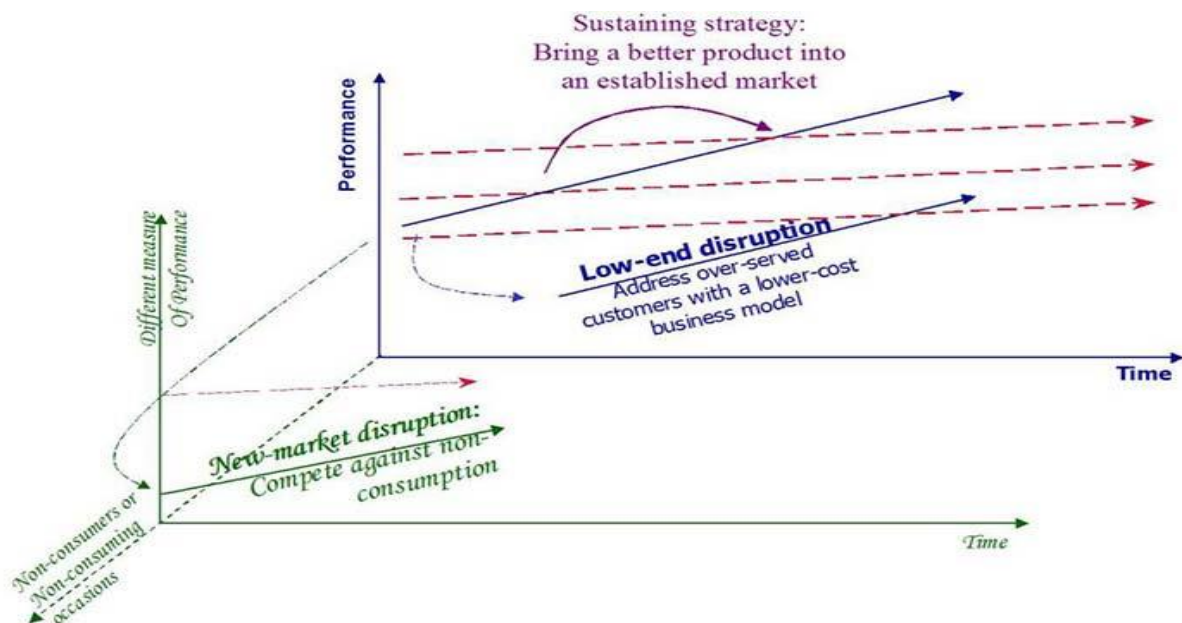


Figure 6: The third dimension of the disruptive Innovation Model including Low-end and new market disruptions(Source: Christensen and Raynor(2013, p.44))

The authors elaborate that the third dimension represents new contexts of consumption and competition, which are new value networks. A value network is defined by Christensen and Raynor, as; “..the context within which a firm establishes a cost structure and operating

*processes and works with suppliers and channel partners in order to respond profitably to the common needs of a class of customers''* (Christensen and Raynor, 2013). Each company's competitive strategy, and particularly its cost structure and its choices of markets and customers within a value network determines its ability to be aware of the economic value of an innovation, and it is these exact perceptions that form the rewards and threats that firms expect to experience either through disruptive or sustaining innovations. Henceforth, the writers refer to disruptions that create a new value network as *New-market disruption*, and *low-end disruptions* as disruptions that serve the least-profitable and most overserved customers at the low end of the original value network. According to Christensen and Raynor, even though the *new-market disruptions* initially compete against non-consumption in their new value network, as their performance improves, they ultimately become good enough to pull customers out of the original value network, into the new one. The authors explain further, that in this case, the disruptive innovation does not necessarily invade the mainstream market, but instead pulls customers out of the mainstream value network, into the new one for convenience purposes. On the other hand, low-end disruptions take hold at the low end of the original mainstream value market, and do not create any new markets. There are however some disruptions that combine new-market, and low-end disruptions that are referred to as hybrid disruptions by the authors. These disruptions are characterized by disruptors pulling customers from the low-end of the original mainstream value network, and at the same time creating new markets (Christensen and Raynor, 2013)

(Govindarajan and Kopalle, 2006b) broaden on Christensen's definition of disruptive technologies to include high-end as well as low-end disruptions, and thus giving a more thorough overview of the disruptiveness of innovations by exploring beyond the cases of low performance, and low price. The authors argue that disruptive innovations could involve either radical technologies (high-end disruptions that are technologically more radical) or incremental technologies (Low-end disruptions that are technologically less radical). In order to give a more general measure of disruptiveness of innovations the authors make an important distinction between the disruptiveness construct from that of radicalness, where the radicalness of innovations is the extent an innovation is based on a significantly new technology relative to an existing practice (Dewar and Dutton, 1986, Ettlie et al., 1984), and where the disruptiveness of innovations is the extent an emerging customer segment, unlike

the mainstream customer segment, sees value in the innovation at the time of introduction, which over a period of time disrupts the products which mainstream customers use (Adner, 2002, Christensen, 2013). Govindarajan and Kopalle (2006) summarize this distinction by describing radicalness as a technology-based dimension of innovations, and disruptiveness as a market-based dimension. The authors define the high-end disruptions as disruptive innovations having inferior performance in traditional attributes, and a higher price. A further definition of these innovations is based on the technological radicalness of the innovation, in which the high-end disruptions are more technically radical than low-end innovations (Govindarajan and Kopalle, 2006b).

To aid in understanding why some innovations are more (or less) disruptive to the long-term health of incumbents, (Schmidt and Druehl, 2008) offer an alternate terminology and a framework complementary to Christensen's work, focusing on the diffusion pattern of the new product (disruptive innovation). Schmidt and Druehl's work offers the alternate terminology by introducing the term "*encroachment*" which basically means that the new product takes sales away from the old product. They elaborate this in their definitions of low-end *encroachment* as;

*"...the scenario where the new product first displaces the old product in the low end of the old product market and then diffuses upward (the new product may open up a new market before encroachment begins). The low end of a product's market is defined to consist of those customers with lowest willingness to pay for the product (they have the lowest demand for the product's key performance attributes)"* (Schmidt and Druehl, 2008).

According to the authors, high-end *encroachment* progresses in a reverse manner, "*... The new product first encroaches on the high end of the existing market and then diffuses downward..*" starting at the high end of the old-product market (Schmidt and Druehl, 2008).

### **2.2.3 Disruptive business models**

This sub-chapter navigates through the theoretical strand about disruptive business and a theoretical strand of Charitou and Markides (2003)'s responses to disruptive strategic innovations which Markides later re-termed as (disruptive) business-model innovation to avoid misunderstandings (Markides, 2006). In this research study, the definition of business

models will adapt that proposed by Osterwalder and Pigneur; *A business model describes the rationale of how an organization creates, delivers, and captures value*(Osterwalder and Pigneur, 2010)(P.14).

Given that organizations commercialize their technologies, or new ideas through business models, it is henceforth eminent to innovate the business models through which the value creation process shall be implemented because as Chesbrough puts it; *"...the same idea or technology taken to market through two different business models will yield two different economic outcomes. So it makes good business sense for companies to develop the capability to innovate their business models."*(Chesbrough, 2010). Amit and Zott(2001)propose that a firm's business model is an important locus of innovation and therefore a crucial source of value creation for the firm and its suppliers, partners, and customers(Amit and Zott, 2001).

According to Chesbrough (2010), it is the aspect of business model experimentation, which represents the most prominent barrier met by incumbent businesses. Furthermore, it is often observed discrepancies in companies regarding the amount of investments in processes for exploring new ideas and technologies, relative to the low ability of these same businesses to innovate their business models through which inputs will pass. The writer points out that an innovation can successfully employ a business model already familiar to the organization, while in other instances, a potential new technology with a disruptive character, may have no obvious business model. The author argues that in such cases, the managers should expand their perspectives to find and develop a business model that enables them to capture value from that technology(Chesbrough, 2010).

Incumbents find themselves facing a dilemma of how to respond to disruptive innovations from competing firms that have business models that are different and conflict with the established business models. To avoid the risk of damaging their existing business and disregarding current well-functioning strategies, Charitou and Markides (2003) propose *strategic innovation* which he defines as *".....an innovation in one's business model that leads to a new way of playing the game"*(Charitou and Markides, 2003). The authors use the term *"Disruptive strategic innovation"* as a particular *"...way of playing the game that is both different from, and in conflict with the traditional way"*, which Markides later re-termed as *"business-model innovation"* and declared that the new term captured the essence of what

strategic innovation was, without ambiguity. The author defined this type of disruptive innovation as the discovery of a fundamentally different business model in an existing business. He goes on to explain that business-model innovators do not come up with new services or products, but rather redefine the established product, and how it is provided to the customer (Markides, 2006). Chesbrough argues that a company has at least as much value to gain from developing an innovative business model as from developing an innovative technology (Chesbrough, 2010).

In their unit analysis of the business model, Amit and Zott (2001), identify four key aspects of business model innovation as efficiency, complementarities, lock-in, and novelty. (Chesbrough, 2010) notes however, that these key aspects would quite likely become barriers for business model innovation within a well-established firm with old traditional ways and arrangements of organization assets. The author goes to explain that managers of these companies tend to resist business model experimentation that might threaten the current value to the company. (Amit and Zott, 2001, Christensen, 2013) identify the root of the tension in disruptive innovation as the conflict between established business model for existing technology, and that which may be required to exploit the emerging, disruptive technologies.

### **2.3 Strategic options in managing disruptive Innovations.**

(Bower and Christensen, 1995) address the most consistent patterns in business as the failure for leading companies to stay on top when technologies, or markets change. The aim of this sub-chapter is to give a theoretical overview of how incumbents can break these patterns, and consequently make strategic choices to confront disruptive innovations, and technologies. The sub-chapter starts out by giving a theoretical overview of factors that play a role in inhibiting firms to respond to disruptive innovations, followed by a theoretical overview of how managers can manage and respond to such innovations. For this thesis, the strategic options to dealing with the challenge of disruptive technologies will focus on harnessing the *principles* of disruptive innovation, as laid out by Clayton M. Christensen in

his book *"The innovation Dilemma*, and a theoretical review of strategic responses to disruptive business models.

### ***2.3.1 Factors inhibiting incumbent response to disruptions***

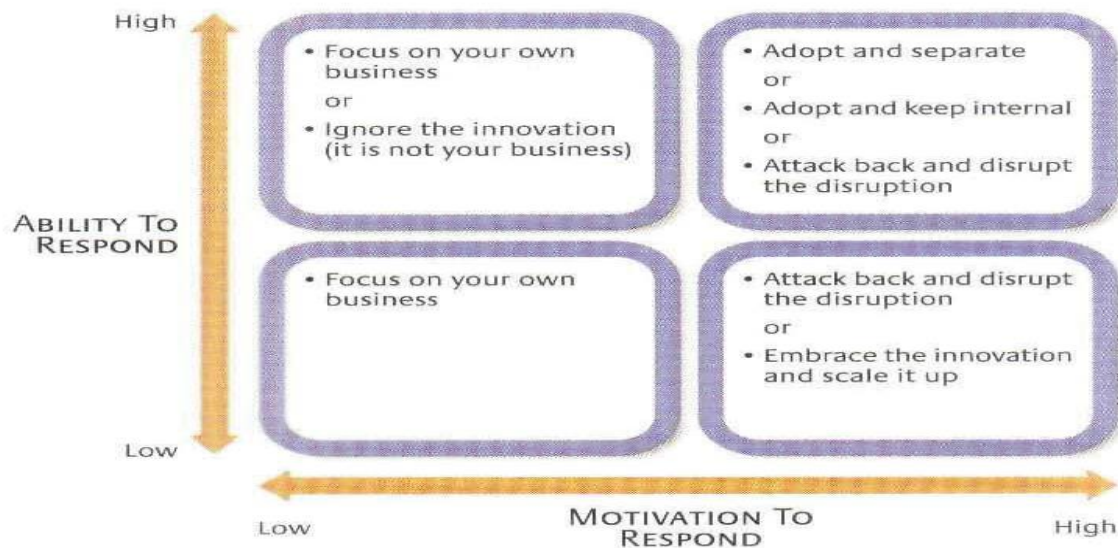
Hill and Rothaermel(2003) discuss strategic reasons for incumbent inflexibility that when confronted with disruptive innovations a firm's value network of suppliers, customers, investors, etc, to which the firm has made strategic commitments may produce fatal inflexibility. The authors present two possible explanations for incumbent inflexibility as strategic reasons; economic, and organizational theory explanations. The authors elaborate on economic explanations by drawing on economic models that suggest that incumbents have an incentive to invest in sustainable innovations since they add to their established knowledge base, maintain entry barriers, and protect or enhance existing streams of income. More so, according to the authors, an extension of these economic models suggest that under conditions of uncertainty, incumbents who already enjoy a huge portion of market will rationally invest less in disruptive innovations for fear of crippling the stream of rents from their established products or services. Furthermore, incumbents seek to maximize marginal returns from the established technology rather than devote resources to pioneering new technology with an uncertain payoff. The incumbents thus preferably channel funds into R&D activities that support sustaining innovations to their existing knowledge base and settle for producing a predictable stream of rents(Hill and Rothaermel, 2003).

On the elaboration of explanations rooted in Organizational theory, Hill and Rothaermel (2003) focuses on arguments that organizations are valued for their predictability, and reliability, and hence tend to foster information systems and processes that enhance these attributes. According to the authors, these systems require formalization and bureaucracy attributes that tend to inhibit change, and thus paradoxically, the systems that help ensure organizational survival in stable environments contribute to inertia and organizational decline when the company is confronted by disruptions(Hill and Rothaermel, 2003). This line of reasoning is concise with one of Christensen's five proposed principles of disruptive innovations which managers can harness in order to establish a suitable response to



disruptive innovations which is; “..Organizational capabilities of incumbents define its disabilities”(Christensen, 2013).

Charitou and Markides(2003) claim that how a company responds to disruptive innovations is dependent upon its motivation and ability to respond as shown in *figure 7*... According to the authors, if the motivation in the firm is low, incumbents



*Figure 7: Summary of how incumbents respond to disruptive innovations (Source; charitou & Markides(2003))*

respond by ignoring the disruptive innovation, and focusing on the main business, and if the motivation is high, the suitable response is dictated by the abilities of the firm, and its circumstances(Charitou and Markides, 2003). The authors argue that it is difficult for an established company to respond to disruptive innovations effectively by trying to compete in both the established position, and the new disruptive position simultaneously hence this kind of strategy can lead to degradation of the value of existing activities, resulting into major inefficiencies for the established business. The authors go on to stress that “..any attempt to manage the innovation by utilizing the company’s old systems, processes, incentives and mind-sets will only suffocate and kill the new business.”(Charitou and Markides, 2003). This is consistent with Christensen’s notion of the necessity of spinning out a small independent company to commercialize disruptive innovations so that the project is regarded by the staff as being on their critical path to growth and success, rather than as being a distraction from the mainstream business of the organization. Because as he puts it;

*"...Expecting achievement-driven employees in a large organization to devote a critical mass of resources, attention, and energy to a disruptive project targeted at a small and poorly defined market is equivalent to flapping one's arms in an effort to fly: It denies an important tendency in the way organizations work"*(Christensen, 2013)(p.135).

### **2.3.2 Harnessing the fundamental laws of disruptive technologies**

Christensen proposes five fundamental principles of disruptive technology which he claims, can be harnessed so that managers can successfully confront disruptive innovations. The author argues that if managers can understand, and harness these "fundamental laws of disruptive technology", instead of fighting against them, they will heighten their chances of success in the confrontation of disruptive innovations. The fundamental laws of disruptive technology as proposed by Christensen(2013b) are as follows; 1) *Resource dependence*: Customers and investors effectively control the patterns of resource allocation in well-run companies; 2) *Small markets do not solve the growth needs of large companies*; 3) *Markets that don't exist cannot be analyzed*: Failure is an intrinsic step towards success; 4) *Organizations have capabilities that exist independently of the capabilities of the people who work within them*; 5) *Technology supply may not equal market demand*(Christensen, 2013)(p.99)

### **2.3.3 Strategic responses to disruptive business models**

Charitou and Markides(2003)' argue that one of the biggest fallacy about disruptive business innovation, is that the new way of creating value is better than the established way. The authors blame this misapprehension on previous research which implied that disruptive technologies replaced the old and established technologies completely and ruined competitors who did not manage to adapt the disruptive business model. The writers elaborate that with business model innovation, the new methods of competing grow rather rapidly to control a certain percentage of the market but fail in overtaking the traditional way of doing business completely. In appreciating that the disruptive business model is neither superior to the established business model neither destined to take complete control of the market, the authors argue that the established competitor does not

necessarily have to adopt the new business model, but can simply ignore it, and instead focus its resources on improving the competitiveness of its traditional business model relative to the disruptive strategic innovation(Charitou and Markides, 2003).

Before adopting a disruptive business model, Charitou and Markides(2003) assert the importance of established firms making an assessment as to whether the new business model is in any way related to the existing one. Consistent with previous research, the authors argue that there is need for firms to go beyond the shallow similarities at industry level and must instead assess relatedness at the competency level. The writers assert that only if the established business and the disruptive one share difficult-to-imitate assets, skills and competences, should the business models be considered related. If not, the authors suggest that the established competitor should not consider the disruptive innovation as a threat, and should therefore simply ignore it(Charitou and Markides, 2003).

Disruptive innovators build their success on introducing new, non-traditional product or service attributes that become attractive to new market segments. Typically, the innovators become good enough at delivering the product and service attributes that the mainstream customers value, and therefore begin to attract the customers that were loyal to the established competitors. In order to tackle this kind of disruption, Charitou and Markides(2003) propose that the established business should not focus on improving the same product or service attributes, but should instead focus on coming up with other different product attributes, and ultimately disrupt, the disruptor(Charitou and Markides, 2003)

Charitou and Markides(2003) argue that if an established firm resigns itself to adopting a disruptive business model, it should find ways of managing two different, and conflicting strategic positions simultaneously. For those established business that chose to embrace the disruptive innovation, the authors propose the establishment of a separate organizational unit, with a new CEO. The authors argue further that in addition to establishing a new organizational unit, it is important that the new independent company has autonomy to run its operations as it sees fit. According to the writers, the higher the degree of decision-making autonomy given to the new organizational unit is, the more effective the unit

becomes at playing the conflicting games simultaneously. The writers credit the success of the newly established unit mainly to the decision-making autonomy given to the new unit, and the degree of synergies between the new independent company, and its parent company(Charitou and Markides, 2003)

## **2.4 Organizational responses to disruptive innovations**

This sub-chapter presents theoretical reviews of organizational characteristics that are key in enabling or inhibiting suitable responses to disruptions. These characteristics include; The organizational culture, structure, and skills and competences.

Despite previous research indicating that incumbents are quite often not successful at commercializing on disruptive innovations(Henderson and Clark, 1990, Tushman and Anderson, 1986, Teece, 2003), there have been some exceptions to this depiction, who despite the organizational constraints, have managed to assess disruptive innovations, and gone on to successfully commercialize on them. The major question in research involving disruptive innovations is why incumbents fail to respond, or, and commercialize on disruptive innovations, and which organizational elements are key to foster successful responses to disruptive innovations.

### **2.4.1 Organizational Culture**

This section of the sub-chapter reviews organizational culture, and its role in the outstanding difficulties met by incumbents confronting changes related to disruptive innovations, as well as theoretical solutions to the innovator's dilemma in the context of organizational culture. In this study, the definition of Organizational culture is going to adopt that of G.R Jones as; *"...a set of shared values and norms that control organization's employees interactions with each other and with people outside of the organization"*(jones, 2013).

According to Christensen(2013, p.169), once members of a firm begin to adopt particular methods of working, and criteria for making decisions by assumption, rather than by conscious decision, then the processes and values come to constitute what is commonly referred to as *Organizational culture*. Christensen defines *processes* as patterns of

interaction, coordination, communication, and decision-making through which companies accomplish the transformation of inputs of resources into products and services of greater worth. The author further explains that *processes* are defined to cater to specific tasks. This implies that when management utilizes a process to execute the task for which it was designed, it is bound to perform efficiently. On the other hand, if the same seemingly efficient process is used to deal with a very different task, it is most likely to come off slow, inefficient, and even bureaucratic. The author puts this simply as; “..a process that defines a capability in executing a certain task concurrently defines disabilities in executing other tasks”(Christensen, 2013).

Christensen defines *values* as the criteria by which decisions about priorities are made. The author explains that an organization’s *values* are the standards by which employees make prioritization decisions by which they make judgements on which orders should be made or not, which customers are more important, which product or service is marginal, etc. The author points out however that these same clear, consistent, and well understood values also define what an organization cannot do(Christensen, 2013)(p.164). Christensen and Raynor(2013, p.187-188) point to the migration of capabilities as key to how an organizational culture comes to be. The authors explain that in the start-up stages of a business, a lot of what is accomplished in the business is mainly because of the resources. Over time, as people work successfully to address recurrent tasks, the firm’s capabilities shift towards the organization’s processes. And as the business model takes form, and it becomes clear as to which activities or and customers are accorded highest priority, values emerge. According to the authors, as successful organizations mature, the members begin to adopt methods of working and criteria for making decisions by assumption, rather than by conscious decision. This then implies that the processes and values have come to constitute the *organization’s culture*. The authors point out that when the organization’s capabilities reside in its people, then changing to address a disruptive innovation is relatively simple. But when the capabilities have come to reside in processes and values, and most specifically if they have embedded in culture, then change can be extraordinarily difficult(Christensen and Raynor, 2013).

Deshpande and his colleagues present the competing values model identifying four cultural types identified in *Figure 8*, illustrating shared beliefs applicable to dominant organizational

attributes, leadership styles, organizational bonding mechanisms, and overall strategic prominence(Deshpandé et al., 1993).

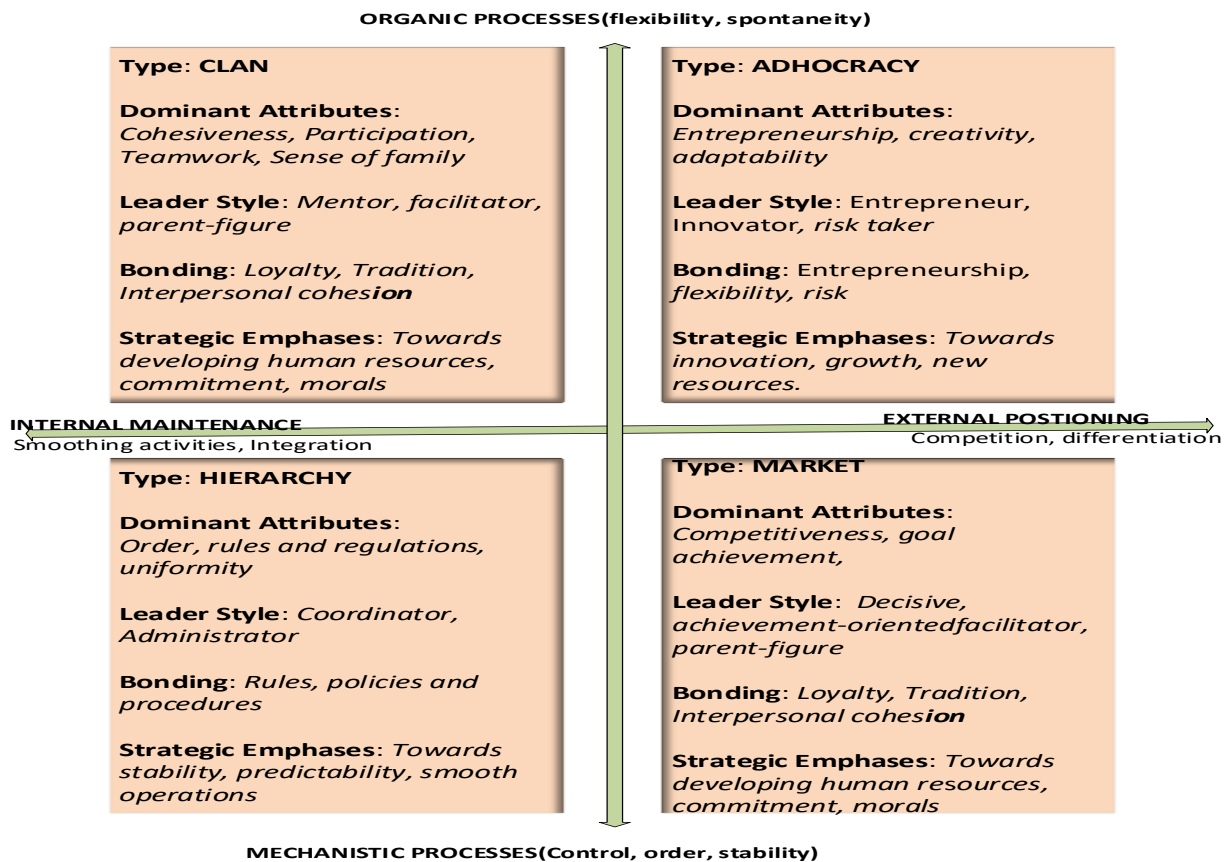


Figure 8: A model of organizational culture types as adapted from (Deshpandé et al., 1993)

According to Deshpandé et al. (1993), the four classifications of culture presented in the figure 8 represent extremes of a continuum as well as varying degrees of business performance in a competitive market place. The vertical axis describes the continuum from organic(flexibility and spontaneity) to mechanistic processes(Control, stability, and order). The horizontal axis describes the relative organizational emphasis either on internal maintenance (smoothing activities, integration), or external positioning(Competition, environmental differentiation). This results into four culture types presented as clan, hierarchy, adhocracy, and market. As depicted in figure 8, the market culture characterized by its emphasis on competitive advantage and market superiority, is expected to result in the best business performance. Portrayed on the other extreme is a hierarchical culture with its emphasis on predictability and smooth operations within a bureaucratic organization contributing to relatively unsatisfactory performance.

On the other hand, the adhocracy culture with its emphasis on innovation, entrepreneurship, and risk taking is expected to have better market performance than clan culture in which tradition, loyalty, and emphasis on internal maintenance may lead to a lack of attention to changing market needs. Deshpande and his colleagues point out that organizational emphasis on external positioning is likely to be associated with stronger performance over internal maintenance. The authors then rank business performance according to organizational cultures from best to worst where best is assigned 1, and the worst is 4, in the following order; 1- Market Culture, 2- Adhocracy culture, 3- Clan culture, 4- Hierarchical culture. Due to the multiple and conflicting goals of many organizations like growing environmental constraints, regulations, research shows that organizations are operating in more complex environments. This implies that these culture types are not mutually exclusive, and it is often found that organizations have elements of different types of cultures (Deshpandé et al., 1993).

#### **2.4.2 Organizational Structure**

The design and alteration of the organizational structure is decisive on an organization's ability to respond to disruptive innovations. Adopting G.R Jones definition of organizational structure as; *..the formal system of task and authority relationships that control how people coordinate their actions and use resources to achieve organizational goals*" (Jones, 2013), this section presents a theoretical overview regarding responses to disruptive innovations through focusing on the design, and alteration of the organizational structure. These alterations include acquisitions and external partnerships, establishing of an autonomous unit, and ambidextrous organizations.

Govindarajan and Kopalle (2006) address the establishment of separate organizational units as a strategy to confront, and respond to disruptive innovations relative to using the organization's existing structure. The authors assert that it can be expected that the creation of separate organizational units will encourage the development of disruptive innovations mainly because as they put it; *"...developing disruptive innovations may require new*

*processes and new routines, and the creation of autonomous units will aid in breaking from current routines and processes*” (Govindarajan and Kopalle, 2006b). According to Christensen (2013), for an organization to have the ability to respond to disruptive innovation, it necessitates management to make an evaluation as to whether the current organizational capabilities are suited at all for the new task.

#### **2.4.2.1 External partnerships**

Some research perceives partnerships with external companies as a valuable way to accumulate new ideas and create an openness to innovation. Chesbrough (2003) argues that large well established companies are shifting from their traditional inward R&D focus to a more outward looking management that draws on technologies from networks of universities, start-ups, suppliers and competitors (Chesbrough, 2003a). Chesbrough and Crowther's (2006) discuss competitive advantage originating from *inbound open innovation*, which, according to the writers is the practice of leveraging the discoveries of others. The authors explain that firms do not have to exclusively rely on their own R&D activities and go on to discuss *Outbound open innovation* which suggests that rather than relying entirely on internal paths to market, companies can look for external organizations with business models that are better suited to commercialize a given technology. In their research study, the authors found that some incumbents viewed open innovation as a way to monitor potentially disruptive innovations that could threaten or have a substantial effect on their established businesses (Chesbrough and Crowther, 2006).

In their study, Chesbrough and Crowther (2006) reported that for incumbents to imbed open Innovation principles into their organization, it started with top-down direction and clear positioning between the need to meet business growth objectives and the desire to look outside for technology. Furthermore, the authors found out that incumbents use open Innovation to address two very different growth objectives; those within the current business and those associated with a potential new business as portrayed in *figure 9*. According to the writers, when internal R&D fails to meet growth objectives, a growth gap emerges.



Exhibit D



Figure 9: Innovation strategy map as adopted from Chesbrough and Crowther(2006)

In order to close this first growth gap, the authors stress that there is need to strengthen or extend the current business by optimizing the execution of the existing established product. The authors explain further that to close the second business growth gap would require identifying potential new businesses in emerging technologies, although this objective was perceived to require a longer time horizon before any results would be achieved(Chesbrough and Crowther, 2006).

Crowther and Chesbrough discuss leveraging inbound open innovation to optimize development execution and found that when firms look outside the organization for technologies to extend or defend their core business, risk is minimized by investing in technology that is often proven in other applications as compared to completely new and unknown technologies. Furthermore, companies were liable to seek agreements with entrepreneurs and smaller companies so that market exclusivity can be obtained. According to the authors, bringing outside technology into the company requires internal 'champions' who can interact effectively with others in many different functions across the enterprise. These champions are viewed as vital in the support of the effort needed to integrate the external technology into an existing product development phase–gate process(Chesbrough and Crowther, 2006).

Addressing leveraging inbound open innovation to create step-change growth, Chesbrough and Crowther(2006) point out that using open innovation to generate new growth in revenues requires a company to confront the issue of over-funding incremental business projects and inadvertently under-funding potentially higher growth, longer term options. The authors go on to argue that companies scanning for breakout technologies under these target areas tend to focus efforts in sub-areas that are perceived as most relevant to their existing established businesses. These opportunities, according to the authors, are of a higher risk, and to manage such risks, companies place a series of small bets at an early stage on unproven technology where commercial viability is unclear, and occasionally, companies go beyond investment and seek board involvement or provide access to internal resources for joint development(Chesbrough and Crowther, 2006). As such, research shows that open innovation; the process by which firms combine externally and internally developed technologies with the sole purpose of developing new businesses(Chesbrough, 2003b), can be beneficial for incumbents, in terms of external partnerships so that they gain the ability to confront and respond to disruptive innovations.

#### **2.4.2.2 Autonomous units**

According to Christensen, a separate organization is required when the mainstream organization's values would render it incapable of focusing resources in the innovation project. The author explains that when a disruptive innovation requires a different cost-structure in order to be profitable and competitive, or when the present size of the opportunity is insignificant compared to the growth needs of the mainstream business, then a spin-out organization with an independent resource allocation process must be established as a strategic solution(Christensen, 2013).

Christensen and Raynor(2013,p.191) summarize a framework in *figure 10* which can aid management in exploiting the capabilities within their present processes and values when possible, and to create new ones, when the present mainstream business is incapable.

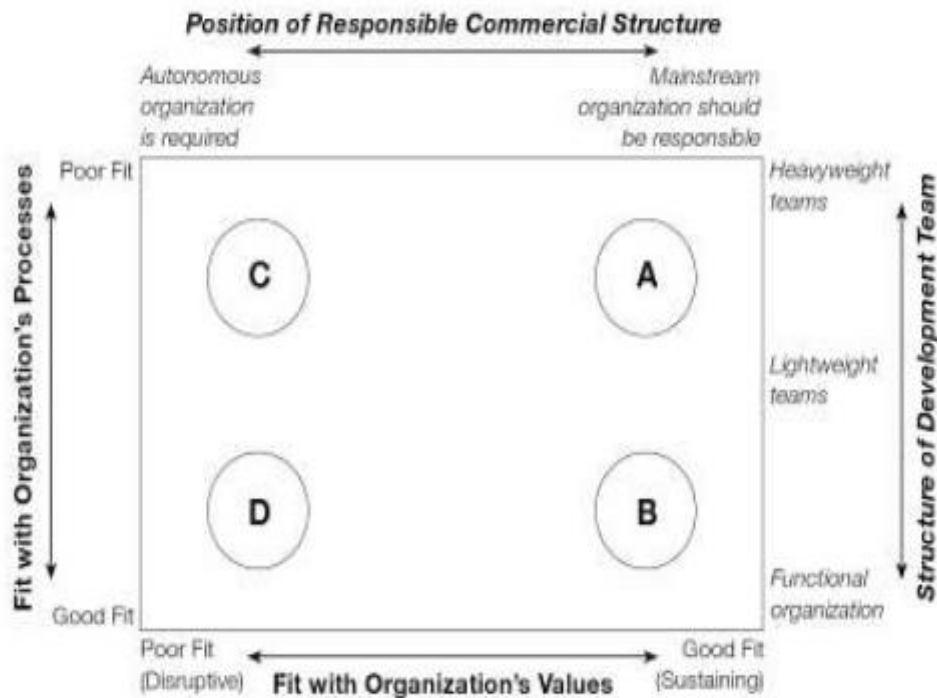


Figure 10: A framework for Fitting an Innovation's requirements with the organization's capabilities(Christensen and Raynor, 2013)(p.191)

According to the authors, the left vertical axis in *figure 10* measures the extent to which the existing processes(patterns of collaboration, interaction, communication, coordination and decision making currently used in the firm), are the ones that will get the new job related to the disruptive innovation done effectively. If the fit is good(Lower end of the scale), management can exploit the organization's existing processes and coordinate work that is done within the existing functional units. If the fit is poor, new processes and new team interactions will be required, and thus, a spin-out, or an autonomous organization is required(Christensen and Raynor, 2013)(p.192).

According to Christensen and Raynor, the lower horizontal axis helps managers to assess if the organization's values should allocate to the new initiative the resources it will need to become successful. If the fit is poor, then the mainstream organization's values will give low priority to the project, and the project is therefore potentially disruptive to the mainstream business model. If the fit is good, then mainstream organization will give high priority to the project, and the project is therefore, potentially sustaining. On the upper horizontal axis, the authors that the axis captures the level of autonomy needed by an organizational unit

attempting to exploit an innovation. The authors assert that for disruptive innovations, setting up an autonomous organization to develop and commercialize the product or service will be absolutely essential to its success. The other extreme indicates a strong sustaining fit, and according to the authors, the managers can expect the resources of the mainstream business to form behind it because the project is sustaining, and thus eliminating the need for a spin-out organization in this case(Christensen and Raynor, 2013)(p.192)

On the right vertical axis of *figure 10*, Christensen and Raynor explain that the axis maps out three types of organizational structures that can either be used to exploit or overcome existing. The authors further explain the four regions integrating the challenges of dealing with different types of fit with the mainstream organization's processes and values. Region A portrays a situation in which a manager is faced with a breakthrough but sustaining technological change where by it fits the organization's values but presents the organization with different types of problems to solve and requires new processes. Region B portrays a situation where the project fits into the mother company's processes as well as its values, and this implies that the new venture can easily be commercialized by coordinating across functional boundaries within the existing organization. Region C, on the other hand, depicts a disruptive technological change that fits neither the organization's existing processes, nor its values. To ensure success, managers are urged to create an autonomous organization. Region D characterizes projects in which the products and services are similar to those in the mainstream business but need to be sold within a fundamentally lower-overhead business model. The ventures in this region can maximize the organization's logistics management processes, but they require very different budgeting, management, as well as profit and loss profiles(Christensen and Raynor, 2013)(p.192).

#### **2.4.2.3 Ambidexterity organizations**

O'Reilly et al.(2008) describe ambidexterity as the ability of an organization to explore, and exploit disruptive innovations simultaneously. The authors argue that despite the high rate of incumbent's failure in the face of disruptive changes, some firms manage to adapt, and prosper over long periods of time. Addressing the conditions under which some organizations sustain their competitive advantage in the face of environmental transitions while others do not, the authors discuss *dynamic capabilities* which explore how some

organizations recombine and integrate their resources to adapt to market and technological changes(O'Reilly and Tushman, 2008).

Teece(2009) defines dynamic capabilities as an organization's ability to integrate, build, and reconfigure external, and internal competencies so as to confront rapidly changing environments(Teece, 2009). O'Reilly and Tushman argue that organizational capabilities are embedded in existing organizational routines, structures, and processes, and more specifically, these routines are found in the way the firm operates, its structures, cultures, and the mindset of senior management. The authors further point out that existing capabilities reflect an organization's ability to compete in the present environment, and the top management's challenge is to both nurture and refine these capabilities, and to be ready to reconfigure these assets as contexts shift(O'Reilly and Tushman, 2008).

O'Reilly and Tushman(2008) discuss the organizations' capacity to adapt in the face of disruptions, and according to the authors, the most basic part of the adaptive process are the notions of an organization's ability to exploit existing assets and positions in a profit generating manner and simultaneously exploring new technologies and markets by configuring and reconfiguring organizational resources to capture existing as well as new opportunities. The authors explain that this capacity is ambidexterity, or as otherwise referred to as exploitation, and exploration where exploitation involves efficiency, increasing productivity, control, certainty, and variance reduction, and where exploration involves searching, discovery, autonomy, innovation and embracing variation. Ambidexterity however, involves implementing both exploitation, and exploration(O'Reilly and Tushman, 2008). March(1991) argues that because of longer time horizons, incumbents will always specialize in exploitation, hence becoming more efficient in using what they have already mastered(March, 1991).

Tushman and O'Reilly discuss the complexity and rate of change faced by many organizations as well as the time required to develop new products and services and conclude that ambidexterity may require that exploitation and exploration is pursued simultaneously, with separate subunits, business models, and distinct alignments for each. According to the authors, ambidexterity, in this context, requires not only separate

structural subunits for exploration and exploitation but also different competencies, systems, incentives, processes and cultures in which each is internally aligned(O'Reilly and Tushman, 2008).

### **2.4.3 Human Resource Management**

According to O'Reilly and Tushman, present at the core of dynamic capabilities is the ability of senior managers to capture opportunities through the orchestration and integration of both new and existing assets to overcome inertia and path dependencies. Furthermore, these capabilities are lately perceived as the central basis underpinning of long-run competitive advantage. And as such, highlights the role of senior management teams in shaping competitive advantage over time(O'Reilly and Tushman, 2008). This sub-chapter is going to present a theoretical framework of what characterizes top management with the cognitive and behavioral flexibility required to establish both an autonomous unit, and an ambidextrous organization to address disruptive innovations.

Damanpour and Schneider(2006) discuss organizational and strategic leadership, and argue that top management has a big influence on organizational capabilities through the establishment of organizational culture, motivating and enabling managers and employees, as well as building capacity for change and innovation(Damanpour and Schneider, 2006). In their study, Sarros et al.(2008) argue that transformational leadership has the ability to facilitate and promote innovation, which in turn can ensure the long-term survival of an organization. In this context, the authors define transformational leadership as; “*..behaviors of leaders who motivate followers to perform and identify with organizational goals and interests and who have the capacity to motivate employees beyond expected levels of work performance* (Sarros et al., 2008). Sarros et al.(2008) claim that, often the type of leadership required to alter culture is transformational because culture change requires lots of energy and commitment to achieve outcomes. Furthermore, for an organizational culture to become more transformational, top management must coherently communicate the changes that are required(Sarros et al., 2008).

Sarros et al.(2008) examine the role of transformational leadership in combination with organizational culture, and organizational innovation and suggest that organizational culture

will mediate the relationship between transformational leadership and the climate for organizational innovation. The authors point to previous research concerning the centrality of vision to transformational leadership and its capacity to stimulate change, as the explanation for the rationale regarding organizational culture mediating the relationship between transformational leadership and climate for organizational innovation. The writers define vision as *“a set of beliefs about how people should act, and interact, to make manifest some idealized future state”* (Sarros et al., 2008). Henceforth, the writers assert that vision is a major component of transformational leadership and drives much of the change in organizational culture as well as helping with directing employee efforts towards innovative work practices and outcomes. Furthermore, vision augments both organizational processes and culture, and contributes to innovative environments. According to the authors, change is accomplished through the managers’ implementation of a unique vision of the organization, because as the authors put it; *“..organizational culture is the lens through which leader vision is manifested and helps build the climate necessary for organizations to become innovative.”* (Sarros et al., 2008).

## **2.5 Theoretical framework**

This theoretical chapter has briefly reviewed theoretical framework of innovation within organizations, and then went on to review the theory of disruptive innovations, the strategic choices and options for how incumbents can confront disruptions, the factors for incumbent inflexibility, as well as organizational elements which are key in enabling or inhibiting incumbents’ responses to disruptive innovations.

The reviewed theory of disruptive innovations has focused on what characterizes disruptive innovations, how they can disrupt incumbents, as well as the types of such innovations. The key words used in this theory are disruptive technologies, sustaining technologies, disruptive business models, low-end, high-end, and new-market disruptions, low-end encroachment, and high-end encroachment. The reviewed theoretical framework of strategic options for incumbents confronting disruptive innovations has focused on the strategic options based on harnessing the five principles of disruptive innovations, and how and when these strategies should be pursued. Another reviewed theory has been that of disruptive models, and how incumbents can respond to them.

Finally, the chapter reviewed a theoretical framework of organizational elements and their ability to facilitate or inhibit successful responses to disruptive innovations. These elements included the organizational structure and culture as well as human resources. The reviewed theory of organizational culture has focused on understanding the migration of capabilities, such as when processes and values are transformed into habit, and thus become culture. The aspect of different types of cultures, and how they can facilitate, or hinder strategic responses to disruptive innovations. The reviewed key elements in the organizational structure were ambidextrous, and autonomous units as well as external partnerships. The theory of human resources has focused on transformational leadership and the ability to facilitate and promote innovation. The aspect of centrality of vision to transformational leadership and its capacity to stimulate change, as well as coherent communication from top management about ongoing cultural changes within the company.

Figure 11 summarizes the important elements from this theoretical review which shall be used as guideline to evaluate and analyze collected data and as a basis for finding the answers to the research questions introduced in sub-chapter 1.3.

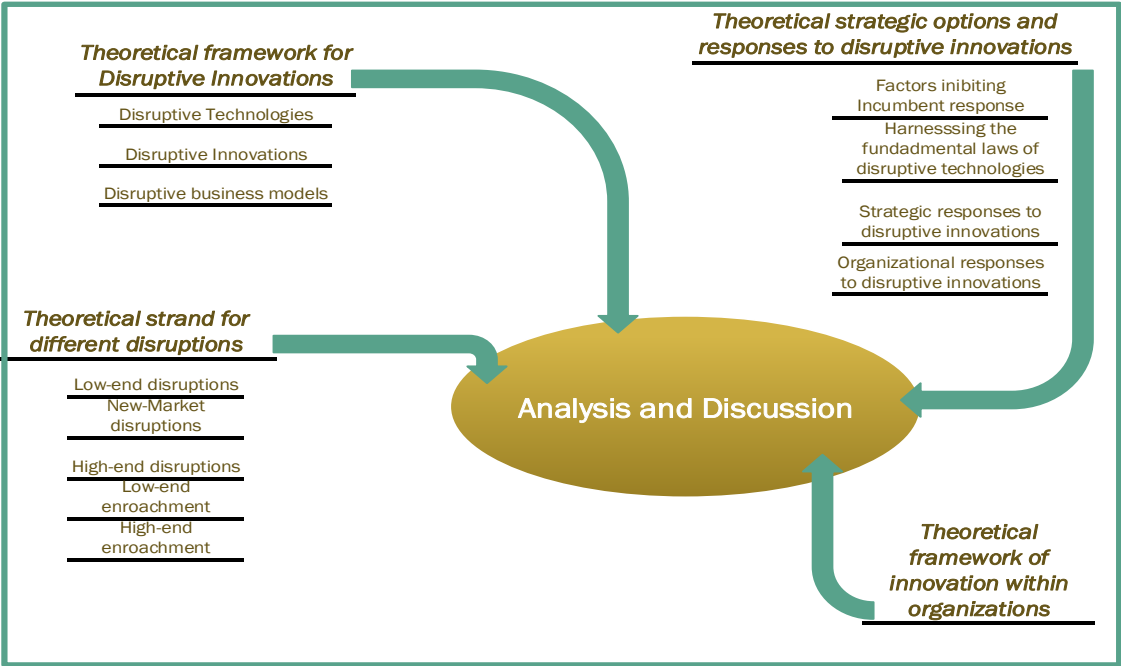


Figure 11: The theoretical framework which was used as a guide for the analysis, and discussion with the purpose of finding answers to the research questions



## 3. Method

### 3.1 Research Method

The problem researched upon in this paper, was an open kind of problem with no statistical figures, or previously collected survey data to call upon for research. Additionally, my research was addressing descriptive, and explanatory questions of why, and how and hence, a case study method was chosen as the most logical choice of research. Robert Yin, who is famously acknowledged for the case study type of research method explains that all case study research starts from the desire to derive an up-close or otherwise in-depth understanding of a single, or small number of cases, set in their real-world contexts.

Yin(2012) explains that this closeness aims to produce an invaluable and deep understanding of the phenomenon. The author presents an abbreviated definition of a case study as an empirical inquiry that investigates a contemporary phenomenon in depth, set within its real-world context, particularly if the boundaries between the phenomenon and context are not evidently clear. The writer further explains that in-depth focus on the case, in addition to the need to cover a wider range of contextual and other complex conditions, tends to lead to a broader range of topics to be covered by any single case study. Hence, research goes beyond the study of isolated variables, and as such, relevant case study data is likely to come from multiple, and not singular sources of evidence. According to Yin (2012, p.5), the case study approach is a suitable methodology to choose for studies for which research questions are in an explanatory form of “why” or “how”, or in a descriptive form of “what is, or has happened?”(Yin, 2012)

This thesis started out on explorative study because of the uncertainty of the Innovation processes within the BKK corporation and the units responsible for implementation of innovation within the corporation. As a member of the BKK organization, I had easy access to intranet publications throughout the research period, as well as access to relevant personnel. My research journey started out by approaching management within the business domain, *Innovasjon og Utvikling(IoU)* with the purpose of exploring and understanding the innovation orientation in BKK, in addition to the function, and fields of operation of the unit. My explorative study of the IoU unit led me to an understanding that the conditions around the innovation arena in the corporation, regarding hydropower were

more complex and were not limited to this one unit but were also covered in the innovation-oriented unit under BKK's subsidiary company responsible for the production of hydropower, ie, BKK-Produksjon's *Forretningsutvikling og Innovasjon(FUol)*. Henceforth, to find answers to the presented research questions, it was deemed necessary, for purposes of this study, to analyze two different innovation-oriented units under the BKK organization. As such, the choice of study came to consist of two embedded units of analysis, within an overall holistic case, which according to Yin(2012) is an embedded, single case-study as shown in *Figure 12* where the units of analysis are the IoU and *FUol* units under the BKK organization, with the purpose to uncover the impact of newer renewables on the BKK core business, and how the incumbent is responding and confronting newer renewables as well as other disruptive innovations.

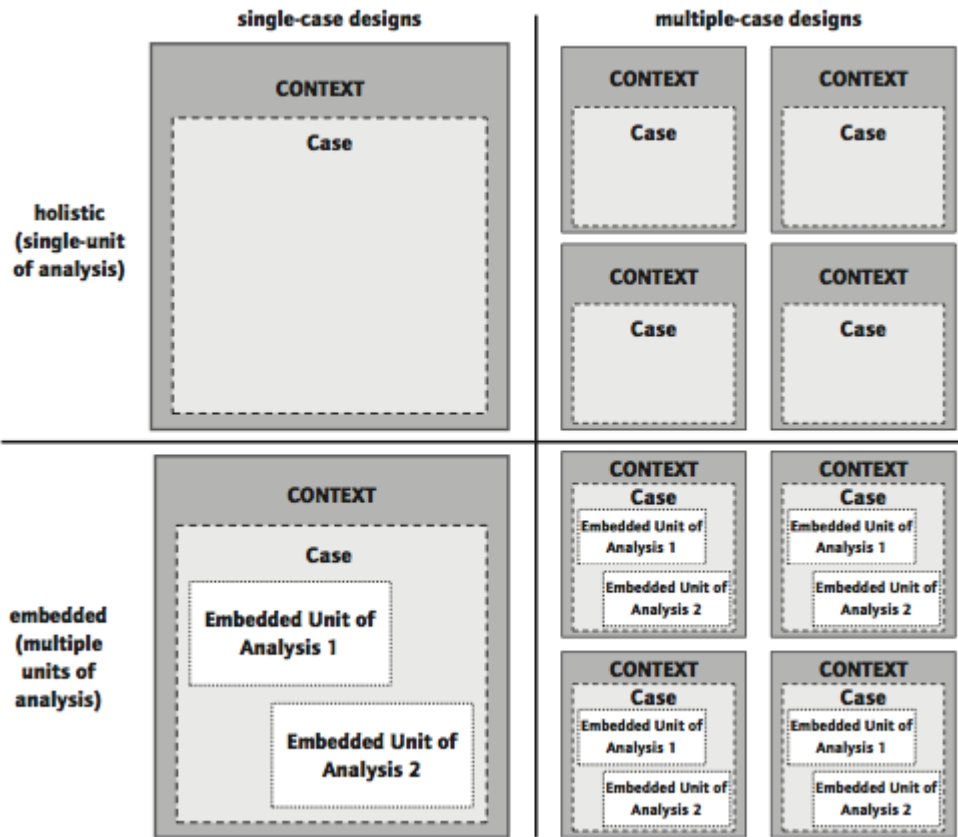
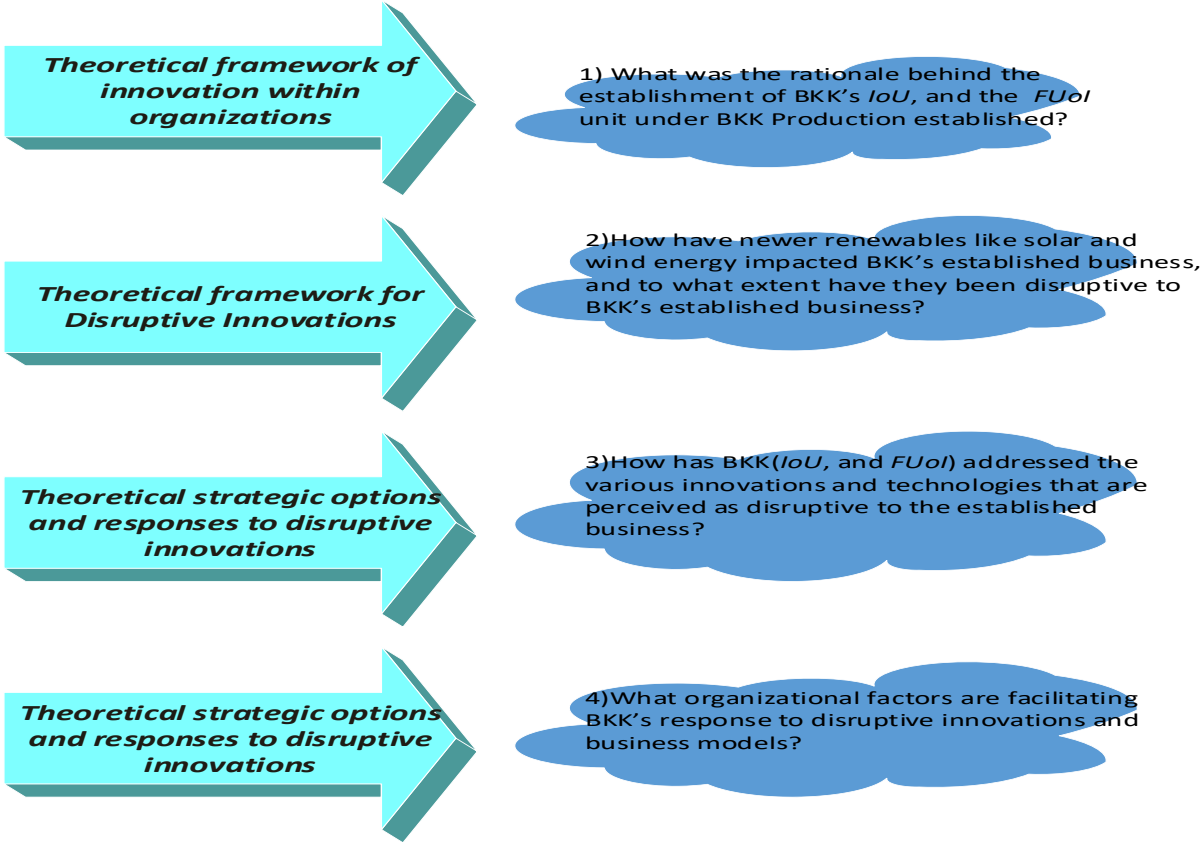


Figure 12: Basic types of designs for case studies(Yin, 2012)P.8)

Given that both IoU and FUol under BKK-produksjon were established barely 2 years ago, the case study took on an explorative approach. Although the grand theoretical framework was

not fully identified prior to the interviews, some theoretical propositions were laid out to help with developing the research questions and selecting my units of analysis in the single case-study. Thus, the research took on an inductive approach where the phenomenon was approached through empirical investigation, and then data was collected to serve as a basis for analysis(Frankfort-Nachmias and Nachmias, 2008). Similarly, this thesis had an empirical fundament in which renewable energy sources, organizational elements key to innovation as well as the research phenomenon of disruptive technologies started out as the basis of research towards the case study in question. Accordingly, the research questions were formed and continuously re-assessed throughout the whole research period thus enabling me to continuously develop my knowledge about the concept of disruptive innovations, and organizational elements in relation to the analysis units, and BKK in general. *Figure 13* gives an overview of the theoretical basis upon which the research questions were formed in conjunction with collected data.



*Figure 13: An overview of the theoretical basis upon which research questions were formed after re-assessment with collected data*

The case-study evidence in this thesis included both qualitative, and quantitative data. The purpose of this explorative embedded single-case study is mainly to shed some light on the challenges faced by incumbents whose business activities are centered on hydropower, when disruptive newer renewables are constantly breaking out in the energy market. It is thus not the goal of this research study to come to one specific solution to a problem.

## **3.2 Research design**

This sub-chapter presents a detailed account of the collection of data, the methods used, how multiple sources of data were combined and for what purpose.

### ***3.2.1 Data sources and Collection methods***

According to Yin(2012), case study is not limited to a single source of data, and case studies benefit from having multiple sources of data. According to the author, the sources can be combined in any combination, as well as with other related sources if the data is relevant for studying the case. Furthermore, data from various sources allows for triangulating, or establishing converging lines of evidence, and thus allowing the researcher to check and recheck the consistency of the findings from different, as well as the same sources(Yin, 2012).

With theoretical propositions in place, as presented in chapter 2, and in order to establish solid construct, two different types of data were used in this study; *Qualitative data*, in the form of primary, and secondary data consisting of individual interviews, emails exchanged with key personnel within the analysis units, A3 LEAN Canvas, BKK intranet publications, BKK official documents, external publications about BKK, and NVE reports; and *Quantitative data* in the form of statistical evidence in the form of tables, and graphs from *SSB.no*, NVE reports, and IRENA. *Table 1* gives an overview of data types, and sources used in this thesis

Table 1: Overview of types and sources of data used in this study

Source of Data	Qualitative data	Quantitative data
<b>Documents</b>	<p><u>Primary data:</u> BKK-produksjon documents detailing goals, and strategies, emails, and A3 LEAN Canvas.</p> <p><u>Secondary data:</u> BKK internal publications, Political platform, newspaper articles, Mass media internet publications about BKK, NVE reports</p>	
<b>Interviews</b>	<p><u>Primary data:</u> Interviews with employees from BKK-IoU, and employees from BKK-Produksjon, Project, and FUOl departments</p>	
<b>Archival records</b>		<p>Statistical data showing the trend of renewable energy growth in the Nordic region, power production in Norway the last five years, IRENA</p>

**3.2.1.1 Qualitative methodology**

According to Taylor et.al(2016), *qualitative methodology* refers to research that produces descriptive data in the form of people’s written words or spoken words, and observable behavior, studying people in the context of their past, and situations in which they find themselves. According to the author, qualitative researchers empathize and identify with the people they study in order to understand how those people view things. In addition to this, qualitative research is exploratory, and inductive, which implies that the insights, and understanding are developed from the patterns in the data collected(Taylor et al., 2016). Because of the method’s emphasis on the context in which events occur, this research

method is ideally used to understand the process of events – how ideas become actions, and the reactions to those actions(Gorman and Clayton, 2005)(p.6).

Notably, qualitative methods have not been as refined as other research approaches, in that the researcher is encouraged to be his or her own methodologist, following guidelines, and never rules(Taylor et al., 2016)(p.21), which consequently allows for unearthing of various interpretations of the phenomenon being studied. It is also noteworthy that central to the qualitative methodology is that, how a researcher studies and interprets collected data is dependent upon the theoretical perspective(Taylor et al., 2016)(P.21).

### *Individual Interviews*

Those interviewed included; a Chief executive, and general managers, and a senior advisor, as illustrated in *Table 2*.

*Table 2: An overview of interview subjects chosen from management in the analysis units*

<b>Respondent code</b>	<b>No. of interviews</b>	<b>Length of Interview in hours</b>	<b>Function in BKK</b>
<b>R1</b>	1	1	CEO Innovasjon og Utvikling(IoU)
<b>R2</b>	2	@ 1.5	General manager BKK- Grønn Invest(GIV)
<b>R3</b>	1	1.2	General manager Forretningsutvikling og Innovasjon(FUoI) unit- BKK Produksjon
<b>R4</b>	1	1	General manager Project unit – BKK Produksjon
<b>R5</b>	1	0.5	Senior adviser – BKK Produksjon

Data from these interviews was used to analyze as accurately as possible the rationale for establishing the IoU, and FUoI units, the decision-making processes related to BKK's strategic options and responses to disruptive innovations, as well as understanding the effect newer renewables have had on BKK's established hydropower. All the interviews were semi-structured, except the interview with respondent R5 which was an open-ended interview. The four interview subjects received the interview guide prior to the interviews to ensure that they familiarized themselves with the questions, and topic of newer renewables and other disruptive innovations in good time. The interview with R5 was non-structured and had the purpose of encouraging a loose and natural conversation without well thought out replies, allowing for a richer and more extensive material about the phenomenon. All the interviews were conducted face to face, varying between half an hour to one and half hours. There was otherwise need for a follow-up interview with respondent R2, in search of answers to more specific questions. The interview questions were centered on; Disruptive technologies, Solar and wind energy as disruptions, disruptive business models, innovation in BKK, BKK's strategies to confront disruptive innovations.

### *Documents*

The primary documents from which data was collected were used in conjunction with theoretical perspective to formulate the research questions. The documents were very informative about the processes in the BKK corporation, and gave a detailed overview of topics discussed, in addition to providing the dates when the information was applicable. *Table 3* presents an overview and description of BKK documents, with key codes, from which data was collected for purposes of this research study.

*Table 3: Overview over primary BKK documents used in the research study*

<b>BKK document</b>	<b>Title</b>	<b>Date</b>
BKK-D1	BKK skal være ledende - Også i fremtiden	09.11.2015
BKK-D2	BKK 2020	27.01.2016
BKK-D3	Ny verdiskaping på ei halvfull melkeku	03.03.2016
BKK-D4	Endringer i BKKs konsernstruktur	25.04.2016
BKK-D5	BKK Grønn Invest investerer i grønne datasentre og karbon-nanofiber	23.08.2017
BKK-D6	Resultatbedring på 78 millioner kroner	25.08.2017
BKK-D7	Lønnsomhet, kompetanse og Innovasjon	29.10.2017
BKK-D8	Lokal Energi har globalt potensial	30.10.2017

BKK-D9	BKK og Tibber samarbeider om et heldigitalt strømmarked	13.11.2017
BKK-D10	Øker innsatsen for mer støtte til FOU- og innovasjonsprosjekt	14.11.2017
BKK-D11	Lønnsomhetsarbeid gir resultater, og det motiverer	23.11.2017
BKK-D12	Øker satsingen på innovasjon	21.12.2017
BKK-D13	BKK styrker satsingen på innovasjon	16.02.2018
BKK-D14	BKK satser offensivt på hurtiglading	13.03.2018
BKK-D15	A3 LEAN canvas - BKK Prod. FUol	15.08.2017
BKK-D16	Feilaktig skremmebilde av utenlandskabel	06.07.2017
BKK-D17	Email from CEO - IoU	12.04.2018
BKK-D18	Email from general manager - Fuol	14.04.2018
BKK-D19	Email from general manager - Grønn Invest	16.04.2018
BKK-D20	Vi skal gripe mulighetene of håndtere utfordringer	24.08.2016
BKK-D21	Hvor mange plusskunder har vi om 10 år	30.05.2017

The secondary documents from which data was collected comprised mainly of internet articles about BKK, archival records like NVE reports and government declarations like the political platform. The online-research tool “Atekst” was utilized to get access to general information from the public about solar, wind, and hydropower. The purpose of gathering information from Atekst was to get a deeper understanding of the changes in the environment regarding renewables, and their trend. This would then give me an insight in the challenges that incumbents are currently facing in the industry.

### **3.2.1.2 Quantitative methodology**

In quantitative methodology, the research method that produces data in the form of gathered numerical data like surveys and uses statistical analysis for inferences about a phenomenon. In this research study, some numerical data in the form of archival records was collected as statistical data showing the trend of renewable energy production in the Nordic region, and in Norway from NVE, and SSB, the trend of renewables on a global scale, and the falling prices of PV modules used in solar energy installations. Archival data has the benefit of allowing a research study to extend its reach over a longer period of time, and thus providing a firmer basis for drawing the conclusions from a case study(Yin, 2012)(p.123). In this study, qualitative and quantitative methods of research were combined



allowing for triangulation, which entails combining methodologies in the study of the same phenomenon. Research has shown that the convergence between these two methods enhances the belief that the results are valid (Jick, 1979).

### 3.3 Validity and Reliability

Easterby-Smith et al (2015) defines validity as; *"..the extent to which measures and research findings provide accurate representation of the things they are supposed to be describing."* (Easterby-Smith et al., 2015). In addition to an analysis of the effects of newer renewables on BKK's core business, this research study aims to present an interpretation of BKK's response to disruptive innovations considering the theoretical review presented. As such, validity was achieved by quoting the respondents, and statements in the original language Norwegian, so the basis of the interpretations and conclusions is clear, and not tainted through translation, hence reflecting an openness about the collected data.

During the interviews, small notes, and drawings were taken to remind me of important nuances that came up during the interview. Transcripts from the interview recordings were written down and shared with respondents who felt the need to review the interview data, hence giving the interview objects the chance to rectify any misunderstandings that may have been jotted down. Wherever possible, accounts relating to the same event, were obtained from more than one data source, including other BKK documents, intranet publications, and declarations in external publications about BKK. Both *Qualitative*, and *Quantitative* methods of research were employed in this study to allow for triangulating, thus establishing converging lines of evidence with the purpose of ensuring that the results are as robust as possible (Yin, 2012).

Robert Yin defines reliability as *"..demonstrating that the operations of a study such as the data collection procedures can be repeated, with the same results"* (Yin, 2014)(p. 46). As a member of the BKK corporation, I had easy access to both internal BKK documentation, and the interview subjects. Furthermore, as a member I had some prior data which was relevant for my evaluation of the data sources that an outside researcher might not have gotten a hold of. This implies that my empirical observations, and way of perceiving the situations in this case study might differ to a certain degree from an outside researcher. It should also be

noted that the research might reflect a degree of bias due to my long-standing membership with the organization, and so my membership in the BKK organization is one of the central factors that may have affected this thesis' reliability. The re-creation of the information uncovered during the interviews would depend on the familiarity of the interview setting for both the interviewer, and the interview subject. Interviewing the respondents as their colleague could have played a vital role in how the respondents answered, including the type, and level of information that was revealed to me. Another central factor that may have affected the reliability of this thesis is the semi-structured interviews. Re-creation of the interview conditions, and the same interview guides may not yield the same results, as an outside researcher, who might for example attain information that is mostly institutionally standardized answers that are given to outsiders.

To show openness and transparency in this research study, the techniques and procedures of the data collection have been presented, the interview guides(Appendix I), as well as an overview over internal BKK documents(*sub-chapter 3.2.1*) has been presented.

## 4. Analysis and Discussion

This chapter presents the analysis and discussion of the thesis in accordance with the sequence of the research questions below;

- 1) What was the rationale behind the establishment of BKK's *IoU*, and the *FUoI* unit under BKK Production established?
- 2) How have newer renewables like solar and wind energy impacted BKK's established business, and to what extent have they been disruptive to BKK's established business?
- 3) How has BKK(*IoU*, and *FUoI*) addressed the various innovations and technologies that are perceived as disruptive to the established business?
- 4) What organizational factors are facilitating BKK's response to disruptive innovations and business models?

### 4.1 Rationale for the establishment of BKK's *IoU*, and *Fuol*

In this sub-chapter, this thesis seeks to find answers to the first research question by analyzing the reasons behind the establishment of both *IoU*, and *FUoI*.

The *IoU* unit was established in May of 2016. The *IoU* unit's field of operation covers; Innovation (Internal and external coordination), Corporation strategy, and M&A(Mergers and acquisitions). The unit is a business domain placed right under the mother business, BKK AS as illustrated in *figure 14*

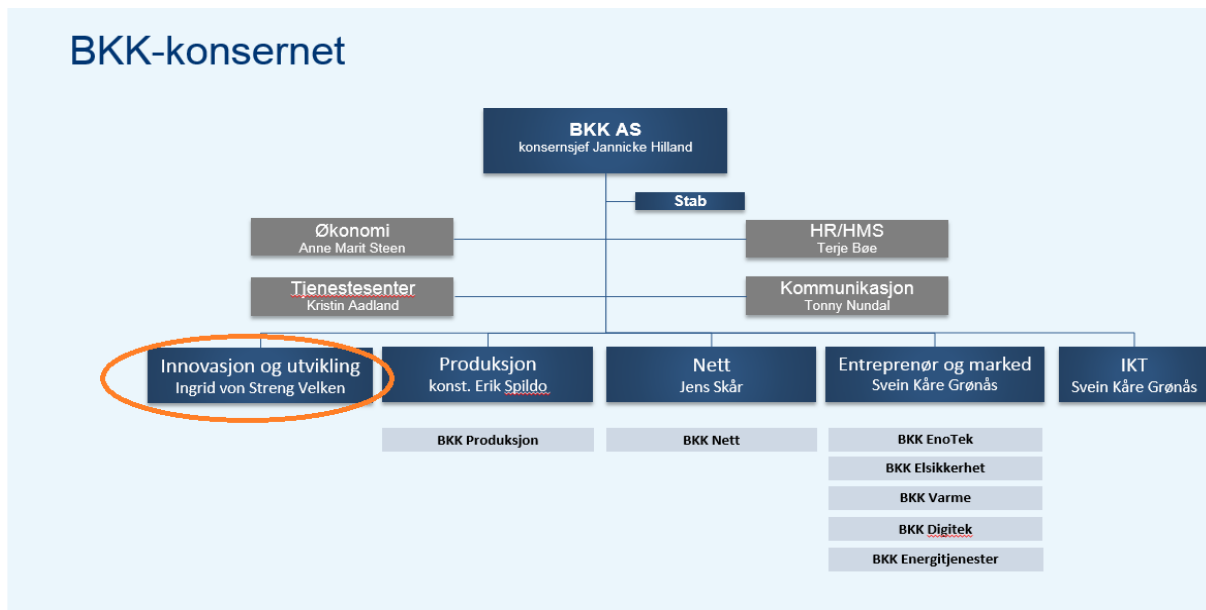


Figure 14: Organizational structure of the BKK corporation showing the newly established unit *Innovasjon og Utvikling* (Source; Internal BKK documents)

The corporation Chief executive redesigned the organizational structure that resulted in the establishment of the business domain, *innovasjon og utvikling*, as a measure to increase value creation through increased efforts in innovation, and business development. This measure was made clear in BKK-D4 where the CEO of BKK AS stated;

*“Ny konsernorganisering er et viktig skritt på veien mot å forme fremtidens BKK og styrke konsernets posisjon og konkurransekraft. Skal vi levere på ambisjonen om å være ett av tre ledende energiselskap i Norge, må vi utvikle oss i takt med endringene i våre omgivelser. Jeg gjør justeringer i konsernstrukturen nå, for at vi bedre skal videreutvikle konsernet og øke verdiskapingen. Jeg ønsker en sterkere satsing på innovasjon og utvikling og danner derfor et eget forretningsområde for dette.”*

Collected data indicates that the unit was formed at a time when the electricity charges were low, which created a strong need for BKK to implement efficiency-improvement measures to reduce its expenses, as well as re-strategize to meet the changes in the energy industry. In BKK-D3, the head CEO, Jannicke Hilland described a market characterized with low power prices;

*“ I år skrev vi følgende: «Basert på nåværende forventninger til utvikling i kraftprisen fremover, stabilt valutaforhold mellom euro og norske kroner og normal utvikling for nedbør*

*og tilsig i Norden forventer styret et underliggende resultat etter skatt for 2016 som er lavere enn i 2015.»....Ordlyden er ganske lik det vi skrev året før. Og året før det.”*

According to this statement, the profit margins were becoming continuously lower for every year that went by, particularly for 2016. This led to a strong need for BKK to strategize and alter the strategic direction of the company. Questioned about the conditions under which the IoU unit was formed, respondent R1 retaliated;

*“IoU ble etablert for å sikre at vi har fokus på ny forretning og nye muligheter også i en tid der vi må redusere kostnader.... IoU ble nok formet pga store endringer i energibransjen, usikkerhet knyttet til pris, usikkerhet knyttet til fremtidig forretningsmodell, mer makt nært kunden, nye konkurrenter, endring i rammevilkår mm.”*

Respondent R1's response indicates that the IoU unit was established at a time when BKK needed a new strategy to decrease costs and increase profitability, and address the uncertainties connected to electricity pricing, future business model, competition dynamics as well as the changes in policy. The FUoI unit was thus established before the IoU unit, in the early spring of 2016, under the subsidiary company BKK Produksjon and the last addition to four other units as illustrated in *figure 15*. The FUoI unit's business domain, covers; Business development of existing power plant facilities, business development of newly built power plants, R&D plus innovation, Continuous improvement and LEAN methodology, Quality assurance, data flow, digitalization, and Strategy

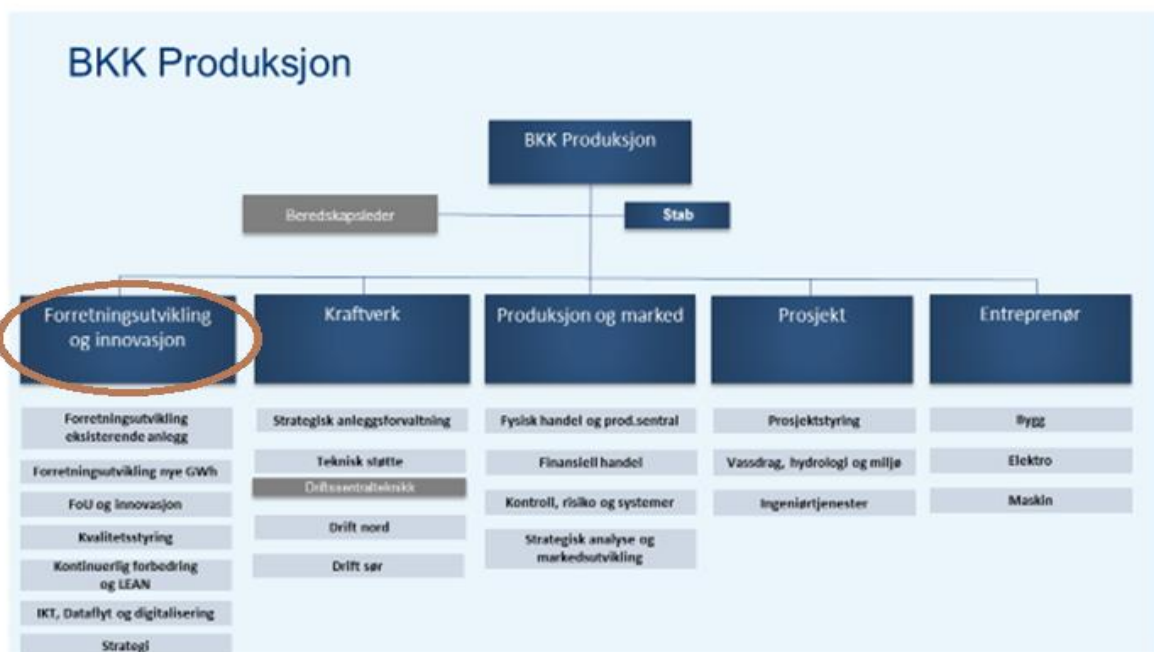


Figure 15: Organizational structure of BKK-produksjon showing Forretningsutvikling og Innovasjon together with other business domains under the subsidiary company.

Querried about the rationale for the establishment of the FUol unit, respondent R3 retaliated; “Det var et sterkt behov for å få fatt på forbedring og innovasjonsarbeid. Det skjer veldig mye rundt oss. Da trenger man en muskel som både utfører videre for å få målbildet på plass og støtte gjennomføring av gapet for å flytte oss.” The respondent pointed to the fast-evolving energy industry which resulted into a strong need to take control of efficiency improvements, cost reductions, as well as the need to increase the innovation tempo within the BKK produksjon company. Additionally there was need for an innovation-oriented unit in the BKK produksjon company to perform and execute, closing the growth gap and consequently enabling BKK to achieves its organizational goal. According to respondent R3, FUol was the first established unit in BKK whose fields of operations were purely innovation based.

#### 4.2 The impact of newer renewables on BKK’s established business

This sub-chapter presents an analysis of the impact of newer renewables on the established hydropower, as well as an analysis of whether solar, and wind energy are disruptive technologies relative to BKK’s established business. The sub-chapter starts out by analyzing

what type of disruptive innovations solar, and wind energy are, and then goes on to give an analysis of the trend of the competitive advantage of newer renewables, as well as their impact on hydropower.

#### **4.2.1 Solar and Wind energy as disruptive innovations**

Christensen(2013) explains disruptive innovations as innovations that bring to a market a very different value proposition than had been available previously, and that they generally underperform established products in mainstream markets. According to the author, these technologies generally have other features that a few fringe, and generally new customers value(Christensen, 2013). Solar and wind energy bring a whole different value proposition than that of the established hydropower, and based on Christensen's definitions, they have the potential to either be a disruptive, or sustaining innovation depending on BKK's ability to integrate the innovations within its current operations.

##### *Solar Energy*

Currently in Norway, solar energy is on a small scale, and is mostly decentralized energy production. Solar energy in Norway has been popularized by private customers in the form of individuals, cooperative housing, community buildings, and even office buildings, installing solar panels on the roofs of the buildings, and producing their own electricity. The excess generated power is transferred onto the grid for a small price from the big power companies. These customers commonly referred to as "*plusskunder*" in Norway, have had to weather the initial high price of the solar installations(*NVE.no*). One of the main advantages of this decentralized energy production to many private consumers, is convenience, control of the electricity production, and constant availability of the electricity depending on the battery technology being used. Although such customers were quite rare barely a decade ago, recent reports of the tremendous growth of both solar energy is undeniable. In 2016 four times as much capacity was installed as the year before, mostly on commercial buildings and private homes connected to the grid(*Teknologirådet.no*).

Yu and Hang(2010) draw on the example of cellular phones as disruptive innovations which initially had higher prices, which are essentially high-end disruptive innovations(Govindarajan and Kopalle, 2006b). The authors mention the acceptance of the

cellular phone by executives who accepted its convenience and portability, despite the relatively high price (Yu and Hang, 2010). This example mirrors the current trend of decentralized power production using solar panels in Norway. As innovations within the photovoltaic solar installations get cheaper over time as has shown recent development (Figure 1), solar energy has the potential to be disruptive to the BKK. BKK-D21 shows that in 2011, BKK had one *plusskunde*, and this remained so for quite a long time. In 2017, BKK in addition to its 24 *plusskunder*, got an application from a cooperative housing in Fyllingsdalen who were evaluating the installation of solar panels on the roof building. The growth, and trend of solar energy is evident, even in a rainy town like Bergen, and although 24 seems like a small number, it is considerable percentwise.

On a global scale, solar energy represented an almost insignificant share of global power generation over ten years ago. Today solar energy is fast-growing (See figure 17), and Norway is bound to catch up with this global trend in not so many years from today. Trine Kopstad Berentsen, the general manager of *Solenergiklyngen*, which is the national industry cluster for solar energy sector in Norway, remarks on solar energy as not for the elite group anymore, but is now becoming a product that is becoming satisfactory to the mainstream customers; “..Solenergi er ikke lenger for spesielt interesserte, men en viktig del av Norges framtidige energimiks, sammen med vannkraft.” (Trine K. Berentsen, til Teknisk Ukeblad 2018).

### *Wind Energy*

Wind energy in Norway is majorly based on large-scale production. In recent years, BKK has experienced lower electricity prices and this has been mainly due to increased wind energy production. The director of NVE, Per Saunderud remarked on the historically low prices of power in an article on NVE (Norges Vassdrag og Energi)'s website; “I tillegg til at den hydrologiske situasjonen har vært god, har det også vært høy vindkraftproduksjon i Norden. Dette har gitt utslag i historisk lave kraftpriser.” In 2017, a total power of 2,85 TWh harnessed from wind energy was produced in Norway. The total installed power was 1188 MW divided between 468 turbines. Wind power stood therefore for 1,9% of the total power production in the country (NVE.no). BKK-D13 details BKK's market analyst faulting lower electricity charges to good wind and solar energy production in Germany; *Tysk vindkraft holder strømprisene nede - Kaldt vær kunne gitt skyhøye strømpriser denne uken, men jeg*



*forventer i stedet relativt normale vinterpriser. Årsaken er at det er god vindkraftproduksjon i Tyskland, og også bra med solkraft. Kraftimport fra Tyskland bidrar derfor til å holde strømprisene her hjemme nede.”*

Given that wind power production is on a large scale, this renewable energy source has the potential to either be sustaining, or disruptive to BKK's established business. In regard to wind energy as a disruptive innovation relative to BKK's established business, Christensen and Raynor(2013, p.34) state that contrary to sustaining innovations, disruptive innovations don't attempt to bring better products to established customers in existing markets, instead, they redefine the performance trajectory by introducing products that are not as good as currently available products, but offer other benefits like simpler, more convenient, and less expensive products that appeal to new, or less-demanding customers(Christensen and Raynor, 2013). As such, innovators within wind energy that can offer decentralized wind production, and wind energy parks that do not get smartly integrated to BKK's power grid, have a disruptive potential relative to BKK's established business. On the other hand, the future is becoming electrified. NVE's report commented on the increasing demand in their report about the grid capacity for electrifying the transport sector In Norway;

*“Det er ikke bare elbiler som ser ut til å bli elektrifisert. I Nasjonal transportplan 2018-2029 er følgende lagt til grunn for regjeringens videre arbeid: nye ferger skal benytte lav- eller nullutslippsteknologi, nye personbiler og lette varebiler skal være nullutslippskjøretøy i 2025, nye bybusser skal være nullutslippskjøretøy eller bruke biogass i 2025, innen 2030 skal varedistribusjonen i de største bysentra tilnærmet være nullutslipp, offentlige etater skal i størst mulig grad benytte biodrivstoff, lav- og nullutslippsteknologi i egne og innleide kjøretøy, og i 2050 skal transporten være tilnærmet utslippsfri/klimanøytral.”*

With an ambition of a fossilfree-generating transport sector within 2050, the country is going to need all the renewable electricity that can be produced. If smart grids are established, wind energy can be integrated with hydro power, and other renewables to ensure that the end consumer always has a high-quality product delivered to them. As Christensen and Raynor(2013, p.34) make a distinction between a sustaining and disruptive innovation, they state; *“A sustaining innovation targets demanding, high-end customers with better performance than what was previously available”*(Christensen and Raynor, 2013). As such, wind energy could be a sustaining energy relative to hydropower in such a

way that it allows for BKK to produce a higher quality product to for example the transport sector, or to foreign consumers, at a probably higher price than is charged local private consumers. The wind energy producers can then cater for energy to the local consumers who are a less demanding type of customer.

Nonetheless, according to collected data, present developments in the renewable energy market indicate that wind energy is not only becoming as competitive as hydro power, it is a renewable energy that is currently disruptive to BKK’s hydropower. This is made even more evident when on the coldest winter days when there is no rain, and the water reserves are running dry, wind energy gets easily harnessed from blowing cold winter winds in Germany for example, who then offer electricity at a fairly good price which mainstream customers that appreciated hydropower from before, would now greatly appreciate since it is cheaper. For decentralized wind energy production, the convenience factor is also very much appreciated by end-users. Even more so, according to NVE reports, the production of wind energy has been on the increase the last five years, as shown in *figure 16*.

<b>NORDISK VINDKRAFTPRODUKSJON (TWH)</b>			
<b>2017</b>	<b>36,7</b>	<b>2014</b>	<b>25,5</b>
<b>2016</b>	<b>31,7</b>	<b>2013</b>	<b>21,5</b>
<b>2015</b>	<b>34</b>		

*Figure 16: Increase in wind energy production in the Nordic countries. (Source, NVE report- Kraftsituasjon 2017)*

The graph imported from NVE’s *kraftsituasjon* report in 2017, the wind energy production was at 21.5 TWH in 2013. In 2017, the production of wind energy was reported to be 36.7 TWH, showing an increase of 58.6% increase in just five years. The report also shows that in 2017, 10% of total energy used in Norway was wind energy.

Another potential disruptive innovation in the wind energy sector is that of the young company *Kitemill* which has developed Airborne Wind Energy (AWE) technology based on the strong and consistent winds at altitudes 500 – 1500 meters above ground level. Kitemill technology harnesses wind energy from high altitudes using a kite. According to information on their website, this innovative technology has been developed, and the first power plants

located on *Lista Fly og Næringspark* shall supply power to 22 businesses in the area, with a total of well over 100 employees in 2018. Kitemill's business idea has the potential to be utilized on private farms out in the countryside, in which case these customers could become "*pluss kunder*" who would harness wind energy and send out the excess produced electricity to the power grid and would therefore be paid by the big power companies, like BKK.

### *Solar and Wind Energy as disruptions*

Govindarajan and Kopalle(2006) define high-end disruptions as disruptive innovations having inferior performance in traditional attributes, and a higher price. Wind energy and solar energy are currently characterized by their inferior performance, and higher investment prices relative to the traditional established hydropower. The authors give a further definition of high-end disruptive as innovations based on the technological radicalness of the innovation, in which the high-end disruptions are more technically radical than low-end innovations(Govindarajan and Kopalle, 2006b). – The Kitemill technology is technologically radical and is thus a high-end disruption. Govindarajan and Kopalle(2006a) summarize attributes that according to my analysis are characteristic of wind, and solar energy as disruptive innovations. 1) that the mainstream market based on hydropower does not value the innovation's particular package of performance attributes at the time of newer renewables introduction into the market, for example many articles have been written about how strenuous and costly the newer renewables are compared to the established hydropower; 2) that wind and solar energy innovations perform poorly on the attributes hydropower mainstream customers value, like for example the fact that hydropower is regulative; 3) Wind and solar energy have been first introduced in an emerging or insignificant niche market like for example individuals that are particularly environmentally conscious, and can afford to buy the expensive installations like the the 49 yr old doctor Arne Nakling living in Bergen(*aftenposten 14.Juli, 2017*); 4)Wind and solar energy innovations currently offer a lower margin and may therefore be ignored by incumbents who are serving larger and more attractive segments"(Govindarajan and Kopalle, 2006a). Christensen and Raynor(2013) explain *new-market disruptions* as innovations that initially compete against non-consumption in their new value network. According to the authors, as

the performance of these innovations improve, they ultimately become good enough to pull customers out of the original value network, into the new one. This theory is consistent with the trend of solar and wind energy the last decade. The growth of these sustainable energy innovations gives an indication that there is a continuous growth of customers utilizing newer renewables, yet these same customers who previously valued hydropower's traditional attributes are now finding the attributes of the disruptive technology attractive, and as Govindarajan and Kopalle(2006a) put it; *"..while disruptive innovations attract a different customer segment at the time of their introduction, over time, the mainstream customers see the benefit in such innovations."*(Govindarajan and Kopalle, 2006a). Henceforth, solar and wind energy can be perceived as new-market disruptions in accordance with the theoretical review. In BKK's case, in recognition of newer renewables as new-market disruptive innovations, respondent R3 stated;

*"Jeg tror at vi er neste bransje ut som kommer til å oppleve rystelser i grunnmuren. Denne prosessen pågår nå...Vi har vært en beskyttet bransje som nå møter sterkere konkurranse fra andre teknologier som vind, og sol, lokale energiløsninger, lagringsteknologi og ny disruptiv teknologi på markedssiden."*

According to the respondent, hydropower incumbents are experiencing more competition from solar, and wind energy, and thus altering the competitive situation that seemed stable over a decade ago. How then so, has this competitive situation changed? A closer analysis is presented in *section 4.2.2*.

#### ***4.2.2 Trend of newer renewables' competitive advantage***

As sustainable energy sources, wind and solar energy never run out and produce no greenhouse gases. *Figure 17* shows the growth of renewable energies on a global scale, in which hydro power has the least growth gradient. Although newer renewable technology is still expensive, innovation in the recent years is making it more affordable, in addition government subsidies which are boosting the use of these newer renewables. Schimdt and Druehl(2008) make reference to high-end *encroachment* in which the new product first encroaches on the high end of the existing old-product market and then diffuses downward(Schmidt and Druehl, 2008)

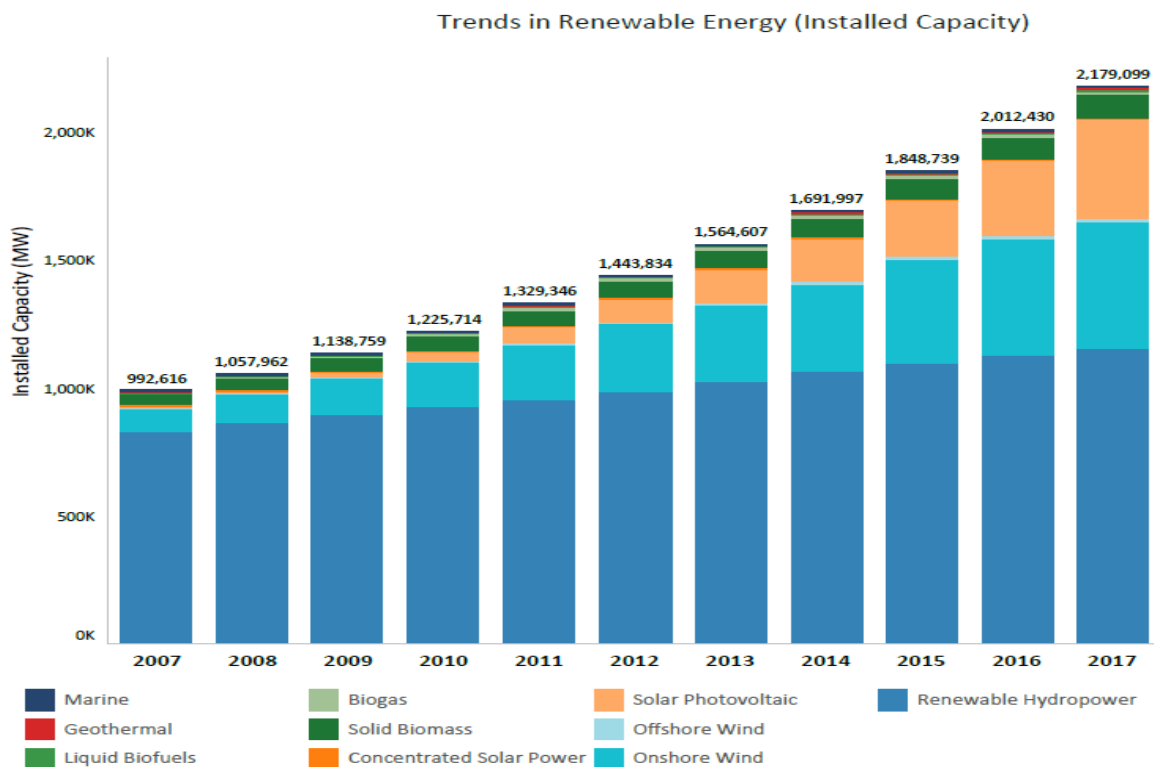


Figure 17: Showing the trend of renewable energies. (Source: International renewable Energy Agency)

This is consistent with the current trend of solar and wind energy and the way they have encroached on the market. In the case of BKK, when asked about whether newer renewables were disruptive to BKK, respondent R1 refrained from answering the question directly, and instead stressed; “.. Jeg tror vår største trussel er om vi har evnen til endring raskt nok, og gripe nye muligheter.” A further probing however revealed that BKK was keenly aware of the falling prices, and increasingly better technology within wind and solar energy. This led to the revelation that BKK has felt the impact of newer renewables specifically because of the falling electricity prices in recent years. Questioned about the changes in the renewable energy industry the last two years, respondent R1 replied; “...vi har observert fallende pris og bedre teknologi innen sol og vind, Batteriteknologiutvikling, ny konkurranse (olje og gass går inn i fornybar), og lavere kraftpriser.” Consistent with respondent R1’s response, the CEO of BKK’s stated in BKK-D7 that;

“..Investeringskostnadene for vindkraft og solkraft har falt så mye de siste årene at det i mange land nå er lønnsomt å bygge uten subsidier. Det er foreløpig behov for subsidier i Norden, men om kostnadene fortsetter å falle, kan særlig vindkraft ta en betydelig del av

*markedet. Både vindkraft og solkraft er teknologier med så lave driftskostnader at marginalkostnaden kan falle til null.”*

The statement from the CEO of BKK indicates that top management is aware that newer renewables are becoming so affordable, that they are a threat to the established market share of hydropower, which then implies that the top leaders recognize the newer renewables as new-market disruptions which are beginning to pull customers out of the original hydropower value network, into the new renewable value network. The CEO's remarks also indicate that the competitive advantage of these newer sustainable energies has increased steadily in the last decade. What factors have then contributed to the increase of newer renewables' competitive advantage?

According to respondents R3, and R5, subsidies, and Norwegian government policies are contributing to the growth of newer renewables. The political platform written on 2<sup>nd</sup> of January this year states future plans for the present regime; *“ Legge til rette for et grønt skifte med større vekt på fornybar energi, og der ren energi brukes til å fase ut fossil energi i andre sektorer”*, which is an indication that the government's plans to take measures to transform the energy industry in which sustainable and clean energy gradually replaces fossils in all sectors. Consequently, more individuals through decentralized energy production, and organizations are being encouraged to bet on renewable energy sources, as the political platform also makes reference to decentralized power production; *“.. Vurdere tiltak for å gjøre det enklere å koble egenprodusert energi til strømmettet.”* The message from the political arena implies that the future is renewable, and all who bet on sustainable energy shall be duly rewarded. Accordingly, respondent R1 states; *“ Jeg er overbevist om at fremtiden er elektrisk og fornybar. Det vil være en selvfølge og erstatte fossilt der det er mulig. Transport, maritim sektor, industri mm.”*

The age of sustainable energy is happening today already. According to collected data, the competitive advantage of newer renewables is on the increase. This fore conclusion is due to the increased production and consumption of these sustainable energies. But what forces are behind this increased competitive advantage?

Collected data indicates however, that this trend has not had a natural development in which all renewable energy sources have the same stipulations. According to respondent R3, the conditions of competition for hydropower differ greatly from those of wind, and solar energy. According to respondent R3 the Oil and gas industry taxes hydropower companies whose power plants produce more than 10MW with a heavy land tax. Furthermore, wind and solar energy do not have to pay the same high tax. Respondent R3 explained that wind and solar energy producers, even on a large scale, are imposed to pay a much smaller corporation tax like any other regular company. According to respondent R3 energy production from oil and gas are as well, imposed a lighter tax than the heavy land tax imposed on hydropower companies. Respondent R5 concurs with respondent R3's claims about oil and gas paying a lower tax than hydropower. Accordingly, the competitive advantage of newer renewables seems to have been propelled by the present fiscal policy, and as respondent R3 puts it;

*"..Konsesjoner for bygging av vannkraft blir ikke realisert fordi BKK klarer ikke å regne det hjem grunnet høye skatten, mens vind og sol med helt andre vilkår, og avskrivningsregler blir bygget. Skattepolitikken gjør at sol og vind får økt lønnsomhet. Og det mener vi er veldig feil."*

This indicates that according to BKK, solar and wind energy presently have an unfair competitive advantage, that is affecting BKK's competitive force, because, as R3 puts it; *"Vi klarer ikke å konkurrere hvis vi får på oss en tung ryggsekk som de andre ikke har."* The respondent remarked on the possibility of a fatality for Norway's energy system and said; *"Politikerne må skjønne at de nå setter hele kraftsystemet i fare, hvis de fortsetter sånn det er i dag."* Consistent with respondent R3's statements, in BKK-D3, the head CEO remarked on the heavy land tax;

*"Vannkraftnæringen trenger ingen særbehandling, men likebehandling med andre næringer.- Grunnrenteskattesatsen bør ikke heves selv om selskapsskattesatsen reduseres. Og så bør friinntekten fastsettes slik at grunnrenteskatten kun rammer vannkraftselskap som genererer grunnrente (altså høy avkastning)...Dagens regler for fastsetting av friinntekten ga for 2015 en friinntekstrekte på 0,7 prosent, og fører til at selv selskap med lav avkastning – under normalavkastningen – betaler grunnrenteskatt. En opprettholdelse av det høye*

*skattetrykket i en tid med lave kraftpriser, gjør det ulønnsomt å reinvestere i det norske energisystemets grunnmur.”*

According to the declarations from the CEO, and respondent R3, although the energy industry has drastically changed, the policy has not. This, in an age when competition from other renewables and other competitors is heightened is making it unprofitable for the BKK corporation to reinvest in the development of its infrastructure. This analysis indicates that the competition dynamics in the renewable energy sector have affected BKK’s margins of profit, as respondent R3 puts it; “ *..Det er mange ting som truer vår konkurransekraft. Sol for eksempel, vind, mye utvikling der. Folk er ikke klar over dette. Folk tar vannkraften som en selvfølge i Norge.*” According to respondent R3, the renewable energy competitive situation has evolved in such an unsatisfactory manner and has thus warranted several appeals to the government in an attempt to achieve the same conditions of competition as solar and wind energy. Furthermore, solar and wind energy have become a threat to hydropower’s competitive force despite the public’s ignorance and assumption that hydropower is a matter of course.

### **4.3 BKK’s strategic choices regarding disruptive innovations**

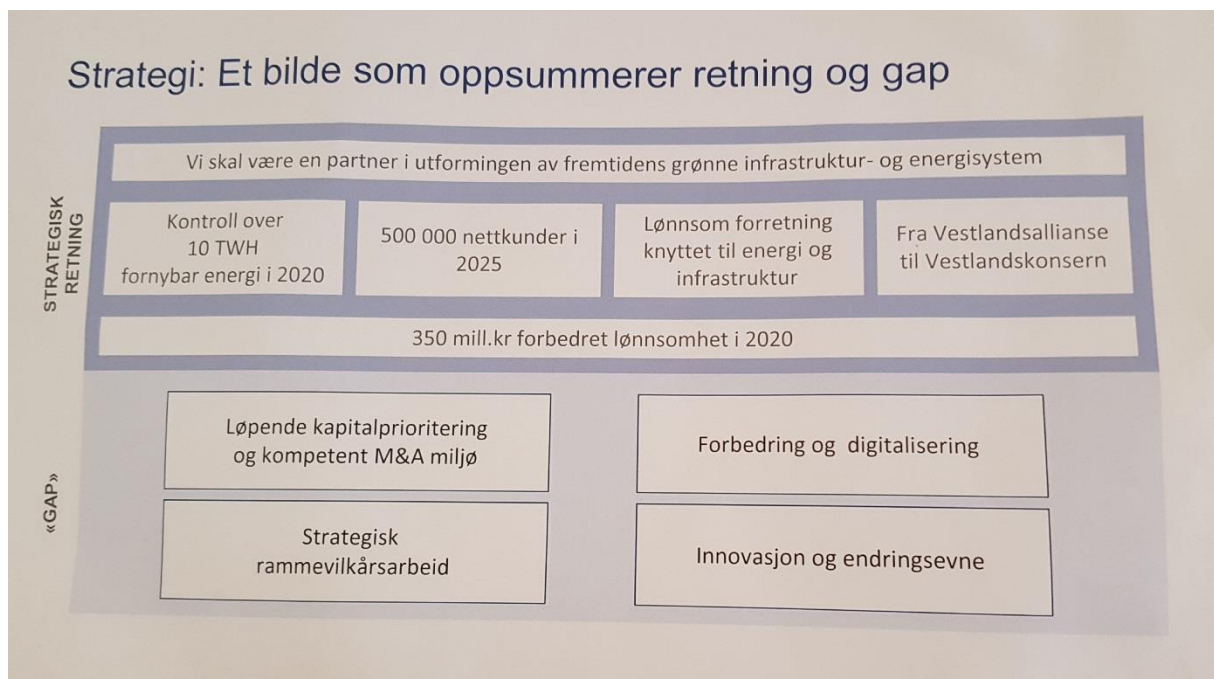
In order to understand the strategic choices that BKK is making to confront disruptive innovations, it is vital to first understand the factors that are inhibiting the firm from responding. As such, this sub-chapter analyzes the factors that could be inhibiting BKK’s response to solar, and wind energy, after which it presents a brief discussion about balancing innovation and creativity in BKK, and then finally, an analysis of BKK’s strategic responses to disruptive innovations, disruptive models, and choices the firm has made in regard to harnessing the five principles of disruptive technologies as theorized by Christensen(2013)

#### **4.3.1 Factors inhibiting BKK’s response to newer renewables**

Bower and Christensen argue that incumbents that missed the disruptive innovations were characterized with good managerial procedures such as having their competitive antennae up, investing in new products and technologies and even listening keenly to their



customers (Bower and Christensen, 1995). – Data collected from internal official documents outlining goals, strategies, highlighting processes and procedures, in addition to interview data from both the IoU, and FUol unit marks BKK as a well-established company, who have an external radar to scan the market, are actively investing in new technologies and even listen keenly to both their investors, and customers. To understand BKK’s inhibitions, it was thus vital for this study, to look at the company’s main strategic direction as illustrated in *Figure 18*, and the “gap” it has got to cover in order to achieve the organizational goals.



*Figure 18: Strategic direction of the BKK corporation and the “gap” efforts it must implement to achieve its organizational goals.*

The head CEO, Jannicke Hilland explained the corporation strategic direction in the energiteknikk magasin and stated; “BKK har som målsetting å være et av de tre ledende energikonsern i Norge. Fremover vil lønnsomhet, kompetansebygging og arbeid med innovasjon prioriteres. Innovasjonssatsingen er viktig for å sikre effektiv kraftproduksjon og framtidsrettet strømforsyning. Videre skal økt innovasjonstakt bidra til at BKK blir en drivkraft i framtidens grønne infrastruktur- og energisystem, blant annet gjennom å utrede nye forretningsmuligheter og bidra til å ta kraften i bruk på nye måter.” The set goal to become one of the three leading organizations in the energy industry, as well as the implementation of efficiency improvement initiatives, increased profitability, and reinforced

innovation initiatives, BKK can be classified as a company that has all the good qualities of a well-run organization in place.

Despite these good qualities, there is a possibility for BKK to lose the leading position in the western region of Norway, or even lose the chance to attain the corporation's current main goal. Hill and Rothaermel (2003) discuss incumbent inflexibility when confronted with disruptive innovations and argue that incumbents have an incentive to invest in sustainable innovations since they add to their established knowledge base, maintain entry barriers, and protect or enhance existing streams of income. Furthermore, incumbents seek to maximize marginal returns from the established technology rather than devote resources to pioneering new technology with an uncertain payoff. The incumbents thus preferably channel funds into R&D activities that support sustaining innovations to their existing knowledge base and settle for producing a predictable stream of rents (Hill and Rothaermel, 2003). – Although BKK has its competitive antennae up and about, and despite management in both FUoI, and IoU being aware of the evolving competitive situation, collected interview data, and data from internal BKK intranet publications indicates that BKK's strongest incentive is to invest in sustainable innovations that add value to hydropower. In the face of the growing trend of renewable energy sources, respondent R3 states;

*“Vi tror på; Fossilt fases ut, mer uregulerbar kraftproduksjon og større behov for stabil forsyning. Med bakgrunn i dette bildet har vi valgt å satse på stor regulerbar kraft og effekt....Fremtiden er fornybar og vannkraften fortjener en sentral plass her.”*

This indicates BKK's confidence in its present competitive advantage of bringing to the market a regulative renewable energy, and thus giving an impression that the other renewables have no chance of out-competing hydropower, which according to the respondent, deserves to have the biggest portion of the market share. Despite hydropower having enjoyed a big portion of the energy market for close to a century, the energy industry is evolving fast with constantly more innovations and smart technological solutions flooding the market. Levels of uncertainty were detected during the interviews with all respondents regarding the changes in the industry. Take for example respondent R1's remark; *“Jeg tror vår største trussel er om vi har evnen til endring raskt nok.”* Respondent R1's remark about the biggest threat being BKK's ability to evolve fast enough designates an uncertainty in the face of an industry undergoing a sustainable energy revolution, and is thus concise with Hill

and Rothaermel(2003)'s theory, that suggests that under conditions of uncertainty, incumbents who already enjoy a huge portion of market like BKK has done for over a century, will reasonably choose to invest less in disruptive innovations like newer renewables for fear of crippling the stream of rents from for example, BKK's established hydropower. The FUol unit has therefore settled for intensifying efforts towards R&D projects. Interview data collected from respondents, R2, and R3, also indicates the corporation's somewhat mild refrainment and hesitation regarding adopting newer renewables. Their reason consistent in all three interviews was that hydropower has the supreme advantage of being regulative, which solar, and wind energy do not have.

In his book the *innovation dilemma*, Christensen writes about observations of incumbents that were confronted with disruptive technologies. The author observed that quite frequently, well established companies intensified investments in the traditional, established technologies when disruptive innovations are introduced into the market. This has been the case with BKK which has seen the corporation not only intensify its innovation efforts, but initiatives towards R&D activities. BKK-D10 addresses the intensified initiatives towards R&D projects and states;

*"BKK har intensivert jakten på økonomiske bidrag fra nasjonale støtteordninger som SkatteFUNN og ENERGIX-programmet. Støtte fra det såkalte virkemiddelapparatet kan medvirke til at endrings- og innovasjonstakten øker i BKK."*

Data collected from internal documentation confirms an escalated tempo in R&D activities towards the end of 2017, in which BKK Produksjon had over three projects approved, and BKK Nett was participating in over twelve projects. It could be argued that BKK's intensified efforts towards R&D are consistent with Hill and Rothaermel's theory, or alternatively, that it is a simple case of resource dependency in which the demand from BKK's biggest customers, and investors requires increased initiatives towards increasing the value of hydropower. In which case, Christensen (2013) argues that the resource dependence of incumbents on their most demanding customers guides investments towards enhancing focal mainstream performance features(Christensen, 2013), which in this case, is hydropower as it offers superior performance attributes like being regulative, which the newer renewables like solar, and wind energy do not currently offer. Accordingly it then becomes most rational for

an established firm like BKK to invest towards increasing the value of hydropower, other than the disruptive technologies of solar, and wind energy.

Wind and solar energy with their current lower performance might not appeal to the mainstream market at the moment, but given the rate of change, and innovation within the energy industry, these sustainable energies have the potential to appeal to BKK's mainstream customers in not so many years from today. Take for example the automobile industry. The electric car was a disruptive innovation over 10 years ago, and due to escalated innovation within the battery technology, a very improved mileage compared to ten years ago, a huge network of boost charging all over the country, the performance attributes of the electric car have become attractive to mainstream customers who did not find it attractive at all over ten years ago. Interestingly, BKK is one of the organizations that are benefiting from a technology that was disruptive to fossil-driven vehicle incumbents, as the firm has now established an ambidextrous unit (BKK-lading) centered on the business of charging electric cars which number up to about 140 000 cars on Norwegian roads. It is therefore noteworthy, that although BKK has an additional incentive to ignore wind and solar energy with their low performance, the potential for the newer renewables performing much higher than they are today should not be disregarded, but rather taken advantage of, as it shall be presented later in section 4.3.3.4

#### **4.3.2 Innovation within BKK**

Collected data depicts falling electricity charges as the main reason for the drastic reduction in BKK's operating result equating to over one billion kroner since 2011. To confront, and turn this negative development around, the board of governors in the BKK AS corporation decided on an efficiency improvement of 350 million kroner before taxes within 2020 because as the CEO of BKK AS stated

*“For å styrke posisjonen som et ledende selskap og bli blant Norges tre største målt i størrelse, antall nettkunder og volum, må vi også bli blant de mest kostnadseffektive på drift og produksjon innen alle deler av virksomheten.”*

The implications of this statement is that without efficiency improvement initiatives, the BKK corporation will lose the chance to become one of the leading organizations in the energy industry. Collected data from internal documents depicts initiatives like employee

adjustments, introduction of the LEAN concept, simplification of control systems, etc. By October 2017, the company had made efficiency gains of 150 million, out of the 350 million which was set as the goal figure within 2020, which is consistent with the theoretical strand presented by Paul Trott, claiming that an organization that focuses on efficiency improvement of the day-to-day operations within an organization acquires efficiency gains. Furthermore, a common dilemma in the management of innovation is managing the tension between efficiency, and innovativeness(Christensen, 2013). – In BKK’s case, the company has been working on managing this tension between innovativeness and efficiency in which efforts towards both efficiency, and creativity have been intensified the last two years. BKK’s IoU is at the front of intensified efforts towards innovation, as Respondent R1 stated; *“Suksesser skapes der det er stort rom for å utfordre etablerte sannheter og lov til å prøve og feile. For å nærme oss ambisjonen om å være med og forme fremtidens løsninger, vil vi øke satsingen på innovasjon.”* According to this statement, the IoU unit has intensified innovative efforts with the purpose of getting BKK closer to its organizational goal. These intensified innovation initiatives, together with the efficiency improvement efforts to increase profitability, imply BKK’s successful efforts in balancing the tension between efficiency, and creativity with the purpose to achieve the organizational goal.

Interview data depicts, traces of innovativeness throughout the BKK corporation.

Questioned about innovation within BKK Produksjon, Respondent R4 replied;

*“Egentlig så har vi innovert alltid, innovasjon er ikke noe nytt. Det er noe som skjer kontinuerlig. Verden endrer seg hele tiden, teknologien endrer seg, marked endrer seg, menneskene endrer seg, og det som Jeg oppfatter som innovasjon, er å være i bevegelse, ta i bruk det som gagnar forretningsutvikling, effektivisering, øker produktiviteten, forbedrer teknologi, og tilpasser seg markedet.”*

Interview data with all respondents (R1, R2, R3, R4, and R5) indicates that BKK corporation is actively working with innovation. Furthermore, although innovation units like FUoI, and IoU deal more aggressively with innovation-oriented work, initiatives to alter the organizational culture into an innovation-oriented culture is in the works throughout the corporation.

#### 4.3.2.1 Collaboration between BKK's IoU, and BKK produksjon's FUol unit.

With the purpose of gaining understanding of the IoU unit's role in the BKK corporation, and its area of business, respondent R1 was questioned about the unit's main purpose, to which she retaliated; *"IoU sin hovedoppgave er å skape nye forretningsmuligheter og teste nye forretningsmodeller, både selv og via oppstartsselskap i Grønn InVest. I tillegg har IoU ansvaret for strategi og for oppkjøp og fusjoner."* Additionally, respondent R1 elaborated on the units main focus; *"IoU fokuserer på «det nye» det disruptive og dermed tror jeg det er et viktig grep for å sikre kapasitet til å jobbe med de langsiktige og viktige temaene."* Basically, according to respondent R1's retaliations, the IoU unit's fields of operation cover business model within BKK, as well as towards start-ups or young companies, with focus on the new, and disruptive.

In order to understand the innovative strategies that can be taken by the FUol unit, as well as limitations, respondent R3 was questioned about the responsibilities that lie under the FUol unit, to which she responded;

*"Vi har ansvar for strategiarbeidet i BKK produksjon. Og det er klart at det å ha en god strategi i bunn er helt avgjørende. Målet for denne enheten er å skape mer verdi av vannet oppnådd gjennom forbedringsarbeid, og utvikling av innovasjonskultur i selskapet....Mål ift FoU, er å ta del i støtte ordninger, og gjerne sikre at det vi jobber med engasjere oss i FoU arbeidet, strategiarbeid er strategisk forankret, og at vi faktisk klarer å nyttiggjøre oss av det som kommer ut av de prosjektene."*

The respondent voiced the basic fields of operation for the FUol unit, as illustrated in *figure 15*. And so what is the level of collaboration between the IoU, and FUol units?

Collected data indicates that FUol's collaboration with the IoU unit is limited to business opportunities that may involve other subsidiary companies. Respondent R3 explained this limitation;

*"Alt som vever av BKK produksjon sin virksomhet blir håndtert her i selskapet, og så kan det være ting som går på tvers av konsernet eller noe sånt, og då håndteres de av IoU i morselskapet. Det er egentlig ikke så mye samarbeid med IoU. Selv om det burde være det."*

The implication of this statement is that FUoI basically focuses on its fields of operation. Further probing of respondent R3 revealed that IoU is often only brought into the picture, if there is an R&D project that might be relevant for other subsidiary companies under the BKK corporation. Queried about the collaboration between IoU and FUoI, Respondent R2 retaliated; *“Vi jobber på felles forretningsutviklingsprosjekter (BKK prosjekter) hvis hensiktsmessig.”* This implies that the units only collaborate when dealing with business developmental projects that have the potential to benefit other business domains in the BKK corporation. Respondent R1 clarified on the collaboration between the units and stated; *“Når vi styrker satsingen på innovasjon så har selskapene ansvar for den selskappspesifikke innovasjonssatsingen, mens vi i Innovasjon og Utvikling vil jobbe med forretningsmuligheter som enten går på tvers av eller ligger utenfor dagens virksomhet.”*

There is however a different handling process for innovative ideas that surface and might possibly benefit other functional units. These, according to respondents R2, and R3, get forwarded to the IoU unit. Respondent R2, and R5 spoke of a newly established meeting arrangement called *“Innovasjonshub”* in which all the managers involved with innovation-oriented fields of operation, meet every now and then to discuss new developments across the BKK corporation. Both respondent R5 and R2 were however quick to add that the meetings have not been effective as such, and the IoU unit who arranged for these meetings is still working on a more routinized arrangement.

#### ***4.3.3 BKK's strategic options to address disruptive innovations***

An evolving energy industry has led to incumbents like BKK having to change their game plan to not only maintain their competitive advantage, but to ensure growth. In 2016, top management in BKK decided on a strategy in which they could work on reversing the negative developments of receding marginal profits. The efficiency improvement program BKK 2020 was put in motion to increase profitability, cost-effectiveness, and cost reduction. In BKK-D1, the head CEO of BKK AS, addressed the reasons for the implementation of the improvement program BKK 2020;

*“Bakgrunnen for forbedringsprogrammet er de store endringene i BKKs omgivelser. Ny teknologi endrer måten energi produseres, distribueres, lagres og brukes....Kraftprisene har vært fallende de siste årene, og prognosene for de neste årene peker nedover.”*

This section of this sub-chapter analyzes BKK’s strategic responses to disruptive innovations, models, and the diverse changes in the energy market, and industry.

Schmidt and Druehl(2008) discuss encroachment which implies that a disruptive innovation has some level of impact on the existing market, but does not necessarily have to displace the established market(Schmidt and Druehl, 2008). This is concise with Yu and Hang(2010)’s argument that incumbents with existing high-end technologies still can survive disruptive innovations by concentrating on satisfying its most demanding but least price sensitive customers(Yu and Hang, 2010). – In BKK’s case, hydropower is a high-end clean and sustainable technology, and according to collected data, newer renewables like solar and wind energy have had some level of impact on the established hydro power, showing consistency with Schmidt and Druehl(2008) theory about encroachment. The question however is whether BKK can survive solar and wind energy as disruptions. And if so, how?

Following Yu and Hang(2010)’s argument, BKK’s main strategic choices have pointed to satisfying the mainstream customers with an intent of surviving new disruptive technologies including the non-regulative newer renewables like solar and wind energy. An aforementioned statement from respondent R3 to validate this observation remarks on the strong competition that BKK is facing in regard to solar and wind energy which implies that these newer renewables are having an effect on the competition dynamics of renewable energy. Additionally, BKK perceives newer renewable energy sources as non-regulative and so emphasizes the competitive advantage hydropower has over the newer renewables, which has led to the corporation’s strategic stand of betting on the established business by intensifying R&D activities as well as innovation initiatives to fight for hydropower’s position. Consistent with respondent R3’s declarations about prioritizing hydropower, respondent R5 stated; *“Det ligger i planen å se på for eksempel vindkraft, men i praksis, satser vi ikke på andre fornybare energikilder. Planen er å se på dem hvis de har en god business portefølje men ellers er det 99,9998% vannkraft vi satser på”* Respondent R5 does not only confirm that BKK’s priority is presently hydropower, he also confirms that BKK has basically chosen not to respond to the newer renewables unless the sustainable energies have a good



business portfolio. This strategy is consistent with Christensen(2013), and Charitou and Markides(2003)'s theoretical arguments about incumbents' incentive to focus on their core business.

According to Charitou and Markides(2003), how a company responds to disruptive innovations is dependent upon its motivation and ability to respond as shown in *figure 7* under *Section 2.3.1*. In response to questions centered around *figure 7*, respondent R3 stated;

*“BKK’s motivasjon til å reagere til disruptive innovasjoner, er mest lav, og tenderer noe til middels. BKK har evne. Evne er egentlig høy. Det som har enorm verdien er vannkraften. De andre har ikke noe særlig verdi. Ikke for BKK i hvert fall.”*

This indicates the company's strategy of not responding to newer renewables, henceforth, drawing on Charitou and Markides(2003)'s theory, if the motivation is low, incumbents respond by ignoring the disruptive innovation, and focus thus on the main business. On the other hand, according to respondent R5, the corporation is still somewhat open for responding to other renewables if the business portfolio is appealing. Charitou and Markides(2003) argue however, that it is difficult for an established company to respond to disruptive innovations effectively by trying to compete in both the established position, and the new disruptive position simultaneously hence this kind of strategy can lead to degradation of the value of existing activities, resulting into major inefficiencies for the established business(Charitou and Markides, 2003). This theory could be the reason BKK has chosen a strategy that currently focuses on enhancing and increasing the value of its established business, instead of using resources to compete in the disruptive position as well. Nonetheless, BKK's strategic response to disruptive technologies is more than just ignoring the threat of solar and wind energy. The next sub-chapter presents BKK IoU, and BKK Produksjon's FUol's strategic responses to disruptive technologies in the form of; prioritizing sustaining technologies, confronting disruptive business models, cultivating growth opportunities to confront an evolving industry, as well as a presentation of BKK's strategic choices by harnessing the five principles of disruptive technologies.

#### 4.3.3.1 FUol's strategic choices

Based on statements from respondent R5 and R3, presented in *section 4.3.3*, FUol's strategic choices are currently limited to increasing the value of hydropower. According to respondent R3, FUol's strategies are limited to improvement efforts, development of the innovation culture in BKK, intensification of R&D activities focused on sustaining technologies, and innovations aimed to increase the value of hydropower. One of the R&D projects that have been a subject of conversation during interviews held with respondent R2 and R3, is that of a young company Tibber which collaborated with FUol on an all-digitalization project of the electrical power market. According to respondent R2, Tibber was first in contact with IoU, who later introduced the young company to the FUol unit, together with whom Tibber's technology was developed under FUol's R&D's section. Needless to say BKK could otherwise have had a chance to develop Tibber's business model through business model innovation, but as it is today, FUol does not engage in business model innovation, although respondent R3 points out it is a frequent topic of discussion during top management meetings. According to respondent R3, business model innovation was otherwise a one-time project, that has not been made a regular practice in the unit. Chesbrough(2010)'s theoretical strand may serve as practical implication for BKK to take into consideration in regard to business model innovation.

During the interview with Respondent R5, he clarified FUol's practical focus of its resources and stated; *"Vi bruker ressursene våre på effektivisering, på LEAN metodikken, på økning av lønnsomheten, dette gjennom riktig vedlikehold for å unngå at BKK opplever tap hvis maskineri ikke fungerer som den skal."* FUol's strategic choices mirror Hill and Rothaermel(2003) theoretical strand about strategic reasons for incumbent inflexibility. On the other hand, IoU's strategic response to disruptive innovations stretches further than initiatives towards increased profitability, cost-effectiveness, and intensified R&D activities. The innovation-oriented unit under BKK AS is making additional efforts to respond to disruptive innovations, and business models as analyzed and discussed in the next section of this sub-chapter.

#### **4.3.3.2 IoU's strategic responses to disruptive innovations**

Christensen(2013,p.102) draws on resource dependence theories and offers a solution to what managers can do when faced with a disruptive technology. The author offers an option of creating an independent organization and embed it among emerging customers that do actually need the technology(Christensen, 2013). – In BKK's case, top management has harnessed this principle by embedding projects that commercialize on disruptive innovations(radical) and incremental innovations within a separate organizational unit IoU. The IoU unit focuses on a different set of customers who are interested and need these different new technologies. Collected data presented in *section 4.3.2*, shows that IoU's focus is mainly on the new, and the disruptive innovations.

Christensen(2013, p.121) asserts that managers who confront disruptive innovations should be leaders, and not followers in commercializing these technologies. According to the author, doing so requires embedding the projects that are to develop such technologies in commercial organizations that match in size the market they are to address. According to the author, the principle of disruptive technologies that managers can harness in this instance is; *Small markets do not solve the growth needs of large companies(Christensen, 2013)* – BKK, through the IoU unit, has made use of this law by placing disruptive technology projects in companies small enough to get excited about small opportunities, and small wins. Take for example the new radical battery innovation from Bergen Carbon Solutions. Having established a partnership with this young company, IoU has ensured that the technology is contained inside the young company where it can be nurtured, and where the competences can get excited about minimal opportunities, and wins. BKK-D5 presented the young company as;

*"...et Bergensbasert teknologiselskap som lager noe hele verden vil ha: karbon-nanofiber. Dette produktet fremstiller de av noe ingen vil ha: CO<sub>2</sub>. Selskapets metode for å lage karbon-nanofiber kan gjøre det sterke, lette og hittil kostbare materialet langt billigere å produsere i store mengder...Bruksområder til karbon-nanofiber spenner seg fra ny batteriteknologi til byggematerialer i form av komposittmaterialer."*

This response to disruptive technologies through harnessing this principle could pay off even better for BKK's case. The newly established partnership with BCS(Bergen Carbon Solutions), if well nurtured, and allowed to grow in the yet small market where it belongs,

BKK can harvest greatly from these carbon nano-fibres. The carbon nano-fibres could be used to attain new battery technology. Given that the newer disruptive renewables like solar energy are so dependent upon battery capacity, and technology, an innovative well-developed technology within this field could yield substantial profits for BCS, and BKK. With this new battery technology, BKK has the potential to disrupt the disruptor which Charitou and Markides(2003) suggest as response to disruptive innovations. The author proposes that the established business should not focus on improving the same product or service attributes, but should instead focus on coming up with other different product attributes, and ultimately disrupt, the disruptor(Charitou and Markides, 2003). In this case, instead of BKK trying to focus on trying to improve the same decentralized solar energy PV installations in people's homes, the company can simply concentrate on offering different product attributes of excellent battery technology which will see the corporation earning from a previously disruptive technology, relative to its established hydropower.

Christensen(2013,p.161-162) argues that the hallmark of a great manager is the ability to identify the right person for the right job, and to train his or her employees so that they have the capabilities to succeed at the jobs they are given. The author explains that organizations, independent of the people and other resources in them have capabilities, and as such good managers should be skilled enough to recognize this principle, and prepare the right organization as well(Christensen, 2013). – In BKK's case, top management has harnessed this principle, by again utilizing some of the resources of the main business to address disruptive innovations through IoU, while at the same time ensuring not to influence the organization's processes and values, but rather finding different smart ways in which they can work together. Questioned about GrønnInvest (an investment company under IoU)'s processes and whether they are integrated with the mother business, respondent R2 retaliated;

*“Organisering og struktur/prosesser for BKK Grønn InVest er utarbeidet med tanke på å gi satsingen handlingsfrihet og hurtighet til å ta avgjørelser. Det betyr for eksempel at investeringsprosessen ikke er en del av BKKs tradisjonelle beslutningsprosess for investeringer nettopp for å kunne gi satsingen handlingsrom.....Samtidig har vi valgt å ikke holde BKK Grønn InVest helt på utsiden av BKK, men trekke på kompetanse fra resten av BKK selskapene. Derfor ligger selskapet i et av forretningsområdene (IoU) og har BKK ansatte som jobber inn mot selskapet og bidrar med sin kompetanse.”*

This statement confirms that top management in BKK has harnessed this principle through the IoU unit, and thus equipped the organization with the right “tool” to confront disruptive innovations.

Christensen(2013 p.191-192) argues that the companies that were most successful at commercializing a disruptive innovation were those who focused on finding, or building a market where product competition occurred along dimensions that favored the disruptive attributes of the product. According to the author, the principle of disruptive innovations to harnessed is; *Technology supply may not equal market demand.*(Christensen, 2013) – Top management in BKK, through IoU, have harnessed this principle by finding or developing markets that value the attributes of the disruptive technologies at the time of commercializing them, instead of searching for a technological breakthrough. For example, BKK’s investment in Tibber’s technology of an all-digitalized power market. BKK’s betting on developing the market for this technology, instead of waiting for a technological breakthrough, has allowed for the potentially disruptive innovation relative to BKK’s business model to compete as a sustaining technology in the company’s mainstream markets. Queried about the Tibber technology, respondent R2 retaliated;

*“Tibbers plattform representerer det som kan bli fremtidens markedsplass for handel og styring av energi. Ikke bare her i Norge, men også globalt. Med økende lokal produksjon fra eksempelvis solenergi, blockchain teknologi og robotisert strømstyring er det naturlig at dagens energisystemer endrer seg dramatisk. BKK ønsker ikke å sitte på gjerdet mens dette skjer, vi ønsker i stedet å aktivt drive frem endringen.”*

BKK’s response of for example developing the Tibber-technology market, and impelling this all-digitalized trading of power in the energy industry implies a response to the disruptive newer renewables, by implementing the same aforementioned strategy of disrupting the disruptor as proposed by Charitou, and Markides(2003). In this case, the different product attributes would be trading and managing of for example locally produced solar, or wind energy using Tibber’s technology, and as such, BKK can generate income from the same customers who are now appreciating the attributes of the disruptive newer renewable like decentralized solar energy. Additionally, this same Tibber-technology could be utilized to monitor how much end-user power actually gets consumed, and as such plan on how much

power can for example be sold to European customers, or be diverted to the electrification of the transport sector (charging of vehicles, ferries), etc.

Christensen(2013,p.143) presents another principle of disruptive innovations that states; *Markets that don't exist cannot be analyzed*. The author points out that not only are the market applications for disruptive technologies unknown at the time of their development, they are unknowable. As such, according to the author, failure is an intrinsic step towards success, requiring managers to make plans for learning and discovery, rather than plans for execution.(Christensen, 2013) – The IoU management has made efforts to harness this principle by exhibiting and allowing for trial and error inexpensively, while searching for the market for the disruptive technologies that get to be developed through the unit. In BKK-D12, respondent R1 stated; *“Innovasjon er å utforske det uutforskede. Det har en iboende risiko for å ikke bli en suksess, og det må vi være komfortable med.”* This declaration indicates that top management is aware, and is accepting of the risks involved in the possibility of not succeeding with disruptive technologies. As such, BKK is harnessing this principle and adopting disruptive technologies with the knowledge that the markets do not exist yet and consequently giving room to try and error. Consistent with this line of reasoning, is respondent R1's statement; *“Suksesser skapes der det er stort rom for å utfordre etablerte sannheter og lov til å prøve og feile.”*

#### **4.3.3.3 IoU's strategic options for disruptive business models**

As aforementioned, one of IoU's main purposes is to cultivate new business opportunities, as well as testing new business models within the BKK corporation, and towards external parties. The fields of operation responsible for testing new business models and cultivating new business opportunities lie under the IoU unit's investment company, BKK Grønn Invest. The company was established to increase the innovation tempo in BKK by searching the market for breakthrough innovative technologies as well as investing in start-up companies with innovative business models. Additionally, GrønnInvest's field of operations include acquiring young companies with new innovative ideas, and innovations.

Queried about BKK's strategy to confront business models that could be disruptive to BKK's established business model, respondent R1 replied; *"Grønn InVest skal være et verktøy for strategisk læring. Vi skal aldri begrenses av at ideer vi investerer i kan disruptere dagens forretning. Vi skal ikke «bare» forsterke vannkraft, men også utfordre."* Respondent R1's statement gives an indication that although the business models of other renewable energy sources could be of a disruptive nature to the established hydropower, BKK, through the IoU unit is open for its established business model being challenged, and as such give an opportunity to the unit's competencies to engage in business model innovation that will reinforce the established hydropower. In BKK-D10, the CEO of IoU remarked on R&D projects that were active at the time, and then remarked on the possibilities of business model experimentation within the newer renewables like solar energy;

*"...De neste prosjektene er ikke bestemt, men det kan dreie seg om å teste vår forretningsmodell innen solenergi, hvordan vi kan utnytte batteriteknologi i strømmettet, eller å utvikle vår egen digitale plattform for å optimalisere samspillet mellom ulike energibærere."*

In this statement, the CEO of IoU indicates that the IoU unit is not only open for business model experimentation within solar energy, but also within the utilization of battery technology along BKK power grid, which is an indication of unexplored growth potentials within solar energy in conjunction with new battery technology. A further analysis of this growth potential is presented in section 4.3.3.4.

Charitou and Markides(2003) argue that the established competitor does not necessarily have to adopt the new business model, but can simply ignore it, and instead focus its resources on improving the competitiveness of its traditional business model relative to the disruptive strategic innovation(Charitou and Markides, 2003). – Although respondent R2 claims that the IoU unit focuses its resources on both incremental, and radical innovations, collected data presently indicates that BKK has so far implemented measures that have the potential to improve the competitiveness of the established hydropower business model relative to the other renewables. Among these measures are business models that have recently challenged BKK's established business model.

An example of a business model that was challenging the established BKK business model, was the one of Tibber technology. BKK which owns a big part of Fjordkraft whose business model is centered on the trading of power, was challenged by the Tibber business model which promised an all-digitalized trading center for power. Instead of using resources to improve the established business model, BKK's strategic response to this potential disruption was to establish an external partnership with Tibber, and thus be a part of driving this innovation forward in the energy market. In BKK-D9, the CEO of IoU remarked on BKK's partnership with Tibber and the challenge of BKK's established business model;

*"..Dette handler om å utfordre en etablert forretningsmodell i en tid preget av raske endringer. Dette kan eksemplifiseres ved å trekke paralleller til mediebransjen. Da Schibsted opprettet Finn.no var dette en bevisst strategi for å utfordre sitt eget tradisjonelle rubrikkmarked - før andre aktører gjorde det. Ved å samarbeide med Tibber sprer vi risiko i en uoversiktlig brytningstid og tilegner oss samtidig verdifull kompetanse om disruptive forretningsmodeller og ny teknologi."*

This response from the CEO of IoU is an indication that BKK's response to disruptive business models is establishing external partnerships with young companies that could have potentially disruptive models and innovations to BKK's established hydropower, and BKK's strategy of embarking on these disruptive innovations early on allows the company room to transform them into sustaining innovations relative to the established mother business or adopt them at an early stage. This is consistent with Christensen and Raynor(2013, p.193)'s theoretical strand that states that organizations cannot disrupt themselves(Christensen and Raynor, 2013), and as such BKK's strategy to partner with Tibber presents BKK with a new-growth business opportunity, while at the same time responding to it as a disruptive innovation.

#### **4.3.3.4 BKK's response through Potential growth opportunities**

Christensen and Raynor(2013,p.238-240) argue that despite a company's success, top management soon comes to the realization that the firm is facing what is termed as a *growth gap*. According to the authors, the only way that managers can generate the



company's share prices to increase at a rate faster than the market average, is to outstrip the growth rate that investors have built into the current price level. And hence, managers who seek to create shareholder value tend to face a *growth gap*, which is defined as the difference between how fast the company is expected to grow, and how much faster it needs to grow to achieve above-average returns for shareholders. The authors go on to assert that sustaining innovation is therefore crucial for maintaining a company's share price, but it is the creation of new disruptive businesses that allows companies to exceed investor expectations, and therefore create unusual shareholder value. The authors argue however, that once growth becomes stagnant, the corporation's "money" turns impatient for growth, which renders it impossible to do the things required to launch successful growth business(Christensen and Raynor, 2013). – Collected data indicates that BKK as an established firm is a company well-versed with sustaining innovations and has thus the capabilities and culture of close to a century characterized by maintaining the company's share price. Nonetheless, just as the head CEO Jannicke Hilland remarked in BKK-D3; *"Tiden da vannkraften var samfunnets melkeku er over. Prisen på sluttproduktet har falt og vil holde seg lav lenge. Men det ligger et stort potensial for ny verdiskaping i billig, ren energi."* Given that the energy industry is evolving fast, and yesterday's cash-cow does not seem to be the certain bread winner for tomorrow, BKK has had to respond to the evolving industry by intensifying its efforts in increasing the value of hydropower in an attempt to close the first growth gap(Chesbrough and Crowther, 2006) which is needed to strengthen BKK's hydropower by optimizing the execution of the existing hydropower.

Christensen and Raynor(2013,p.246-247) assert that the growth engine is a delicate *machine* that must be kept running continuously by process and policy, rather than by reacting when the growth gauge reads empty. According to the authors, establishing a policy that endorses the launch of new disruptive growth businesses in a predetermined pattern is the only way management can avoid reacting after the growth engine has stalled. The authors assert that managers must, on a regular basis launch new-growth business/es while their core business is still growing healthily. (Christensen and Raynor, 2013). – For the last two years, BKK has intensified efforts of new business growth, which started out by the establishment of the IoU unit, followed by the investment company Grønn Invest. Through this innovation-oriented unit, the BKK corporation has explored business opportunities, business models,

and disruptive innovations to increase profitability, and to ensure company growth. The timing for the intensified efforts towards growth could be argued upon, seeing as to how collected data indicates that these efforts were intensified at the time when the price of hydropower had been low for quite a while. In BKK-D3, the head CEO remarked on the low price of hydropower stating;

*“Energimarkedene er i endring, og det er ikke en midlertidig turbulens. Prisene har falt i flere år på grunn av lave brenselpriser og et kraftoverskudd i Norden. Det er derfor risikosport å forvente at markedet skal snu tilbake til den gamle normale.”*

The CEO's perception of an industry in which the price of hydropower has been falling for years due to low combustible prices presented BKK with a situation that seemed dire, and which drove top management to re-evaluate the corporation strategy. Consequently, data collected indicates that the BKK growth engine had stalled, and hence a risk that the growth efforts were intensified at the time when the corporation's investment capital had become impatient for growth(Christensen and Raynor, 2013)(p.240).

According to Chesbrough and Crowther(2006), when internal R&D fails to meet growth objectives, a growth gap emerges. – In BKK's case, collected data indicates that R&D projects did not meet growth objectives two years ago, leading to top management strategizing by optimizing the established business model to close the first growth gap. This is visible in efficiency improvement efforts the last two years, through the Fuol unit. Simultaneously, to close the second growth gap, the BKK corporation is identifying potential new businesses in emerging technologies through the IoU unit. To optimize development execution, BKK has strategized by adopting technologies which have been somewhat proven in the young companies that the corporation has partnered with, which is consistent with Crowther and Chesbrough(2006)'s theory about firms looking outside the organization for technologies to extend or defend their core business.

As such, one of BKK's responses to disruptive technologies, and newer renewables has been to close growth gaps, by exploring growth potentials, and investing in innovative business models, and business ventures. According to respondent R1, Some of the new-business growth potentials for BKK are; The Tibber technology that promises an all-digitalized power trading center; The BCS carbon nano-fibres that promise to not only clean up the

environment, but have the potential to produce raw materials for better battery technology; The increasing need to charge electrical cars; The electrification of the transport sector which will see the increased need for big ferries to charge at the docks, in addition to more electric public transport like trams; and the increased export of renewable energy to Europe.

Among the biggest growth potentials that BKK has, electrification of the transport sector, and the need for exportation of clean sustainable energy are the biggest. To understand the strategic response of exploring growth potentials, a brief analysis of these two potential growth opportunities is going to be presented. Questioned about whether the introduction of newer renewables is a cause for BKK not to sell all the power it possibly can produce, respondent R3 retaliated;

*“Det stemmer ikke at BKK ikke får solgt produksjonen sin, men det kommer mye vind og noe sol inn i markedet kommende år. Det stilles krav til mer nett og utenlandske kabler for å få flyttet energien der det skal brukes...Det jobbes også med elektrifisering av transportsektoren mm noe som vil øke etterspørselen.”*

The implication of respondent R3's statement is that the situation was not optimum before renewable energies like solar and wind were introduced into the energy market. But now that they are commercialized and growing steadily, newer renewables threaten a portion of hydropower's market share in the coming years, especially since BKK is limited by grid capacity, which won't allow for exportation of unconsumed energy to European customers. My search to find out how much of the hydropower potential that is unconsumed, led me to BKK-D16, in which BKK's market analyst, Anne-Mari Knudsen remarked on the hydropower potential;

*“På Vestlandet har vi imidlertid dobbelt så mye kraftproduksjon som elforbruk, med begrensede muligheter for å sende kraften ut av området. Statnett sine nettprosjekter blir stadig skjøvet på, slik at kraftselskapene på Vestlandet om få år risikerer å tape 200-300 millioner kroner årlig. Dette vil i så fall ramme våre eierkommuner betydelig. Statnett uttaler selv at en utenlandskabel ut av området vil avhjelpe situasjonene med innelåst kraft.”*

This evaluation from BKK's market analyst confirms that the organization is among the incumbents in the west of the country, with 50% of potential power production unconsumed. Given that the competition dynamics have changed drastically, solar, and wind

energy are now taking a portion of the consumed share, which, according to BKK's market analyst, is a source of frustration for the company. The solution of expanding the grid seems to be taking longer than BKK would have wished despite Statnett itself declaring that a foreign cable out of the western region of the country would redress the situation of the "locked-in" unconsumed power. Until the new foreign high voltage cable is built to allow for BKK to realize this growth potential, to what extent will the electrification of the transport sector contribute to closing the growth gap?

According to the Norwegian, *National transport plan;2018-2029* the prognosis for the electrification of the transport sector within 2030 entails; 1,5 million electrical cars, 7000 more fast chargers, all town busses shall be electrified, all electric, and hybrid ferries shall be in operation. According to NVE report(*NVE.2017.p.17*), there shall be increased energy efficiency that will ensure a reduction in greenhouse gas pollution, as well as less noise when ships dock. The report also states that Bergen has the biggest potential for onshore power for these ships. Presently, Bergen and Omland Havnevesen have three terminal points which can be used by offshore ships and is thus the first harbor to offer onshore power to ship company *Hurtigruten*. This growth potential promises substantial gains for the BKK corporation if nurtured, and well harvested.

As such, decentralized power production from solar energy, or and wind energy can be utilized by local private consumers so that the grid is released to allow for the BKK corporation to concentrate its efforts on bigger customers like the electrified-transport consumers, and hence allow for bigger margins of profit. Henceforward, although the innovations within newer renewables are currently changing the competition situation of renewable energy, and having a considerable effect on BKK's established business, a regulative and stable supply of renewable energy is a competitive advantage that BKK can currently put to good use regarding the electrification of the transport sector. This is not to say that technology will not change so fast as to enable solar and Wind energy to gain in on this potential, but this knowledge gives BKK a head start in this department seeing as to how they already have a volume of about 50% energy production potential that they could divert to the transport sector. Now however, the ambidextrous unit BKK-lading is developing and cultivating this business opportunity.

Another potential growth opportunity for the BKK corporation lies in Green certificates. These are tradable commodities proving that electricity is generated using renewable energy sources and are thus a stimulation for sustainable energy production. Additionally, they are a form of penalty that is given to parties who pollute the air as a way of “cleaning the environment”. Respondent R3 remarked on green certificates, and the growth opportunities they present;

*“De er for å sikre at en gir en stimulering til grønn energi. Da gir man en økt til de som produsere grønt, og de som forurensere er pålagt å kjøpe opprinnelsesgaranti, for å “vaske vekk” forurensingen. Så er det blitt mer og mer vanlig at virksomheten er opptatt av å ha en grønn profil som blir en del av deres konkurranse fortrinn. Og det gjør at etterspørsel etter disse grønne sertifikatene øker. Så dette tror vi, vil være et marked i vekst. Det skal være store verdier å hente for BKK.”*

Although there are many companies’ activities that generate greenhouse gasses, and BKK has competition from other renewables, these green certificates still present a substantial growth potential for BKK.

#### **4.4 BKK’s Organizational responses to disruptive innovations**

This sub-chapter presents an analysis of BKK’s organizational factors that are not only essential to facilitate growth, but are key in either facilitating, or inhibiting the corporation’s confrontation of disruptive innovations. The analysis of these elements is presented in the next sub-chapter

Despite previous research indicating that incumbents are often not quite successful at commercializing on disruptive innovations (Henderson and Clark, 1990, Tushman and Anderson, 1986, Teece, 2003), there have been some exceptions to the depiction that organizations decline when faced with disruptive innovations, who despite the organizational constraints, have managed to assess disruptive innovations, and gone on to successfully commercialize on them. This chapter presents an analysis of BKK’s organizational factors that are inhibiting the company’s responses to disruptive innovations as well as the organizational elements which are critical for the fostering of successful responses to disruptive innovations. The sub-chapter starts out with analyzing the

Organizational structure, focused on IoU, and the Fuol units, and then moves on to the organizational culture in these two units. Finally, the sub-chapter presents the human resource management required to transform an organization and accordingly enable it to address disruptive innovations and evolving environments.

#### **4.4.1 Organizational Structure**

Christensen and Raynor(2013,p.177) argue that a great number of innovations fail because responsibility to build these disruptive businesses is given to managers, or organizations(or even organizational units) whose capabilities are not up to the new task at hand, because as the authors put it; *“An organization’s capabilities become its disabilities when disruption is afoot.”*(Christensen and Raynor, 2013). Govindarajan and Kopalle(2006) address the establishment of separate organizational units as a strategy to confront, and respond to disruptive innovations relative to using the organization’s existing structure(Govindarajan and Kopalle, 2006b). – According to BKK-D4, a new organizational structure was to be established by the 1<sup>st</sup> of May, 2016, in which an ambidextrous unit IoU with fields of operation directed towards Innovation and development was established. As aforementioned in sub-chapter 4.1, the strategic development was in response to the changes in the energy industry, the uncertainties regarding the competition dynamics of renewable energy, as well other disruptive innovations. The head CEO remarked on the strategic response of establishing separate organizational units and stated;

*“Disse strukturelle endringene skal bidra til at vi når lønnsomhetsambisjonen og videreutvikler konsernet. Gjennom enda større fokus på kostnadseffektivitet i vannkraftproduksjon og nettselskapet skal BKK fortsatt være blant de ledende selskapene i landet. Vi skal også styrke oss innen entreprenør- og markedsrettede forretningsområder, og satse sterkere på innovasjon og utvikling.”*

This declaration from the head CEO came however, after the establishment of the ambidextrous unit FUol under the daughter company BKK-produksjon, which indicates that the establishment of this separate unit was one of the first strategic responses to an evolving industry. An analysis of these ambidextrous units is presented in the next section of this sub-chapter.

#### **4.4.1.1 Ambidextrous unit**

O'Reilly and Tushman(2008) discuss the organizations' capacity to adapt in the face of disruptions, and according to the authors, the most basic part of the adaptive process are the notions of an organization's ability to exploit existing assets and positions in a profit generating manner and simultaneously explore new technologies and markets by configuring and reconfiguring organizational resources to capture existing as well as new opportunities. The authors explain that this capacity is ambidexterity, which involves both exploitation, and exploration(O'Reilly and Tushman, 2008). – As ambidextrous units, both Fuol, and IoU have different levels of exploitation, and exploration and are thus presented independently.

#### *Fuol as an ambidextrous unit*

BKK-produksjon's response to adapt in the face of changes within the competition dynamics of renewable energy was to intensify the company's efforts to exploit BKK's hydropower-based assets, and functions in such a way as to increase profitability, while at the same time using research and developmental projects to find new business opportunities that will ensure the growth of the company. In order to effectively adapt, BKK produksjon established the ambidextrous unit FUol. According to respondent R5, the unit's resources are concentrated on initiatives directed towards efficiency, increasing productivity, control of processes, establishing certainty, and variance reduction. According to respondent R3, the unit calls on different interdisciplinary resources across the company to find the best solutions to existing problems which might involve either increasing productivity, cost-effective challenges, or simply efficiency-improvement. Respondent R3 explained this as a flexible way of working and gave an example;

*“Hvis man har en oppgave som skal løses. Et tverrfaglig utviklingsteam er koblet sammen med kunden som skal ta produktet i bruk, for eksempel LEAN metodikken. Så velger kunden kompetansen som de har behov for, og så Jobber de intensivt i to uker for å finne løsning.”*

According to respondent R5, it could be that there is need to improve the solution the following two weeks again before the perfect solution is attained. As such, the unit is actively involved in continuous efficiency improvement efforts.

Simultaneously, the unit works with research and developmental projects that allow for the exploration of new technologies which lead to the unit discovering new processes and business opportunities that have the potential to increase the value of hydropower.

Respondent R3's aforementioned statements about R&D activities, and BKK-D10 remarking on the three R&D projects which the unit is currently involved is an indication that the unit is actively working towards finding new business opportunities, as well as capturing existing opportunities within the company through exploration.

#### *IoU as an ambidextrous unit*

According to O'Reilly and Tushman, dynamic capabilities lie at the heart of the ability of a firm to be ambidextrous by competing simultaneously in both mature and emerging markets as well as exploring and exploiting (O'Reilly and Tushman, 2008). – An analysis in sub-chapter 4.3, detailing BKK's intentions, goals and ambitions characterize an organization that is set on achieving sustained success. The established IoU unit possesses dynamic capabilities in the form of skills, processes, decision rules, which has allowed the unit the ability to function simultaneously in both the established hydropower market, and the emerging markets of newer technologies, in addition to exploiting, and exploring. Collected data from intranet publications indicates that the skills, processes, and disciplines in IoU's investment company allow for top management to identify threats and opportunities through this investment company, and thus enabling the organization the ability to reconfigure company assets to counter potential disruptive innovations.

In BKK-D13, the CEO of IoU stated; *"Innovasjon og Utvikling har ansvaret for å skape det nye - teste nye forretningsmodeller og utforske nye forretningsmuligheter på tvers av konsernet."*

This confirms the unit's fields of operation as an ambidextrous unit involving efficiency improvement, and increased profitability initiatives that can be utilized across the whole BKK corporation. In exercising the ambidextrous unit's dynamic capabilities, and seeing the need to reconfigure its assets, and organizational structure, The CEO reorganized the organizational structure under IoU, as remarked upon in BKK-D13; *".. det er opprettet en egen divisjon å styrke synergieffektene mellom den eksterne satsingen og det interne*



*innovasjonsarbeidet i BKK.*”- Indicating that a new division was established to ensure that disruptive technologies which are discovered through GrønnInvest, are easily integrated into the BKK corporation and thus establishing a collaborative balance to ensure an-all-organizational growth.

It is through the Investment company GrønnInvest, that IoU carries out its exploration which involves searching for start-up companies with innovative ideas as stated on BKK’s website that; *“BKK Grønn InVest investerer i oppstarts - og vekstvirksomheter som utvikler disruptive/innovative løsninger innen fornybar energi”* This advertisement statement focuses on potential start-up, and up-coming companies with smart innovative solutions within renewable energy, in which BKK can invest. Through this search, the investment company has discovered several technologies with the potential to disrupt BKK’s established business model, and some of which have been adopted by the BKK corporation through the autonomous unit Grønn Invest.

#### **4.4.1.2 Autonomous units**

According to Christensen, a separate organization is required when the mainstream organization’s standards by which employees make prioritization decisions, would render it incapable of focusing resources on the task at hand (Christensen 2013). – GrønnInvest is an autonomous unit under IoU whose fields of operation involve investment in start-up companies, external partnerships, exploration of business models, and new business opportunities. In respondent R2’s words; *“BKK Grønn InVest er et eget datterselskap, men det er et investeringselskap.”*. Govindarajan and Kopalle (2006) argue that small business units attempting to commercialize disruptive innovations require a culture that values entrepreneurship, experimentation and risk-taking, flexibility and creativity(Govindarajan and Kopalle, 2006b). This theoretical strand is true for the autonomous unit GrønnInvest, as respondent R2 explained;

*“Organisering og struktur/prosesser for BKK Grønn InVest er utarbeidet med tanke på å gi satsingen handlingsfrihet og hurtighet til å ta avgjørelser. Det betyr for eksempel at investeringsprosessen ikke er en del av BKKs tradisjonelle beslutningsprosess for investeringer nettopp for å kunne gi satsingen handlingsrom. Det gir også mening ettersom det å investere i oppstartsselskap har vesentlig annerledes karakter enn det å investere i f. eks vannkraftverk.”*

This statement is an indication that GrønnInvest's processes, values, are independent of the mother business culture.

To understand if GrønnInvest should have been span out as its own independent organization or not, *figure 10* in *section 2.4.2.2* is used to make an informed analysis. The left vertical axis measures the extent to which the existing processes, are the ones that will get the new job related to investments in start-up companies, new business models, external partnerships done effectively. The fit was bad, and so management could not exploit the organization's existing processes and could not coordinate work in the new unit within BKK's existing functional units. Since the fit was poor, new processes and new team interactions were required, and thus, an autonomous unit, GrønnInvest was formed. Respondent R1 remarked on the advantages of the autonomy in GrønnInvest;

*“Fordelen med styring i Grønn InVest er at investeringer tas av styret (der jeg er styreleder) og ikke skal til styret i AS. Vi har derfor mulighet til å ta raskere avgjørelser. Vi har et team med dyktige, kompetente prosjektledere. Arbeider med å få opp innsikt på ny teknologi og energisystemet. Vi har en med executive master i Design Thinking. Vi jobber med forretningsmodeller og rammeverk.”*

Respondent R1 remarked upon the independence of GrønnInvest as well as upon the new competences that are instrumental in spotting new technologies in the energy industry. The unit's fields of operations cover more than the business model framework, it also covers Acquisitions, as well as external partnerships. There is no evidence collected that proves that BKK has made acquisitions after the establishment of the IoU unit, and so the next section shall only present BKK's strategic responses through external partnerships.

#### **4.4.1.3 BKK's response through external partnerships**

Chesbrough and Crowther's (2006) discuss competitive advantage originating from *inbound open innovation*, which, according to the writers is the practice of leveraging the discoveries of others(Chesbrough and Crowther, 2006) – BKK, through GrønnInvest, whose fields of operations involve M&A have strategized by responding to disruptive technologies through external partnerships with start-up, or young companies who possess breakthrough innovative technologies, that could be sustaining, or disruptive to BKK's established

hydropower, as advertised on the website; *“Finansiering gjennom co-investering i selskapet.”* Information on the GrønnInvest website, combined with collected interview data indicates that BKK is strategically responding to disruptions within newer renewables by betting on external partnerships with young companies that can come up with brilliant innovative ideas that have the potential to give BKK a competitive advantage over its competitors within solar, wind, and other renewables. This analysis is based on Grønn Invest’s specific request that the required technology is specifically within the renewable energy field, which also makes sense considering the direction in which the energy industry is evolving. In response to IoU’s strategy regarding investments in start-up companies, respondent R1 retaliated;

*“Energibransjen er i endring. Nye forretningsmodeller og nye produkter utvikles hurtigere enn tidligere, og mange av dem påvirker vår kjernevirksomhet....Vi skal være et ledende energiselskap og da ønsker vi i større grad å være i front, tenke nytt og være med og definere det som blir fremtidens energisystem. For å redusere risikoen ved usikre investeringer er det naturlig at vi både drar nytte av offentlige innovasjonsmidler og at vi investerer i partnerskap med andre.”*

BKK management does not only recognize the impact of newer disruptive technologies and renewables on the core business, it reveals one of the company’s strategy. To confront disruptive innovations by utilizing open innovation to monitor potentially disruptive innovations that could threaten or have a substantial effect on BKK’s established hydropower business, through the investment company BKK-GrønnInvest.

BKK has through GrønnInvest invested in both Bergen Carbon Solutions and Tibber. Respondent R2 explained the partnership with these two young companies saying; *“Det er viktig å presisere at BKK har en liten eierpost i begge disse selskapene ca 14% i Bergen Carbon Solutions og ca 8% i Tibber”*. Consistent with Chesbrough and Crowther’s theory, the organization is leveraging BCS, and Tibbers’s discoveries, and through these partnerships, the firm is set to gain competitive advantage, and possibly generate substantial gains, if the technologies are well nurtured and allowed to mature. To acquire sustained success, it is vital for BKK as a corporation to create the capabilities that allow for the changes within the corporation to facilitate responses to disruptive technologies, and business models. The

analysis of BKK's IoU, and FUoI units' processes and values are presented in the next section of this sub-chapter.

#### **4.4.2 Organizational Culture**

Drawing from theory presented in subchapter 2.4.1, Deshpandé and his colleagues, present four classifications of culture presented in *figure 8*. The vertical axis describes the continuum from organic (flexibility and spontaneity) to mechanistic processes (Control, stability, and order), while the horizontal axis describes the relative organizational emphasis either on internal maintenance (smoothing activities, integration), or external positioning (Competition, environmental differentiation). This results into four culture types presented as clan, hierarchy, adhocracy, and market (Deshpandé et al., 1993). – The organizational culture in the IoU and FUoI units differs, and as such the two units will be analyzed independently.

##### **4.4.2.1 FUoI's Organizational Culture**

Using *figure 8*, as basis for analyzing the organizational culture in the FUoI, the unit's dominant attributes are shown to be order, rules, and regulations, uniformity, as well as competitiveness, and goal achievement. These attributes are drawn from two cultural types, which are Hierarchy, and Market culture. Among FUoI's fields of operation, is quality control, which involves control of the quality of the processes, and procedures, which in turn mandates employees to particularly follow certain rules, regulations, and procedures made available on BKK's quality control system, *KVALIK*. This alone characterizes the unit with a hierarchy culture. The bonding in the FUoI unit is also emphasized by rules, policies and procedures which have been a long-standing tradition in the mother business. This is consistent with Hill and Rothaermel (2003)'s theoretical strand which focuses on arguments that organizations are valued for their predictability, and reliability, and hence tend to foster information systems and processes that enhance these attributes. According to the authors, these systems require formalization and bureaucracy attributes that tend to inhibit change (Hill and Rothaermel, 2003).

Respondent R5 remarked upon cost-effective initiatives in the unit not being sufficient enough, as the employees out in the field tended to do their jobs, the old-fashioned way. This gives an impression that the new organizational culture which top management wishes

to implement has not really been permeated into the organization and should therefore be developed further, if the unit is to gain the ability to respond to disruptive innovations effectively. Respondent R4's declaration about the new LEAN methodology culture is concise with R5's remarks, because as he put it; *"Vi bruker nå LEAN verktøy, men gamle kulturen sitter i veggene."* Respondent R3 on the other hand believed that the LEAN methodology, which is the implementation tool for cultural change in BKK, had become well absorbed by most of the employees and so stated; *"Det er innarbeidet LEAN kultur i selskapet. Jeg synes Produksjon har kommet langt med LEAN. Vi bruker metodikken mye."*

The statements from Respondent R5, and R4 indicate that FUoI unit has been working with a cultural change, but the older culture of order, stability, and control is still somewhat dominant. Simultaneously, collected data also indicates that the strategic emphases for the FUoI unit is towards innovation, growth, and new resources which lies under the Adhocracy culture. According to this analysis and given that most of the employees in the new FUoI unit were working under the processes and values of the mother business, I find that the FUoI unit is characterized by elements of three culture types combining the old BKK culture(Hierarchy), with the market, and adhocracy culture. Deshpande and his colleagues argue that because of multiple and conflicting goals of many organizations, research shows that organizations are operating in more complex environments, and thus culture types are not mutually exclusive, and it is often found that organizations have elements of different types of cultures(Deshpandé et al., 1993), which according to this analysis is the case with the FUoI unit.

#### *4.4.2.2 IoU's Organizational Culture*

The IoU unit on the other hand is greatly characterized with dominant attributes that emphasize both the Adhocracy, and market culture. The leadership style of entrepreneur, innovator and risk taker characterizes the unit's management. The bonding, and strategic emphasis also corresponds to the adhocracy culture. Utilizing one of the aforementioned statements from the CEO of the IoU unit which stated; *"Vi skal aldri begrenses av at ideer vi investerer i kan disruptere dagens forretning. Vi skal ikke «bare» forsterke vannkraft, men også utfordre."* This statement characterizes the leadership style in IoU unit as risk takers, in addition to entrepreneur orientation, and flexibility. The strategic emphasis is towards innovation, growth and new resources or opportunities as the statement from the CEO of

IoU stated in BKK-D13; “...satser på innovasjon, både for å utvikle eksisterende virksomhet og for å skape nye forretningsmuligheter. Innovasjon og Utvikling har ansvaret for å skape det nye - teste nye forretningsmodeller og utforske nye forretningsmuligheter.”

The other dominant attributes of competitiveness, and goal achievement are emphasized on how the unit monitors the market through its investment company, by inviting partnerships with start-up companies with innovative ideas to BKK. The leadership style in GrønnInvest, which is under the IoU unit is characterized by decisive traits, as well as being achievement-oriented. This is clearly indicated in the investment company’s ability to establish partnerships with BCS, and Tibber. Hence, the conclusion that IoU’s culture type is a combination of adhocracy, and market culture which has equipped the unit with abilities to successfully respond to disruptive technologies. In this regard, having an adhocracy culture, is an essential ingredient for the IoU unit to be able to respond and enable development of disruptive innovations. This has been made possible through GrønnInvest, and since the autonomy given to the unit has minimal interdependency with the processes and values of the BKK corporation, it has allowed the unit to build its own market and adhocracy culture. The support of top management as R1 stated has been found to have positive effects on this ability.

#### **4.4.3 Human Resource management**

O’Reilly and Tushman, argue that at the core of dynamic capabilities is the ability of senior managers to capture opportunities through the orchestration and integration of both new and existing assets to overcome inertia and path dependencies. These capabilities are perceived as the central basis of underpinning long-run competitive advantage. And as such, highlights the role of senior management teams in shaping competitive advantage over time(O’Reilly and Tushman, 2008). – According to intranet publications dating back to 2016, BKK top management has on a regular basis, communicated a strategy directed towards increasing profitability, cost reductions, efficiency-improvement initiatives, implementing an innovative culture in the organization, as well as increasing innovative initiatives.

Additionally, BKK top management has over a two-year period orchestrated changes within the organization to enable the organization to capture business opportunities and respond to a changing energy sector by integrating both new, and existing assets to achieve

organizational goals. The implementation of these strategies has seen top management establish innovation-oriented units, FUol and IoU as well as other autonomous units to ensure that the strategic direction of the BKK corporation (Illustrated in *figure 18*, section 4.2.2 ) leads to the organization becoming one of the three leading energy companies in Norway.

Sarros et al.(2008) claim that, often the type of leadership required to alter culture is transformational because culture change requires lots of energy and commitment to achieve outcomes. And thus for an organizational culture to become more transformational, top management must coherently communicate the changes that are required(Sarros et al., 2008). – The BKK corporation top management through the intranet publications, as well as through regular informative meetings(*allmøter*) has encouraged all members of the BKK corporation to not only identify with the organization's goals, and interests, top leadership has, on a regular basis communicated the company's ambition as well. Recent developments of a new communication's channel called *\*@Workplace* has been introduced to cater for better and smoother sharing of information throughout the corporation, in addition to other intranet articles. In BKK-D20, the head CEO Jannicke Hilland stated;

*“Vår ambisjon, som strategien bygger på, er at vi skal være et ledende energikonsern i Norge. Med de endringene vi ser i rammevilkårene, og de endringene blant annet ny teknologi, økt digitalisering og endret kundeadferd fører til, så innebærer det å være ledende at vi også må være ledende i å håndtere store endringer i omgivelsene våre..... Vi skal tydeliggjøre virksomhetsstyringen i konsernet. Vi skal bedre lønnsomheten gjennom bedre anskaffelser og vi skal bruke LEAN-metodikken for å forbedre arbeidsprosesser.”*

In addition to the consistent communication about the organization's ambitions and strategic direction, this statement indicates that top management is implementing a cultural change in the corporation by using the LEAN methodology to improve work processes, as well as constant clarifications about the performance management of the corporation, which have on a regular basis been shared with organizational members through intranet publications, and *allmøter*. The coherent communication from the top management about the changes in the company, and in the BKK environment indicates the basic steps to transforming an organizational culture. Furthermore, it also indicates that BKK top management has transformational leadership characteristics that are key in influencing

organizational capabilities through the establishment of an organizational culture, motivating and enabling managers and employees, as well as building capacity for change and innovation (Damanpour and Schneider, 2006). Consistent with this theoretical strand, is respondent R1's statements regarding the strategic direction of the IoU unit, as well as top management's ability to motivate its employees while catering for change and innovation; "*Vi jobber med forretningsmodeller og rammeverk. Jannicke er tydelig på at hun vil satse på innovasjon. At vi skal styrke teamet og tenke nytt. Det er viktig med slik støtte fra topplederen.*"

Another key characteristic that is essential for BKK top management to influence organizational capabilities which enable the corporation to confront disruptive innovations, is vision. Sarros et al. (2008) assert that vision is a major component of transformational leadership and drives much of the change in organizational culture as well as helping with directing employee efforts towards innovative work practices and outcomes. Furthermore, vision augments both organizational processes and culture, and contributes to innovative environments. According to the authors, change is accomplished through the managers' implementation of a unique vision of the organization. – In addition to intranet publications and information feeds at *allmøter*, Top management has decided on a strategic direction, which has set the whole BKK organization on a transformational journey that is intended to place BKK among the three leading energy companies in 2050. Top management has communicated strategies to attain this vision (see *figure 17*), simultaneously reinforcing innovation initiatives, recombining, and reconfiguring assets and organizational structures to adapt to an evolving industry.



## 5. Analytical summary

The aim of this thesis was to gain an understanding of the impact of newer renewables on incumbents whose core-businesses are centered around hydro power, the strategic responses and choices of these established firms to tackle disruptive innovations and business models within renewable energy. This embedded single-case study undertook an explorative, inductive approach in which data was collected together with preparatory theoretical propositions to serve as basis for developing the research questions below.

- 1) What was the rationale BKK's IoU, and FUoI under BKK Production established?
- 2) How have newer renewables like solar and wind energy impacted BKK's established business, and to what extent have they been disruptive to BKK's established business?
- 3) How has BKK(IoU, and FUoI) addressed the various innovations and technologies that are perceived as disruptive to the established business?
- 4) What organizational factors are facilitating BKK's response to disruptive innovations and business models?

Henceforth, the research study has led to these answers to the research questions.

Newer renewables, and other disruptive innovations altering the competition dynamics in the renewable energy industry led to a strong need for BKK to re-strategize. Based on these changes, as well as the prognosis of uncertain power tariffs, and an uncertain business model, BKK top management found it necessary to reinforce the organization's position and competitive force through stronger initiatives towards innovation, and development.

Consequently, this led to first the establishment of FUoI under the hydropower production company, and then the IoU, under the BKK corporation, as a strategic choice to confront the fast-evolving industry.

The competitive advantage of solar and wind energy has increased steadily in the last decade, which has altered the competition dynamics within renewable energy. The energy policy has however not been changed accordingly, which in an age when competition from other renewables and other competitors is heightened, is making it unprofitable for the BKK corporation to reinvest in the development of its infrastructure as well as maintain its competitive force. Furthermore, solar and wind energy are high-end, and new-market

disruptions that have affected BKK's margins of profit in a negative manner. The growth of newer renewables is an indication that there is a continuous growth of customers utilizing decentralized power production, in addition to increased utilization of imported wind energy.

The analysis revealed that although there has been more non-regulative power production, there is still need for stable power supply, hence BKK's choice to exploit this competitive advantage, and focus on its regulative hydropower. But with a 50% potential power production unconsumed, and solar and wind taking a portion of this consumed share, the company is looking to the extension of the power grid, as a strategic response, as opposed to addressing the newer renewables directly. Accordingly, the firm has chosen not to respond to the newer renewables unless they have a good business portfolio. Another BKK strategic response to disruptive innovations, and the threat of newer renewables has been to intensify innovation initiatives, together with the efficiency improvement efforts to increase profitability, as well as the intensification of R&D activities, to close the first growth gap through the FUoI unit. The analysis has revealed another strategic response of intensified efforts to close the second growth gap, by exploring growth potentials, through investing in innovative business models, and business ventures and establishing external partnerships with start-ups, and young companies through the IoU unit. Investing in disruptive models and innovations at an early stage is allowing the corporation the possibility to transform them into sustaining innovations relative to the established mother business or adopting them early enough when they can be nurtured and developed.

One of BKK's organizational factors that were meant to facilitate successful responses to disruptive innovations was the establishment of the ambidextrous unit FUoI whose fields of operation involve efficiency, increasing productivity, control, certainty, and variance reduction, and the research and developmental projects with the purpose of increasing the value of hydro power. The FUoI unit has however not been successfully transformed to facilitate disruptive innovations. The organizational culture is still strongly characterized by the hierarchy culture, although the study has revealed some traits of the market, and adhocracy culture. Noteworthy is that adhocracy, and market culture allow for a successful response to disruptive innovations. This implies that the unit is still characterized by

elements that facilitate sustaining innovations, rather than the successful response to disruptive innovations.

The BKK organizational factor enabling successful responses to disruptive innovations and models was the establishment of the ambidextrous IoU unit with fields of operation involving efficiency-improvement, as well as the search for business opportunities, discovery of good business models, autonomy(BKK-GrønnInvest), innovation initiatives and embracing variation. The unit is greatly characterized with dominant attributes that emphasize both the Adhocracy, and market culture, and thus facilitating effective response to disruptive innovations. The final organizational factor is transformational leadership which has been essential for BKK top management to influence organizational capabilities that enable the confrontation of disruptive innovations. BKK top management is characterized by important attributes of vision, and coherent communication that keep the organizational members informed about the changes the corporation is going through, and which are necessary for the corporation to move in the direction of the corporation vision set for 2050.

## 6. Conclusion and practical implications

### 6.1 Practical implications

The analysis of the IoU, and FUoI units can be perceived as a vital step for BKK to understand the organization's ability to address the changes in the energy industry, as well as the disruptive innovations, and how the organization can exploit the opportunities such innovations can offer. The findings in this research study can provide some practical implications for BKK, as it was revealed in the analysis that the FUoI unit does not practically engage in business model innovation. By engaging a team of interdisciplinary individuals from across the subsidiary company to experiment, and constantly re-innovate the hydropower business model may give BKK an extra advantage, and leverage. Furthermore, the theoretical framework reveals that for a company to benefit from the differences in the returns, the essential competence is the ability to re-innovate the company's business model. The practical implication for BKK in this case, is to review the processes under FUoI such that business model innovation is adopted as one of the processes in the unit. Another implication which BKK should consider is the cultural transformation in the FUoI unit. The findings in the analysis reveal that the unit's culture has not been fully transformed as it is characterized by a strong hierarchy type of culture, with very small traits of the adhocracy, and market culture. It is thus vital for the unit to fully develop an adhocracy culture, and market which shall equip the unit with the right tools to address potentially disruptive innovations.

### 6.2 Conclusion

This research has found that BKK's rationale for establishing the FUoI, and IoU units was in response to disruptive renewables, and other disruptive innovations altering the renewable energy competition dynamics, as well as the prognosis of uncertain power tariffs, and an uncertain business model. The ambidextrous business unit IoU has provided BKK with the ability to exploit in-house assets, as well as explore new business opportunities and business models through external partnerships with start-up companies or young companies with innovative ideas within renewable energy. Both the IoU, and FUoI units are instrumental in closing growth gaps as a strategy to counter disruptive innovations, and an evolving industry,

as well as ensuring that BKK attains its organizational goal of becoming one of the three leading organizations in 2050. The analysis revealed however that the BKK growth engine had stalled in 2016, and hence an indication that the growth efforts were intensified at the time when the corporation's investment capital had become impatient for growth, which according to theory is risky because it triggers a subsequent cascade of inevitable incorrect decisions.

The analysis revealed that FUoI rationally invests less in disruptive innovations which is typical of an organization that is used to enjoying a big portion of the market share. Additionally, this study has found that although BKK's IoU unit has the right culture to respond to disruptive innovations, the organizational culture in the FUoI is still characterized by a hierarchical culture which does not allow for a successful response to disruptive technologies. Finally, the study has revealed that BKK's top management is characterized by transformational leadership skills which is an indication that the corporation has a good managerial basis for confronting disruptive innovations. Given the new developments in the renewable energy competition dynamics, it is noteworthy that a government policy which does not allow for fair competition within renewables, is affecting hydropower's competitive advantage as a regulative energy supply. Henceforth even with the right organizational characteristics to successfully confront disruptive innovations, without fair competition, incumbents like BKK face a bigger challenge than simply addressing newer renewables as disruptive innovations.

## **7. Limitations and Commended future studies**

### **7.1 Limitations**

An explorative approach has the limitations of time, as well as the tedious process of collecting data, theoretical search, and comprehension of the phenomenon. The research problem and definition underwent significant changes, which required constant review, and re-structuring of the research work done. Additionally, given that it was an embedded single case study, there was not enough time to extensively research on both the IoU, and FUoI units. This study can thus be criticized for not including all relevant information to the phenomenon at hand. Additionally, this thesis could be criticized for not having enough theory on innovation strategy within organizations. The other limitation was the selection of the interview subjects. A bigger number of subjects should have been interviewed in especially the IoU unit to increase the convergence, and accuracy of gathered data.

### **7.2 Commended future studies**

This research study has focused on theoretical reviews of elements within an organization that are key to implementing successful responses to disruptive innovations. In order to get a better understanding of how organizations can successfully respond to disruptive innovations, it is recommended to further investigate the topics of resource allocation, innovation strategy, commoditization, and de-commoditization as otherwise emphasized in literature. Another commendation for future studies is to execute comparative studies of two incumbents whose core businesses are based on hydro power , and analyze their strategic responses to disruptive innovations.

## 8. Sources

- ADNER, R. 2002. When are technologies disruptive? a demand-based view of the emergence of competition. *Strategic Management Journal*, 23, 667-688.
- AMIT, R. & ZOTT, C. 2001. Value creation in E-business. *Strategic Management Journal*, 22, 493-520.
- BOWER, J. L. & CHRISTENSEN, C. M. 1995. Disruptive Technologies: Catching the Wave. *Harvard Business Review*, 73, 43-53.
- CHARITOU, C. D. & MARKIDES, C. C. 2003. Responses to Disruptive Strategic Innovation. *MIT Sloan Management Review*, 44, 55-63.
- CHESBROUGH, H. 2003a. The logic of open innovation: managing intellectual property. *California Management Review*, 45, 33-58.
- CHESBROUGH, H. 2003b. *Open innovation : the new imperative for creating and profiting from technology*, Boston, Mass, Harvard Business School Press.
- CHESBROUGH, H. 2010. Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, 43, 354-363.
- CHESBROUGH, H. & CROWTHER, A. K. 2006. Beyond high tech: early adopters of open innovation in other industries. *R&D Management*, 36, 229-236.
- CHRISTENSEN, C. M. 2006. The Ongoing Process of Building a Theory of Disruption. *Journal of Product Innovation Management*, 23, 39-55.
- CHRISTENSEN, C. M. 2013. The innovator's dilemma : when new technologies cause great firms to fail. *innovator's dilemma*. Harvard Business Review Press.
- CHRISTENSEN, C. M. & BOWER, J. L. 1996. CUSTOMER POWER, STRATEGIC INVESTMENT, AND THE FAILURE OF LEADING FIRMS. *Strategic Management Journal*, 17, 197-218.
- CHRISTENSEN, C. M. & RAYNOR, M. E. 2013. The innovator's solution : creating and sustaining successful growth. *innovator's solution*. Harvard Business Review Press.
- CHRISTENSEN, C. M., ROTH, E. A. & ANTHONY, S. D. 2004. *Seeing what's next : using the theories of innovation to predict industry change*, Boston, Mass, Harvard Business School Press.
- DAMANPOUR, F. & SCHNEIDER, M. 2006. Phases of the Adoption of Innovation in Organizations: Effects of Environment, Organization and Top Managers 1. *British Journal of Management*, 17, 215-236.
- DANNEELS, E. 2004. Disruptive Technology Reconsidered: A Critique and Research Agenda. *Journal of Product Innovation Management*, 21, 246-258.
- DESPANDÉ, R., FARLEY, J. U. & WEBSTER JR, F. E. 1993. Corporate Culture Customer Orientation, and Innovativeness in Japanese Firms: A Quadrad Analysis. *Journal of Marketing*, 57, 23-37.
- DEWAR, R. D. & DUTTON, J. E. 1986. THE ADOPTION OF RADICAL AND INCREMENTAL INNOVATIONS: AN EMPIRICAL ANALYSIS. *Management Science*, 32, 1422-1433.
- EASTERBY-SMITH, M., THORPE, R. & JACKSON, P. R. 2015. *Management and business research*, Los Angeles, Sage.
- ETTLIE, J. E., BRIDGES, W. P. & O'KEEFE, R. D. 1984. Organization Strategy and Structural Differences for Radical versus Incremental Innovation. *Management Science*, 30, 682-695.
- FRANKFORT-NACHMIAS, C. & NACHMIAS, D. 2008. *Research methods in the social sciences*, New York, Worth Publishers.
- GORMAN, G. E. G. E. & CLAYTON, P. R. 2005. *Qualitative research for the information professional : a practical handbook*, London, Facet.
- GOVINDARAJAN, V. & KOPALLE, P. K. 2006a. Disruptiveness of innovations: measurement and an assessment of reliability and validity. *Strategic Management Journal*, 27, 189-199.
- GOVINDARAJAN, V. & KOPALLE, P. K. 2006b. The Usefulness of Measuring Disruptiveness of Innovations Ex Post in Making Ex Ante Predictions\*. *Journal of Product Innovation Management*, 23, 12-18.

- HENDERSON, R. M. & CLARK, K. B. 1990. Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly*, 35, 9-30.
- HILL, C. W. L. & ROTHARMEL, F. T. 2003. THE PERFORMANCE OF INCUMBENT FIRMS IN THE FACE OF RADICAL TECHNOLOGICAL INNOVATION. *Academy of Management Review*, 28, 257-274.
- JICK, T. D. 1979. Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, 24, 602-611.
- JONES, G. R. 2013. Organizationa Theory, Design, and Change. 7th Edition, 28,30,31,33,201.
- MARCH, J. G. 1991. EXPLORATION AND EXPLOITATION IN ORGANIZATIONAL LEARNING. *Organization Science*, 2, 71-87.
- MARKIDES, C. 2006. Disruptive Innovation: In Need of Better Theory\*. *Journal of Product Innovation Management*, 23, 19-25.
- O'REILLY, C. A. & TUSHMAN, M. L. 2008. Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185-206.
- OSTERWALDER, A. & PIGNEUR, Y. 2010. Business model generation : a handbook for visionaries, game changers, and challengers. Hoboken, N.J: Wiley.
- SARROS, J. C., COOPER, B. K. & SANTORA, J. C. 2008. Building a Climate for Innovation Through Transformational Leadership and Organizational Culture. *Journal of Leadership & Organizational Studies*, 15, 145-158.
- SCHMIDT, G. M. & DRUEHL, C. T. 2008. When Is a Disruptive Innovation Disruptive?\*. *Journal of Product Innovation Management*, 25, 347-369.
- TAYLOR, S. J., BOGDAN, R. & DEVAULT, M. L. 2016. Introduction to qualitative research methods : a guidebook and resource. 4th edition. ed.: Wiley.
- TEECE, D. J. 2003. *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, World Scientific Publishing Co. Pte. Ltd.
- TEECE, D. J. 2009. *Dynamic Capabilities and Strategic Management : Organizing for Innovation and Growth*, Oxford, GB, Oxford University Press.
- TROTT, P. 2012. Innovation Management and New Product Development. Fifth Edition, 8,9,15,84,94,102,103.
- TUSHMAN, M. L. & ANDERSON, P. 1986. Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, 31, 439-465.
- YIN, R. K. 2012. *Applications of case study research*, Los Angeles, SAGE.
- YIN, R. K. 2014. *Case study research : design and methods*, Los Angeles, Calif, SAGE.
- YU, D. & HANG, C. C. 2010. A Reflective Review of Disruptive Innovation Theory. *International Journal of Management Reviews*, 12, 435-452.

## 8.1 Web Sources:

- BERGENSTIDENDE, 2017. [https://www.bt.no/boliq/Kan-solceller-fungere-selv-om-det-regner-mye-Ja\\_-mener-denne-familien-10393b.html](https://www.bt.no/boliq/Kan-solceller-fungere-selv-om-det-regner-mye-Ja_-mener-denne-familien-10393b.html)
- DAVID KEITH; HARVARD UNIVERSITY, 2016. <https://keith.seas.harvard.edu/blog/cheap-solar-power>
- ENERGITEKNIKK, 2018. <http://energiteknikk.net/2018/04/30-mnok-mer-i-utbytte>
- KLIMAPARTNERE, 2017. <https://www.klimapartnere.no/om-klimapartnere/>
- GRØNN INVEST, 2018. <https://www.bkk.no/groninvest>



INTERNATIONAL RENEWABLE ENERGY AGENCY, 2018. <http://www.irena.org/>

MILJØDIREKTORATET, 2010. [http://www.miljodirektoratet.no/no/Nyheter/Nyheter/Old-klif/2010/Februar/Klimakur\\_2020\\_viser\\_hvordan\\_Norge\\_kan\\_reducere\\_utslippene/](http://www.miljodirektoratet.no/no/Nyheter/Nyheter/Old-klif/2010/Februar/Klimakur_2020_viser_hvordan_Norge_kan_reducere_utslippene/)

MILJØDIREKTORATET, 2010. <http://www.miljodirektoratet.no/old/klif/publikasjoner/2590/ta2590.pdf>

NATIONAL TRANSPORT REPORT, 2018. <https://www.regjeringen.no/no/dokumenter/meld.-st.-33-20162017/id2546287/sec11>

NVE(Norges VassdragsEnergi), 2017. <https://www.nve.no/energiforsyning-og-konsesjon/vindkraft/>

NVE, 2017. [http://publikasjoner.nve.no/rapport/2017/rapport2017\\_77.pdf](http://publikasjoner.nve.no/rapport/2017/rapport2017_77.pdf)

NVE, Kraftsituasjon-2015. <https://www.nve.no/Media/3434/4kvartal2015.pdf>

NVE, Kraftsituasjon-2017. [https://www.nve.no/Media/6633/q4\\_2017\\_.pdf](https://www.nve.no/Media/6633/q4_2017_.pdf)

NVE, Nykraftproduksjon-2017. <http://webfileservice.nve.no/API/PublishedFiles/Download/201202014/2300846>

OLJE OG ENERGIDEPARTMENT, 2015. [https://www.regjeringen.no/contentassets/fd89d9e2c39a4ac2b9c9a95bf156089a/1108774830\\_897155\\_fakta\\_energi-vannressurser\\_2015\\_nettpdf](https://www.regjeringen.no/contentassets/fd89d9e2c39a4ac2b9c9a95bf156089a/1108774830_897155_fakta_energi-vannressurser_2015_nettpdf)

REGJERINGEN, 2014. <https://www.regjeringen.no/no/tema/energi/fornybar-energi/norsk-vannkraftshistorie-pa-fem-minutter/id2346106/>

REGJERINGEN, 2018. <https://www.regjeringen.no/no/dokumenter/politisk-plattform/id2585544/#k14>

STATISTISK SENTRALBYRÅ, 2017. <https://www.ssb.no/energi-og-industri/statistikker/elektrisitet/maaned/2017-02-09>

TEKNISK UKEBLAD- HANNE LØVIK, 2018. [https://www.tu.no/artikler/sol-eksplosjon-aldri-blitt-bygget-ut-mer-solkraft-i-norge/432693?utm\\_source=newsletter-2018-03-16&utm\\_medium=email&utm\\_campaign=newsletter](https://www.tu.no/artikler/sol-eksplosjon-aldri-blitt-bygget-ut-mer-solkraft-i-norge/432693?utm_source=newsletter-2018-03-16&utm_medium=email&utm_campaign=newsletter)

TEKNOLGIRÅDET-SOLAR ENERGY, 2018. <https://teknologiradet.no/english/the-solar-revolution-and-what-it-can-mean-for-norway/>

UNITED NATIONS ENVIRONMENT PROGRAM-Report, 2017.

<http://wedocs.unep.org/bitstream/handle/20.500.11822/22251/k1708347e.pdf?sequence=2&isAllowed=y>

UNITED NATIONS ENVIRONMENT PROGRAMM, 2018.

<https://www.unenvironment.org/explore-topics/energy/what-we-do/renewable-energy>

WORLD ENERGY, 2015. <https://www.worldenergy.org/data/resources/resource/solar/>

WORLD ENERGY, 2016. [https://www.worldenergy.org/wp-content/uploads/2017/03/WEResources\\_Hydropower\\_2016.pdf](https://www.worldenergy.org/wp-content/uploads/2017/03/WEResources_Hydropower_2016.pdf)

## APPENDICES I – Interview guide

### Interview guide 1 - BKK's Innovasjon og Utvikling(IoU)

<b>Interviewer</b>	Maria Monero	<b>Interviewee</b>	CEO BKK's Innovasjon & Utvikling – Respondent, R1
<b>Research purpose</b>	Masterthesis	<b>Research topic</b>	The impact of newer renewables and disruptive innovations
<b>Date of Interview</b>	11.04.2018		

***Purpose of Interview:** To uncover the incentive behind the establishment of BKK's IoU, its current innovation strategy in ensuring that BKK's is one of the leading companies, and is well-equipped to tackle the fast changes in the energy industry. In Focus, BKK's IoU*

***The challenge:** What is BKK's IoU's strategy in confronting newer renewables and other disruptive innovations?*

---

1. How long have you been employed in BKK?

When did you take up the position of CEO of Innovasjon og Uvikling?

---

2. When was the subsidiary company IoU established?

- How is the company structured?
- How many employees, and eventually number of divisions?

---

3. What were the conditions under which BKK's Innovasjon og Utvikling was established, and what was the major driving force behind its establishment?

- Was the consistent low price of hydropower, and the need to earn money for BKK's owners among the main incentives? Or was it other incentives?
- What is the main goal, and strategy of IoU

---

4. How does IoU assess and capture changes occurring in different market-segments and in the energy industry specifically?

- Who is the technical/commercial scanner(One who acquires vast amounts of info about new technology and the market ?

- Who has the role of technical innovator(Expert and generator of new ideas, and diff. ways of doing things)? GrønnInvest?
- In your opinion, where do the roles of *Product champion*(Sells new ideas to others in the company and a risk taker who can acquire resources, and is aggressive in championing his or her own causes) , *project manager*( One who plans and organizes projects, provides the team with leadership and motivation, and ensures necessary coordination among team members, plus a balance between project goals and organizational goals) , and *gatekeeper*(One who keeps himself informed of related developments that occur outside the organization through journals, conferences, colleagues, and other companies) fall within BKK?

---

5. What major trends did you see in 2016, 2017, and today that are significantly changing the energy industry and the way BKK operates?

- How has this changed the corporation strategy of BKK?
- How have these signals been converted and implemented into the company strategy?

---

6. What major geographical and cultural differences have you experienced regarding the climate change issue and the "green shift"?

- What is your take on the increased focus on renewable energy sources?
- How is BKK responding to the signals of increase in the use of other renewables like solar energy, and wind energy?
- In your opinion, are other renewables considered a threat at all to hydropower's market share?

---

7. Are there any technologies, or innovations out in the market that you perceive as disruptive for BKK's established technologies?

- Considering the structure and strategy of *IoU*; in what manner do you think the business unit is flexible and agile enough to be able to respond and take advantage of disruptive innovations and business models?
- What do you consider as the main challenge?

---

8. In what ways do you believe *IoU* will provide BKK with the necessary tools to jump on the disruption wave?

- In your opinion, is *IoU*'s strategy leaning more towards efforts in sustaining technologies(*They improve the performance of established technologies*) than disruptive technologies(*Innovations that result in worse product performance*)?

---

9. Considering BKK's core activities are centered around hydropower, what strategy has *IoU* put in place to deal with business models that are disruptive to BKK's business model?

- In your opinion, does BKK have the ability to respond to the most threatening business models? How so?
- One of GrønnInvest's goal in 2018 is to invest in innovative business models. Has GrønnInvest gotten a directive from management to specifically invest in business models that increase the value of hydropower?

---

10. What do you see as BKK's main strengths and weaknesses? In relation to the threat of disruptions within newer renewable energies?

---

11. In what way is *IoU* and the BKK corporation capable of exhibiting risk acceptance that often is needed in relation to disruptive innovations and business models?

---

12. *In order to succeed in maturing and bringing forward new and potentially disruptive ideas or innovations, there is need for leaders who embrace change and have abilities to act as role models with an entrepreneurial mindset. Another important factor is the ability to accept and embrace failure - and the ability to learn and develop from that failure.* To what degree is *IoU* structured and organized to succeed in ensuring that BKK is future oriented, and is equipped to tackle the changes in the energy industry?

- What are the strengths and weaknesses of the skills and competences in *IoU*?
- What capabilities or competences do you think would strengthen *IoU*'s and strategy?

---

13. *It is said that for a business model or a disruptive innovation to be viable it requires some maturation.* In your opinion, do the strategic decision processes in relation to new business models or disruptive innovations in *IoU* allow for this type of maturation?

---

14. How do you think the organizational culture and structure in BKK influences the strategic choices in *IoU*? Positively, or negatively?

- How do you think it affects *IoU*'s ability to be flexible and agile in the face of disruptive innovations?

---

15. According to your most optimistic evaluation, where do you see BKK in 20 or 30 years?

---

## Interview guide II - GrønnInvest under BKK's (IoU)

<b>Interviewer</b>	Maria Monero	<b>Interviewee</b>	General manager BKK-GrønnInvest – Respondent R2
<b>Research purpose</b>	Masterthesis	<b>Research topic</b>	The impact of newer renewables and disruptive innovations
<b>Date of Interview</b>	08.02.2018		

***Purpose of Interview:*** To uncover the incentive behind the establishment of BKK-GrønnInvest(GIV), its current innovation strategy, and which start-up companies BKK has invested in. In Focus, BKK-GrønnInvest

***The challenge:*** What is BKK-GIV's main role in the implementation of strategies that ensure that BKK is future-oriented, and is among the three leading energy companies in Norway?

---

1. How long have you been employed in BKK?

When did you take up the position as general manager of BKK-GIV?

---

2. When was BKK-GrønnInvest established?

- What were the incentives behind the establishment of BKK-GrønnInvest?
- How many employees, work for GrønnInvest?

---

3. What is BKK-Grønn Invest's main strategy, and what are the company's main goals and ambitions

- Has GrønnInvest managed to acquire any companies that have innovative business models? If so, which ones?
- What are the future plans for the companies that have been acquired by BKK-GIV?

- 
4. What is the level of integration if any between the newly acquired companies, and BKK?
- Have BKK's processes and values been integrated into the newly acquired start-up companies? Or have they retained their processes and values independent of BKK's own processes and values?

- 
5. Has there been an occasion where BKK has evaluated the establishment of an autonomous organization as response to the appearance of a disruptive innovation in the energy market?
- If yes, what was the disruption?

- 
6. In your opinion, is BKK's innovation strategy focused on implementing sustaining technologies that increase the value of hydropower? Or does the strategy involve potential responses to disruptive innovation?
- Does BKK's innovation strategy involve response to disruptive innovations?
  - If yes, how has the corporation positioned itself in regard to confronting disruptive innovations?
  - In your opinion, are other renewables disruptive innovations?

- 
7. What is BKK(IoU)'s view on open innovation?
- GrønnInvest is an investment company under IoU. Is acquisitions, and open innovation one of BKK's strategy to monitor potentially disruptive technologies that may threaten BKK's established business?

- 
8. What kind of collaboration does IoU have with BKK-Produksjon's FUol division?
- Does the division get support from IoU in relation to innovation challenges, like disruptive business models out in the market, or even disruptive innovations?

- 
9. Are GrønnInvest's processes and values integrated into BKK's processes and values?

- 
10. In your opinion, where do you see BKK-GIV 30 years from now?

## Interview guide III - BKK Produksjon – FUoI unit

<b>Interviewer</b>	Maria Monero	<b>Interviewee</b>	Divisjon manager BKK produksjon_Forretningsutvikling og Innovasjon – Respondent, R3
<b>Research purpose</b>	Masterthesis	<b>Research topic</b>	The impact of newer renewables and disruptive innovations
<b>Date of Interview</b>	11.04.2018		

***Purpose of Interview:** To uncover the innovation strategy within the subsidiary company, and the integration between BKK's innovasjon & Utvikling, with other BKK's subsidiary companies. In Focus, BKK Produksjon- Forretningsutvikling, og innovasjon, and what the division's strategy is regarding disruptive innovations, business model innovation, and the unit's collaboration with BKK's IoU?*

***The challenge:** Understanding why the unit was established, the level of innovation integration in BKK Produksjon, and the level of collaboration with IoU?*

- 
1. How long have you been employed in BKK?
    - When did you take up the position of Divisjon manager for BKK Produksjon-Project?

---

  2. When did you take up the position of Divisjon manager for FUoI
    - When was the FUoI subunit established?
    - What were the conditions under which it was established? Purpose?
    - What is the main goal and strategy of the division?

---

  3. In your opinion, what made your division team succeed in implementing innovation within the BKK Produksjon subsidiary company?
    - How did you get the employees within the division to think in an innovative way?



---

4. What innovative measures have been implemented in the time you have been in office?

- LEAN? Digitalization? Design thinking? Use of drones for inspection purposes?

---

5. Where does the directive for innovative measures to be implemented come from? FUol division? loU? Corporation management?

- Which communication channels are used?

---

6. What is the process of handling of potential innovations when they come from within the division? For example, if employees come up with some good innovative ideas?

- To what extent can you as division manager decide on what innovative ideas can be implemented? Mutual adjustment? Any on-the-spot decision making?

---

7. Who are BKK-produksjon- FUol division's biggest customers? (This is to ascertain the theory of resource dependency)

- Are there any specific technologies, or and services that are particularly appreciated by the customers?

---

8. During your time as division manager, have you observed innovations or technologies out in the market that might be disruptive to BKK- Produksjon's established technologies?



- How would you rate the motivation to respond to disruptive innovations in the division be? High? Or low?
- In your opinion, can FUol respond to disruptive innovations? Is the ability high? Or low?

---

9. What are some of your biggest challenges as a manager in regard to investing adequate resources in disruptive technologies?

---

10. Have there been any major alterations on BKK-produksjon's business model since FUoI was established? Or is it still based on the old business model based on *"The more electricity the company sells to customers, the more income the company get"*?

- Is it true that BKK has the capacity to produce more hydropower electricity than the society is able to use up? If yes, if the turbines were running to full capacity(100%), about how much percentage is enough to satisfy the societal demand?

---

11. Are there any business models out in the market that you regard as disruptive to BKK-Produksjon's main business model?

- What is FUoI's strategy in dealing with disruptive business models?
- Does FUoI have an ideation team that is mainly used for business model innovation? If yes, what are the strengths, and weaknesses of these competences?

---

12. Can you say something about green certificates and how they work?

- What is a typical business model for green certificates like?
  - Recent developments in the industry show a drastic increase in the use of renewables other than hydropower. Is there a possibility that business models centered around green certificates of other renewables could be a threat to BKK's business model based on green certificates?
-

## Interview guide IV - BKK Produksjon; Project unit

<b>Interviewer</b>	Maria Monero	<b>Interviewee</b>	Divisjon manager Project unit BKK Produksjon – Respondent R4
<b>Research purpose</b>	Masterthesis	<b>Research topic</b>	The impact of newer renewables and disruptive innovations
<b>Date of Interview</b>	11.04.2018		

***Purpose of Interview:** To uncover the innovation strategy within the subsidiary companies, and the level of integration down to the subunit level within BKK's subsidiary companies. In Focus, Divisjon, BKK Produksjon- Project.*

***The challenge** The level of integration of innovation within BKK-produksjon?*

- 
1. How long have you been employed in BKK?
    - When did you become part of the management team in BKK Produksjon
    - When did you take up the position of Divisjon manager for BKK Produksjon-Project?
- 
2. What is your opinion about the changes the company has been through the last four years?
    - How easy has it been to implement the changes required to increase efficiency in the divisjon?
    - How have the employees taken the changes in the way they do their assignments? Enthusiastically? Friction? Easily?
    - How have you been able to communicate the importance of innovation, and effectiveness to the employees? Through meetings? Emails? Actively engaging them in innovative activities?
- 
3. Could you name any innovative measures the divisjon has taken up and actively put to use the last 3 years?
    - LEAN? Digitalization? Design thinking? Use of drones for inspection purposes?

- 
4. Where does the directive for innovative measures to be implemented come from? FUol division? IoU? Corporation management?
- Which communication channels are used?
- 
5. What is the process of handling of potential innovations when they come from within the division? For example, if employees come up with some good innovative ideas?
- To what extent can you as division manager decide on what innovative ideas can be implemented? Mutual adjustment? Any on-the-spot decision making?
- 
6. Who are BKK-produksjon- Project division's biggest clients or customers? *(To show resource dependence: Must give a customer what he or she wants, and preferably better than competition.)*
- Have the customers demanded any wishes, or technologies which the division could not offer? If yes, how was this dealt with?
- 
7. What are some of your biggest challenges as a manager in a corporation which is undergoing many changes given that the energy sector is changing?
- 
8. In your opinion, have you experienced an increased level of integration and collaboration between BKK's subsidiary companies, and across the whole corporation?
- Do you recognize any good collaboration between the divisions in BKK produksjon?
  - If yes, has the collaboration made it easier to implement effectiveness measures in the division, as well as increase in productivity?
- 
9. Have you any knowledge of technologies out in the market which are different from BKK's technologies, and have probably the ability to deliver better products, or services? Could be in the form of competences, equipment, tools etc?
- If yes, how have these signals been communicated further on in the division, or in the company?
- 
10. Can you say something about green certificates and what they are about?
-

## APPENDICES II – Consent Form

### Description of master thesis and consent form

#### *Description of master thesis*

I, Maria Monero, are a student at the masters program *Innovation and Entrepreneurship* at the Western Norway University of Applied Sciences (HVL). My Supervisor is Ole Andreas Brekke

The thesis' research question concerns the impact of newer renewables and disruptive innovations, and as a case study I have taken on the study of BKK's Innovation strategy and specifically the business unit *Innovasjon og Utvikling*, and BKK Produksjon's *Forretningsutvikling og Innovasjon*

My purpose is to study the processes behind the establishment of both BKK's *Innovasjon og Utvikling*, and BKK Production's *FUoI* units their function, in addition to ascertaining how the units are collaborating in the context of confronting disruptive innovations.

As part of the project I would like to carry out interviews with key personnel who either are part of or involved in the establishment of *Innovasjon og Utvikling*, and *FUoI* units, the units' strategy, in addition to the addressing of disruptive innovations in BKK. The interview data will assist me in answering my research questions.

Under the interview I would like to ask questions concerning your role in either the *IoU* or *FUoI*'s functions today, the strategic choices made before the establishment of the units, past establishment, presently, and for the future.

#### *Voluntarily participation*

Your participation is entirely voluntary, and even if you agree, you may withdraw at any time without any negative effect, including during the interview itself. I shall ask you to sign this consent form at the bottom, which is a standard document that both interviewer and interviewee must sign in order for the Library to legally place the interview in its publicly accessible collections. If desired, I shall also provide you with a draft copy of the transcript of the interview so that you may review its content and add any clarifications and corrections that you feel necessary. For the transcription to be as accurate as possible I would like to record the interview.

#### *Anonymity*

If desired, your identity and any other information that might lead to your identification will be anonymized in the final thesis.

I have read this document and I understand what is requested of me as a participant in the Master thesis project, I freely consent to participate.

.....

Interviewee: Name (Signed)

.....

Interviewer: Maria Monero (Signed)