Energy companies becoming energy service providers

A comparative study between Denmark and Sweden

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Abstract
Energy efficiency is important – but an energy saving potential has yet to reach its full range. Energy services are means to reach that potential and energy companies are stressed as important actors into creating an established market for energy services. Energy services are tools that include providing in-direct services such as energy statistics, audits, declarations, consultations and analysis. It also includes a number of more complex and direct services, for example energy efficiency measurements or service contracts.

This report is a result of a study on Danish and Swedish energy companies offering energy services, based on the market they act upon. It aims to find their driving forces for providing energy services. It also looks closer into whether publically and privately owned energy companies differ and if there exist contradictions to both supply energy and energy services at the same time. It also looks into how energy companies are affected and feel about national regulatory instruments.

Energy companies in both countries offering energy services are reaching a wide spectrum of client segments and energy services. They often have the possibility to combine and package energy supply with energy services and they can reduce many of the theoretical barriers to energy efficiency by offering energy services. They are driven by a client demand and a closer client relationship, both leading to a decreased supply client fluctuation. A new business opportunity and a green profile strategy are also driving factors. Energy services also help energy companies to decrease heavy investment on existing equipment by having more control over their clients’ energy use and reducing energy utilization tops.

Danish energy companies are tied to an energy saving obligation scheme, providing them with conditions, which their market is based, whilst Swedish energy companies offering energy services act on a market that is created by them and their competitors derive from different business backgrounds. There exist an assertive regulatory instrument in Denmark affecting driving factors for public and private energy companies and clients. In Sweden regulatory instruments, such as energy efficiency programmes, subsidises for energy audits and voluntary agreements for industries affect energy companies in a less way than in Denmark, mostly increasing a client demand for energy services. The regulatory instruments in Denmark increase a trust for energy companies as energy service providers as in Sweden they are trusted upon their existing substantial role on the energy market, a reputation of knowledge and experience and a strategy aiming towards visualisation, motivation and education for the clients.

Public energy companies feel a responsibility towards their public owners to offer an efficient energy supply and by having a local connection to the municipality they are able to increase competitiveness in the region by offering energy services. Private companies are substantially larger than public companies and have a great potential to reach out to a larger number of clients through their existing supply client stock. This is of substantial higher relevance in Sweden than Denmark.
Table of Contents

1. Introduction .................................................................................................................. 3
  1.1 Presentation................................................................................................................. 3
  1.2 Aim and objectives..................................................................................................... 3
  1.3 Research questions................................................................................................... 4
  1.4 Delimitations and assumptions............................................................................... 4
  1.5 Disposition ............................................................................................................... 4
  1.6 Specifying terminology ......................................................................................... 5
    1.6.1 Energy ................................................................................................................ 5
    1.6.2 Energy use .......................................................................................................... 5
    1.6.3 Energy companies ............................................................................................. 5
    1.6.4 Energy efficiency ............................................................................................... 5
    1.6.5 Energy savings .................................................................................................... 5
    1.6.6 Energy service market ....................................................................................... 5
    1.6.7 Energy services .................................................................................................. 6

2. Background .................................................................................................................... 8
  2.1 Energy efficiency – a global question .................................................................... 8
  2.2 EU 20-20-20 targets .............................................................................................. 9
  2.3 Directive 2006/32/EC ............................................................................................. 10
    2.3.1 Denmark ............................................................................................................ 11
    2.3.2 Sweden .............................................................................................................. 16

3. Methodology .................................................................................................................. 19
  3.1 Outlines and implementation ............................................................................... 19
  3.2 Data collection ........................................................................................................ 19
    3.2.1 Theory ............................................................................................................... 19
    3.2.2 Seminars, workshops and conferences ............................................................ 20
  3.3 Empirical data collection ..................................................................................... 20
    3.3.1 Company selection and approach .................................................................... 20
    3.3.2 Interviews ......................................................................................................... 20
  3.4 Confounding .......................................................................................................... 21

4. Theory .......................................................................................................................... 22
  4.1 Barriers ................................................................................................................ 22
  4.2 Driving forces ....................................................................................................... 24

5. Results ........................................................................................................................... 25
  5.1 Company presentation ......................................................................................... 25
  5.2 Offered services .................................................................................................... 26
  5.3 Ownership ............................................................................................................. 28
  5.4 Clients ................................................................................................................... 29
  5.5 Strategy and future development ....................................................................... 30
  5.6 Advantages .......................................................................................................... 32
  5.7 Driving forces ....................................................................................................... 32
  5.8 Dual roles and other barriers .............................................................................. 33
  5.9 Challenges ............................................................................................................ 35
  5.10 Regulatory instruments ...................................................................................... 36

6. Analysis .......................................................................................................................... 37
  6.1 What are the driving forces for energy companies to offer energy services?..... 37
6.2 How does energy companies tackle the role of being both a supplier of energy and a provider of services that reduce energy use? .......................................................... 38
6.3 How are energy companies affected by regulatory instruments, both existing and future? ................................................................................................................... 39
6.4 How do privately and publicly owned energy companies differ to each other when offering energy services? .......................................................... 40

7. Conclusion ....................................................................................................................... 42
8. References ......................................................................................................................... 43
APPENDIX A ......................................................................................................................... 46
APPENDIX B ......................................................................................................................... 47
APPENDIX C ......................................................................................................................... 49

Table of Figures
Figure 1 - Energy service steps .......................................................................................... 6
Figure 2 - Energy use for OECD and Non-OECD countries in a perspective 1990-2035 in quadrillions Btu ................................................................. 8
Figure 3 - Gross energy use Denmark in % 2008 ............................................................. 11
Figure 4 - Development of the Danish energy efficiency obligation in GWh .............. 13
Figure 5 - Energy saving between clients variation over time ........................................ 14
Figure 6 - How much influence was subsidising for project implementation? .... 15
Figure 7 - To what extent had clients considered their energy saving projects prior to the involvement of an energy company or other involved actors? 15
Figure 8 - Gross energy use Sweden in % 2008 ............................................................. 16
Figure 9 – Time arrows showing the phases throughout the project ..................... 19
Figure 10 - Perspectives given to explain barriers to energy efficiency ............ 22

Table of tables
Table 1 – Theoretical barriers to energy efficiency inspired by ............................ 23
Table 2 - Company presentation, numbers shown in millions € .......................... 25
Table 3 - Offered services defined in chapter 1 ..................................................... 26
1. Introduction

1.1 Presentation
This report is a result of a master thesis off 30 ECTS performed by undergraduate M.Sc. in Mechanical Engineer Elin Dahl during spring 2012. The thesis is based on initiatives together with supervisors Sandra Backlund at the Department of Management and Engineering at Linköping University and Michael Søgaard Jørgensen at the Department of Management and Engineering at Technical University in Denmark.

Energy efficiency is stated as a mean to reach energy security and climate goals all around the globe but yet has the full potential of energy savings been reached. Energy services have been recognised as a way to reach that potential and energy companies are stressed as important actors into creating an established market for energy services.

Energy companies’ involvement on the energy service market is underlined by the European directive 2006/32/EG based on goals set to reach a 20 % reduction of primary energy use by 2020. The directive states that energy companies are able to improve energy efficiency by offering energy services and therefore this project aims to highlight their involvement. With a possible new directive discussed during summer 2012 binding energy saving targets for all Member states could be a reality over the next year and therefor the topic is of high relevance to a future development for energy services and energy companies.

1.2 Aim and objectives
The report is structured to give the reader an understanding of the role of energy companies within the energy service market in Denmark and Sweden and is based on empirically collected data as well as a literature review of the current state of practise, both globally and nationally.

The main objective of this thesis is to investigate, in a comparison between the Danish and Swedish markets, what driving forces energy companies have to offer energy services.

This report aims to create a platform for discussion for involved actors on the energy market and be a base for continuous research and decision-making. It aims to highlight policy and regulatory instruments in relation to the energy companies and to visualise both the Danish and Swedish energy market for energy companies. The work is based empirical data collection in forms of interviews and a literature review based on economic theory for barriers to energy efficiency and empirical studies of driving forces for supplementary actors on the energy market.

In addition to finding the driving forces, three topics for the involvement of energy companies becoming energy service providers are highlighted in this report – 1. How regulatory instruments affect energy companies. 2. If a difference can be seen between publicly and privately owned energy companies.
3. How energy companies experience the issue of trust from clientele and the market itself in order to find success and hindering factors for energy companies on the energy service market.

1.3 Research questions

What are the driving forces for energy companies to offer energy services?

How do energy companies tackle the role of being both a supplier of energy and a provider of services that reduce energy use?

How are energy companies affected by regulatory instruments, both existing and future?

Do privately and publicly owned energy companies differ to each other when offering energy services?

1.4 Delimitations and assumptions

As basis for research prior to the empirical data collection the energy service market has been researched as a whole and have not been specified to exclusively deal with energy companies.

This thesis is centred on the empirical data collection through interviews from 10 energy companies in both Sweden and Denmark. They are selected through their variation in size, ownership and offered services. They do not aim to represent the market as a whole but can be relevant to a certain extent.

This report tackles energy as a whole, mainly electricity and district heating. It does not differ to services related to different energy carriers, but for energy companies who offer energy services, all services are accounted for.

It is important to state that definitions for energy services given in this report and described in the section below, do not cover the whole spectrum of energy services but a majority of the market.

1.5 Disposition

Chapter one presents the overall aims and objective incorporated with the research questions. Then follows a list of definitions and terms needed to understand ideas merged in this report.

A background to energy efficiency and current status of international and national goals is presented in chapter two.

In chapter three the reader are presented with the structuring and methodology concerning the outline of this project.

Chapter four contains theory on with the empirical data collection is based on. It describes a theoretical and economical theory concerning barriers to energy efficiency and driving forces that energy companies can be influenced by.
Chapter five present the findings from the empirically performed data collection and the results.

An analysis and discussion follows in chapter six. This is presented accordingly with the research questions.

Chapter seven intents to present a categorical and concrete conclusion.

1.6 Specifying terminology
This section explains terms and defines used expressions in this report in order to clarify and easily understand the context.

1.6.1 Energy
The term energy is here defined by - "Energy: all forms of commercially available energy, including electricity, natural gas (including liquefied natural gas), liquefied petroleum gas, any fuel for heating and cooling (including district heating and cooling), coal and lignite, peat, transport fuels (excluding aviation and maritime bunker fuels) and biomass” (European Commission and Council, 2006)

1.6.2 Energy use
Is in this report defined as final or end-use energy use, all other usage is specified.

1.6.3 Energy companies
An umbrella term for companies participating in this report, include energy distribution companies and energy companies.

1.6.4 Energy efficiency
The term energy efficiency is here defined through - "Energy efficiency: a ratio between an output of performance, service, goods or energy, and an input of energy” (European Commission and Council, 2006)

1.6.5 Energy savings
The term energy saving are here defined as - “Energy savings: an amount of saved energy determined by measuring and/or estimating use before and after implementation of one or more energy efficiency improvement measures, whilst ensuring normalisation for external conditions that affect energy use.”(European Commision and Council, 2006)

1.6.6 Energy service market
Since there are actors on the energy service market that do not have energy services as their core business, the market for energy services are defined as a collection of different markets that together form a platform in which energy services are offered e.g. “there is no single industry called energy services”. (Golove and Eto, 1996)

Therefore used in this report is the concept of an energy service market as a market with multiple actors within diverse disciplines and core businesses but with one common factor joining them, they all offer energy services.
1.6.7 Energy services

Due to the numbers of actors on the market, and how they have chosen to define their energy services, the client is often over-whelmed and in little understanding of what is actually open to them on the market. Often different actors define services variously and often these definitions tend to overlap each other, making it hard for the customer to get a clear view over the market (Energimyndigheten, 2011). The term 'energy service' will in this report be accordingly to the European Parliament and the Council directives 2006/32/EG on energy end-use efficiency and energy services that defines an energy service as - “Energy service: the physical benefit, utility or good derived from a combination of energy with energy efficient technology and/or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to lead to verifiable and measurable or estimable energy efficiency improvement and/or primary energy saving”

Further on, energy services can be divided into segments that clarify current existing services, and in this report 11 different are represented (Energimyndigheten, 2011). It is important to point out that the energy service market is a market that is heterogeneous and therefore changeable and so are the services provided (Golove and Eto, 1996). This definition is to clarify the term energy services for the reader but also to simplify a comparative analysis.

The following model shows an example of the process of an energy service. Based on the level of the service you offer one or more of these steps are used.

![Figure 1 - Energy service steps](image-url)

In-direct are services that actors offer to consult or advise clients in efficient energy use but they do not take part of the executing. Direct services are those who offer a noticeable change, where the service can be measured and allocated to a tangible result. They are listed below (Energimyndigheten, 2011).

In-direct energy services:

1. **Energy statistic** – knowledge based on the clients will of the outcome. Divided into sub-groups
2. **Energy audits** – a mapping of the energy use of targeted system or building
3. **Energy declaration** – a tool to verify the state of energy use (energy efficiency, kWh/m²) and to advise on where saving can be accomplished
in accordance with the European Efficiency Directives and regional laws and policies. Performed by certified personnel.

4. *Energy consulting* – consulting given by public energy or climate experts, consultants or energy companies

5. *Energy analysis* – an analysis of the energy audit, an evaluation that often lead to concrete energy saving proposals

Direct energy services:

6. *Complete energy efficiency measurements* – the definite executing of an energy saving

7. *Load controlling steering* – Evens out and equalizes the electricity use over time as a way of increasing the efficiency of the energy within a system

8. *Service agreement/contracting* – A long-working agreement providing the guaranty for the delivery of energy to a system or functions

9. *Energy service agreement for operation and maintenance* – With the same on-going commitment that within the service agreements but with expanded responsibilities over operation and maintenance in contracted facilities. This service is usually offered on the condition that the energy service company get a share of the savings being made

10. *Performance contracts* – A complex service where the client fully allows the supplier to access the facilities and make various improvements, installations, handle operation etc. The client and supplier share risk and profit. Include EPC (energy performance contract), incentives contracting saving contracting and guaranteed usage contracting with various business models

11. *Function contracting* – Contract where full solutions for climate, indoor climate, electricity, heating are offered to the client.
2. Background

This chapter aims to give the reader an introduction to the topic energy efficiency, give a historical view on energy services and then present both European and national perspectives on energy targets and regulatory instruments that are relevant to this report.

2.1 Energy efficiency – a global question

“The most important contribution to reaching energy security and climate goals comes from the energy that we do not consume.” - (IEA, 2011)

Over the last years with a higher population and an increasing usage of energy through more application and improved lifestyles, the demand for energy has placed pressure on existing energy sources and in the way they are utilized. Scenarios for a future development of the use of energy show a contiguous growth with 53 % from 2008 and to 2035 (IEA, 2008). OECD¹ member countries are a majority of advanced energy consumers and will have an annual growth of 0.6 % over the upcoming years whilst non-OECD countries predict a growth of 2.3 % (EIA, 2011). China and India expect an increasing energy demand of up to 100 % by 2023 (Hansen et al., 2009).

Figure 2 - Energy use for OECD and Non-OECD countries in a perspective 1990-2035 in quadrillions Btu (EIA, 2011)

Figure 2 shows a doubling of energy use from 1990 to 2030. This demand and an environmental aspect have lead to an increasing interest for energy and its use, giving room for a market for energy savings. (European Commision and Council, 2006; Hansen et al., 2009; IEA, 2011)

¹ OECD countries included in figure 2: United States, Canada, Mexico, Austria, Belgium, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, Japan, South Korea, Australia, and New Zealand.
In the European Climate Foundation Roadmap 2050, energy efficiency is stated as a necessary mean to reduce the demand for energy. It estimates that with cost-effective energy savings, a decrease in energy demand could be accomplished in the size equivalent to 440 medium-sized coal plants and through energy efficiency in buildings and industry, the growth in energy demand can be evened out by 2050 (European Climate Foundation, 2010).

In June 2008, the G8 countries, European Community, China, India and South Korea confirmed an international partnership for energy efficiency cooperation (IPEEC) and released a declaration of the need for global cooperation within energy efficiency. IPEEC acknowledged that improving energy efficiency is a quick, green and cost-efficient way to secure energy supply, climate change and ensure economical growth.

Historically energy efficiency was made into a concept already after the oil crises in 1973 and 1979 in response to the increasing demand for energy and the concern for dependency of foreign energy sources. In 1978, USA launched National Energy Conservation Policy Act (NECPA) within the concept Demand Side Management (DSM) which is recognised as the first policy on energy efficiency (Eto, J., 1996). This spread across USA and in the mid-80's, DSM was seen as a tool for the reduction of new power plant constructions (Loughran, D. and Kulick, J., 2004). The interest for energy efficiency spread but interest downed during the 1980's when oil and electricity prices were relatively low but the concept of energy efficiency was now spread across multiple countries and by 1993 it generated 2.7 billion dollars on the U.S. market (Eto, J., 1996).

However – the evidence that energy efficiency decreases energy uses is debatable. The economic-wide rebound effect, which is hard to measure in itself, can have sever consequences for energy efficiency and is highlighted to be taken into consideration when forming energy policies and regulatory instruments. It is stated that additional research is needed within this field to more in detail specify how it affects energy efficiency. (Sorrell and Dimitropoulos, 2007; Madlener and Alcott, 2009)

2.2 EUs 20-20-20 targets
As part of a strategy to transform Europe into an energy efficient and low carbon economy and through global interest presented above, EU set up three targets to be met by 2020 also known as the 20-20-20 targets.

- 20 % reduction of greenhouse gas emissions compared to 1990 levels
- 20 % of energy use from renewable energy sources
- 20 % reduction of primary energy use by improving energy efficiency

These targets were constructed in order to meet the climate change, increase energy security and competitiveness. (Energistyrelsen, 2009a)

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2 GB - France, Germany, Italy, Japan, United Kingdom, United States, Russia and Canada.
In association to meet these targets a European action plan was introduced for 2007-2012. The plan proposed measurement for achieving the 20 % target which included improving energy performance and transformation, limiting costs linked to transport, review and introduce financial tools, create incentives and fares to boost energy efficiency as well as education and establishing of partnership.(European Commision and Council, 2006)

Improving energy performance include a directive on energy end-use efficiency and energy service called Directive 2006/32/EC where frameworks for guidelines, a code of conduct and certification procedures are proposed for increasing energy efficiency and energy services within the European Union. The directive and how both Denmark and Sweden interpreted it, is presented below.

2.3 Directive 2006/32/EC
The directive proclaim that Member states must adopt and achieve an indicative energy saving target by the help of national action plans and appoint a public authority or agency to monitor the process. In Denmark this is the Danish Energy Agency (Energistyrelsen) and in Sweden it is the Swedish Energy Agency (Energimyndigheten). Within the framework of the directive stands that public sector adopts measurements that improves energy efficiency and that energy end-use efficiency and energy services are promoted by:

*Energy distributors, distribution system operators and retail energy sales companies (Article 6), information spreading (Article 7), availability of qualification, accreditation and certification schemes (Article 8), financial instruments (Article 9), energy efficient tariffs and other regulations for net-bound energy (Article 10), funds and funding mechanisms (Article 11), Energy audits (Article 12) and metering and informative billing of energy use (Article 13). (European Commision and Council, 2006)*

Article 6 is of special interest in this report and the focus on distribution system operators and retail energy sales companies, referred to as energy companies in this report, has been labelled with several beneficial arguments:

- They have the possibility to reach a wider spectrum of different energy services and measurements and then combine them than to fit individual users
- It is often more cost-efficient for the society to let energy companies be responsible for energy efficiency rather than making investments to support an increased energy demand
- Clients often ask for a need of satisfaction e.g. indoor climate, rather than energy as a commodity
- It is socioeconomically unprofitable to let energy efficiency and energy sales be in contrast with one and another meaning not let energy companies profit be only linked with energy sales
- Energy efficiency can add value to energy companies existing products and give them a client loyalty advantage on a deregulated energy market with homogenous products
They can contribute with new ideas and solutions to energy efficiency
It is economically feasible to take advantage of their knowledge and infrastructure in services associated with energy efficiency
With their involvement, a functioning market for energy efficiency could be reached more rapidly

(Thomas, S., 2007)

The directives set non-binding measurements and by the mid-term evaluation of national action plans, it was seen that targets would only be met by half (e.g. 10%) (European Commision, 2011). Therefore, in June 2011 the Commission suggested a new directive that would bring all Member States efforts forward in order to reach 20-20-20 targets. As of today, trilogies meetings are being held between the European Parliament, Commission and Council. A possible agreement is said to come during the summer of 2012. (Bach, P., 2012a) (EurActiv.com, n.d.)

2.3.1 Denmark
To understand the national level of energy policies and instrument, a brief background to the energy mix and national background to energy efficiency is presented in pre-hand of instruments relevant for this report. In Figure 3, Denmark's energy mix is presented and a majority of the mix is supported by fossil fuels.

Due to the oil crisis in the early 1970s, Denmark made sever changes to their energy policies, focusing on independent energy conversion with the help of development within renewable energy sources as well as energy saving measurement (Jørgensen, U. and Strunge, L, 2002). This strategy was accomplished in 1997 when Denmark was self-sufficient in energy and despite a
economical growth of 78% since 1980, Denmark's energy use has remained unchanged, much due to quotas and taxes (Danish Energy Agency, 2010).

The Danish energy policy includes a 100 % renewable energy supply by 2050 within all sectors, electricity, heating, industry and transport. Energy saving is counted for as one of the most important factors for reaching this goal. Compared to 2010 gross energy use levels, a 7.6 % reduction is called for until 2020. To improve energy efficiency and meet European targets, Denmark has implemented a variety of instruments such as; energy and CO₂ taxes, CO₂ emission allowance trading scheme, voluntary agreements for industry, energy labelling and binding measurements for energy companies to fulfil a annual energy saving target, also know as the Danish energy efficiency obligation scheme.(Energistyrelsen, 2009b)

In this report, focus is put on the obligation scheme. It is stated that when an obligation scheme is well designed, it is a tool to reduce barriers to energy efficiency (E. Lees, 2012) and the primal regulatory instrument affecting the energy companies in Denmark.

In Denmark, the obligation scheme is set to energy distributing companies and involves an energy use reduction of a set amount shown in figure 3. During the first period of the obligation scheme 2006-2009, targets were set on a reduction of 0,7 % of total energy use and between 2010 and 2012, it increased to 1,5 %. Also during this period, adjustments saying that savings had to come from implemented energy efficiency measurements were made.(Bach, P., 2012b)

In the new energy agreement from March 2012 between the Danish government and the energy companies, a target is set for a future 2.6 % reduction annually, which is an increase with 75 % in 2013 and 2014 of energy use to 2010 level. Targets are set to increase by 100 % in the next years up until 2020, see figure 4. (Ministry of Climate, Energy and Building, 2012)
The scheme differentiate between different energy distribution companies; electricity, district heating, oil or natural gas energy companies. In this report all participating companies are both distribution and supply companies and therefore they all have the obligation to complete national targets.

The energy companies are allowed to realise these energy savings anywhere in the country and within any energy type using means available. Means include subsidises, information or consultancy for example. Typically a client presents a project before implementation, and then the energy company buy the rights to include that project’s energy savings in its targets. All agreements between the energy company and the client must be made prior to implementing the measurement. The energy savings can be calculated through standard values or specific calculations, around 20% of energy savings are calculated through standard values.

The distribution companies are restricted from implementing direct energy services by themselves, which lead to organisational changes for energy companies that wanted to be able to deliver energy services, dividing divisions within the company, giving them other legal conditions. This also leads to external actors being involved. Among these, contractors such as plumbers or advising engineers are included for example. Savings have also been sold between affected parties, bilateral, using smaller marketplaces such as web-based sources for example but the sales are limited and this process is at an infantile state.

The Danish system has been evaluated and annual sample controls are made, after which changes have been made to the scheme. In sample controls it is shown that only 11 out of 25 chosen energy companies fulfil documentation demands and those who did have established existing procedures and standards
to handle the documentation. Also seen is that 25 % of projects in a sample control was projects with a payback time less than one year.

Clients vary most are within industries and private households. A handful is within the public sector, even though the trend is increasing seen in figure 5.

Figure 5 - Energy saving between clients variation over time (Ea Energianalyse et al., 2012)

Energy companies use subsidised means on offered energy services, charged for by increasing clients' tariffs, and used in 85 % of all cases where energy savings are made. Clients within the industry see subsidies as an important mean to get a project implemented, as for private households it does usually not affect the total cost that much, seen in figure 6. Regulation states that subsidise can be no bigger than 30 % of the total investment cost.(Ea Energianalyse et al., 2012; Bach, P., 2012b)
In a recent evaluation of the obligation scheme, 80% of involved clients were satisfied with the obligation scheme and seen in figure 7, a majority of clients did not know about the energy saving possibility until approached by an energy company.

Figure 6 - How much influence was subsidising for project implementation? 1 - Don’t know, 2 - Very much, 3 - Much, 4 - Some, 5 - None. Based on 173 big saving projects and 14 small. (Ea Energianalyse et al., 2012)

Figure 7 - To what extent had clients considered their energy saving projects prior to the involvement of an energy company or other involved actors? 1 – Other options, 2 – Not considered, 3 – Some consideration but involvement lead to substantial increase of information, 4 – Project was already considered, 5 – Don’t know (Ea Energianalyse et al., 2012)
2.3.2 Sweden

A few energy companies in Sweden initiated in the 1980s and 1990s programmes offering energy services to clients but a majority of them put energy efficiency aside due to the liberalisation of the energy market and the surplus of energy produced in Sweden during that time (Strid and Bergmasth, 2004). Also due to the oil crisis in the early 1970, the Swedish government expressed a goal to reduce use of fossil fuels and promote programs for alternative sources such as bio fuels. In 1981 a review of the Swedish national energy programs are made with the goals to reduce energy use and replace fossil fuel with nuclear power conversion which is allowed to expand heavily during the next years (Energimyndigheten, 2012). Nuclear power was later voted through a referendum to be discontinued by 2010 but as of today, nuclear power stand for 33 % of Sweden’s energy supply and is also the biggest wedge within Swedish energy politics for a cross-political agreement (Partiledardebatt, 2012). See figure 8 for Sweden's energy mix.

Through an agreement in 2008 with the present government, it is said that Sweden will build its new energy politics based ecologic sustainability, competiveness and supply security (Regeringen, 2009).

In association with directive 2006/32/EC, Sweden set national targets with 6.5 % more efficient energy end-use use by 2010 and 9 % by 2020. Targets are calculated on energy intensity, which are units of energy per unit of GDP (kWh/SEK) meaning that high energy intensity in country indicates a high price or cost of converting energy into GDP.

In the first national action plan presented in 2008, a focus was set on information spreading and subsidises for new energy efficient technology (Regeringen, 2009). In Sweden’s second national plan for energy efficiency released June 2011, the government states that economical market based regulatory
instruments such as tax and pollution tariffs were increasing in importance, because of their ability to internalise the external effects in a cost-efficient way.

Swedish regulatory instruments for reaching national targets include taxes on energy, sulphur, carbon dioxide and nitric oxide, voluntary agreements within industry, regulations for buildings, energy labelling of goods, emission trading, a subsidise when performing energy audits, energy declaration of buildings and energy efficiency programmes for example. Below are the most relevant to this report presented as well as the public procurement act and a discussed possible Swedish obligation scheme.

A central part is a five-year energy efficiency programme between 2010-2014, which is generated by 300 MSEK to promote regional and local energy- and environmental procedures and to enhance information spreading and consultation.

The subsidise for performing energy audits is a financial support mean that was initiated in April 2010 and can be applied for until 2014. The support is to cover half of the cost of an energy audit, but as a maximum of 30 000 SEK. It is given to companies having more than 500 MWh energy use.

Voluntary agreement towards industry is an instrument giving a participating industry a “zero-tax” on energy (e.g. a reduction of the energy tax by 0.005 SEK/kWh). It was initiated in 2005, and is given to companies to within a two-year period implement an energy management system and do an energy audit. There on, energy efficient measurements need to be implemented within a period of five years. (Regeringen, 2009)

The public procurement act is an act increasing competiveness in public procurement, meaning that before contracting, a public organ financed by public means must take in offers from multiple suppliers and then evaluate the most suited one. The act derives upon European directive 2004/18/EC.

There has also recently been activity and dialogs in Sweden around a possible obligation scheme as a consequence of the European discussions concerning a new directive. In an evaluation of the consequences for a possible Swedish obligation scheme released by the Swedish Energy Agency in 2012, there is a discussion of who should be responsible for delivering targets within the obligation system. It is discussed if it should be distributers or suppliers, which within electricity often is the same company. As a conclusion, neither of the two writing governmental organs (Energimyndigheten and Energimarknadsinspektionen) writing the report could give an unanimous answer onto who it should be placed on. (Energimyndigheten, 2012)

The evaluation is based around calculation of an annual 1,5 % energy saving demand from the energy distributed or supplied by energy companies, which states a saving of 3 TWh. 3 TWh is approximately the same number as the third period of the Danish obligation system for energy saving and 10 % of recommended saved energy use for industries in Thollander et al, 2010, which
also states that a search for additional regulatory instruments than those existing is needed. (Thollander, Rohdin, et al., 2010; Energimyndigheten, 2012)

Between the 59,000 industry companies in Sweden, total energy use is around 151 TWh annual and prior to the first Swedish national plan, an annual energy efficiency potential of 22.5 TWh in primary energy use and 12.8 TWh energy use, where primary energy expresses the total energy to produce final energy, for industries were calculated. (Statens offentliga utredingar, 2008; Thollander, Rohdin, et al., 2010). In the evaluation, the Swedish Energy Agency states that between sectors as industry, housing and service, it would prove to be difficult to reach 3 TWh annually without including the transport sector (Energimyndigheten, 2012).

The evaluation however emphasise coordinating the obligation scheme with other regulatory instruments, policies and adding a market transformation which implies involving actors in the whole chain from conversion, distribution, supply and end-user. A system in Sweden would, based on a study of external obligation schemes, benefit from having an underlying goal that in Denmark means reducing the energy imports (Energimyndigheten, 2012). The report does not present an alternative to an obligation scheme for Sweden, however the scheme is said to be beneficial for energy companies to allow an opportunity to develop their energy efficiency services and increase satisfied clients (Stengård, L., 2006).
3. Methodology

This chapter describes how the planning, execution, documentation and analysis have been structured and implemented throughout the process of this project.

3.1 Outlines and implementation

The planning and outlines of this project where categorised into divided phases shown in figure 9 and then separated and adjusted to a time line presented as Appendix A.

![Figure 9 – Time arrows showing the phases throughout the project](image)

Throughout the process of this project a continuous dialog, through mailing contact, telephone and personal meetings, with supervisors Michael Søgaard Jørgensen and Sandra Backlund was held and Backlund also participated in an interview during the empirical data collection.

3.2 Data collection

3.2.1 Theory

The energy issue is one of great complexity and to understand various terms and conduct a quality empirical data collection, a wide range of fields within energy efficiency, energy services, energy policies and the economics of energy were studied. This gave an overview of highlighted fields, both historically and present and a suitable introduction to perform valuable semi-structured interviews with energy company's representatives.

This review is mainly based on reports, legislation and research from the International Energy Agency, United Nations Industrial Development Organisation, Danish and Swedish governments, Danish Energy Agency, Swedish Energy Agency, European Commission, Technical University of Denmark and Institute of Technology at Linköping's University.
3.2.2 Seminars, workshops and conferences
Within the segment for energy, development are at a rapid speed and in order to keep this project as updated and relevant as possible, a number of visits to applicable events were included in the data collection. The visits included presentations, discussion panels and dialogues one-on-one with representatives from the Danish and Swedish energy sector.

Visits included a workshop concerning a possible Swedish obligation scheme with the Swedish Energy Agency held on February 29th, Nordic Energy Outlook held by Swedish Energy Agency on 13-15 March, a seminar on energy services held by the Danish Energy Agency 16th April and a seminar on new innovation policy arenas for the transition to a low carbon society held at the Technical University of Denmark 20th April.

3.3 Empirical data collection
3.3.1 Company selection and approach
In the selection process for possible companies to interview, a study of the Swedish and Danish market for energy companies offering energy services were conducted through company websites, interest organisations such as Danish Energy Association and Swedenergy as well as information from the Danish and Swedish Energy Agency.

Through initial research, potential candidates were chosen. The candidates were approached mainly through telephone contact or in a few cases via e-mail and out of these, ten were scheduled for an interview. Out of the chosen candidates, five were from Denmark and five from Sweden and were chosen based on their variety in size, offered energy services and ownership. Companies in this study have conversion, distribution and supply fields within the company and all offer energy services, which in exclude companies from this report not offering energy services.

3.3.2 Interviews
From the literature review, factors were visualised as potential driving forces as well as barriers to energy efficiency. From these factors and in line with the research questions, an interview guide was made and sent out to candidates pre-hand to the interview.

In the name of information gathering through interviews, the main types of interviews were explored, the open-ended or unstructured, the semi-structured or the group interview (Rogers et al., 2011). Out of the four, the semi-structured was considered the most suited for the purpose of this research.

An interview is defined as a conversation with a purpose (Coker, 1958) and the types vary in how much control the interviewer has over reaching the set target for this interview (Rogers et al., 2011). Accordingly, the semi-structured interview allows both flexibility and structure. In a semi-structures interview, questions can be both open and closed and the interviewer uses probes when the situation requires additional information. Semi-structures imply that the same
questions in the same order are asked to all participants, so that the result easier can be analysed.

Already at an initial state for a semi-structured interview, planning is emphasized. It is said that the detail of preparation is crucial if the outcome wishes to be the desired and therefore the literature review have been of great importance for this project. It is also strongly advised not to pre-empt an answer by setting questions which seem to have a preferred result, but instead construct question based on openness and a sense of naivety (Gillham, 2005) which was implemented in the guide shown in Appendix B.

Out of ten interviews, eight took place at location at the energy company and two were conducted over the telephone. The interviews ranged in length from 1.5 hours up to 3 hours and all were recorded and documented through transcripts.

3.4 Confounding
As the policies for Denmark and Sweden vary to a distinctive degree, the interpretation of the interview guide has varied to fit the respondent, allowing them to answer out of their perspective and the respondents have had the opportunity to comment on the written result.

Numbers presented in this report is based on the interviews, and to some extent verified through annual reports or additional e-mails to other departments within the energy company more relevant to answer but in some cases this has not been possible.

As a final remark and limitation would be the writer’s own personal experience on to what would be preconceptions entering this project. They would limit in a way that a mental awareness and a fully open-minded opinion towards interviewing and presenting unlimited angles in this report would be proven itself to be extremely challenging.
4. Theory

This chapter presents theory used to gather relevant empirical data and analysis. It presents barriers to energy efficiency as well as driving forces based on a literature review.

4.1 Barriers

Among research and studies, a common agreement when analysing energy efficiency is the potential it has, but how it often fails to be implemented – also referred to as the ‘energy paradox’ or the ‘energy efficiency gap’. This ‘gap’ can be explained by a number of barriers prohibiting energy efficiency to reach its full potential. (Jaffe and Stavins, 1994; Golove and Eto, 1996; Weber, 1997; DeCanio, 1998; Sorrell et al., 2000; Brown, 2001; Schleich and Gruber, 2008)

Energy services are stated at means to decrease and lower these barriers (European Commision and Council, 2006). The literature approach to describe and explain barriers to energy efficiency is wide and uses concepts from overlapping theories such as neo-classic or orthodox economics acting on perfect rationality, competition, markets and market failures, as well as institutional economics – principal-agent theory and transaction cost economics – and behavioural concept, psychology and social. (Masselink and Hendrickx, n.d.; Jaffe and Stavins, 1994; Brown, 2001; Sorrell, 2004; Schleich, J., 2011)

In literature, an overlapping of the different perspectives, seen in figure 10, is common and barriers are interpreted into different perspectives and barriers. Principal-agent theory is a theory proving barriers in literature but can also be interpreted and coexist within different perspective in below described barriers. Barriers can also be of different importance and allocated at different levels such as micro or macro, above-mentioned perspectives deliver a gathered vision to barriers. (Schleich, J., 2011; Sorrell et al., 2011)
In orthodox economics perfect markets are said to be markets which are well defined and have no exit or entry barriers, have perfect competition and all actors act based on rationality and with the same information, and if any of these condition fail to deliver a market failure has existed according to this theory. A market failure is proposed to rationalise policy intervention, only if cost-effective, and is therefore of importance in when talking about overcoming the energy efficiency gap. Market failures relative is imperfect information of a good and asymmetric information about a good. (Sorrell, 2004) As mentioned, several perspectives collect a gathered vision on barriers and some barriers cannot be explained through market failures but are referred to as non-market failure barriers (Jaffe and Stavins, 1994). Barriers include: Risk, Imperfect information, hidden cost, access to capital, split incentives, bounded rationality and human capital.

Table 1 – Theoretical barriers to energy efficiency inspired by (Sorrell, 2004)

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>Risk can be divided into external (energy prices, government regulation and policies for example), financial (inflation, capital markets influences to loans) and technical (unreliable equipment etc.). Technical investments seen as irreversible and prohibit implementation is one example.</td>
</tr>
<tr>
<td>Imperfect information</td>
<td>When information is lacking or unevenly (asymmetric) spread over involved parties, optimal rational decisions concerning energy efficacy may lack to be taken. Concern terms as adverse selection and moral hazard – barriers prior and after contractual agreement and often related to principal-agent relationships and trust between actors.</td>
</tr>
<tr>
<td>Hidden cost</td>
<td>Claimed as a primal factor for the gap, and involve costs for energy management, specific costs associated with an energy efficient measurement or the potential loss of utility reduction in association with energy efficiency.</td>
</tr>
<tr>
<td>Access to capital</td>
<td>Energy efficient measurements are often associated with higher costs that less efficient products and for clients access to liquid means have proven to be difficult to establish, both through loans and payback time. It is also associated with lack of interest from management, leading to neglecting of budgeting for energy efficient measurements</td>
</tr>
<tr>
<td>Split incentives</td>
<td>Split incentives are commonly associated through asymmetric information and transaction cost and are often referred to the landlord-tenant problem where the tenant pay for energy efficient measures but have little motivation to implement energy services as they have no ownership in the facility.</td>
</tr>
<tr>
<td>Bounded rationality</td>
<td>According to orthodox economic theory, decisions are based on rationality, but acts based on gut feeling, habits and own objectives are related to bounded rationality and it is often associated with time, interest and information</td>
</tr>
</tbody>
</table>
Additionally barriers that specifically turns towards energy companies are considered human capital e.g. lack of skilled staff. (Energimyndigheten, 2011; Marino et al., 2011)

4.2 Driving forces
In general, driving forces differentiate from which level is present and three levels have been established during this literature review.

- **External**
- **Clients**
- **Internal**

**External** - For governmental and public reason as stated in chapter 2 an increased energy efficiency is promoted at state level in both Sweden and Denmark where both countries see energy companies as an important brick in the equation. Promotion is generated from both national energy policies but also direction from a European perspective. The European liberalisation of the energy market has lead to more competitiveness, which in itself has created incentives for a supply of energy services.

**Clients** - The public support is a recognised driving factor, with increased knowledge and awareness for a sustainable society, which increasing the demand for energy services. There is also a trend for enhanced understanding and a change of mind-set, which also produces a driving force. Elevated energy prices are of substantial matter when mentioning the public driving forces. There is also a need for upgrading, renovating and increasing competiveness by implementing energy services. Having energy strategies, which are complimented by energy services, are also within clients interest since it would promote a greener profile. (Statens offentliga utredingar, 2008; Thollander, 2008; Marino et al., 2011)

**Internal** - For companies offering energy services means a business opportunity and an increased customer relation. Energy services provide relatively low risk, especially for established energy supply companies. Regulatory instruments and legislation are forces that drive the development of energy services as well as established networks. For energy companies, energy services provide an opportunity to release space in the distribution and conversion area, implying less costly investment on renewing present equipment to meet demands. (Energistyrelsen, 2009b; Thollander, Svensson, et al., 2010; Energimyndigheten, 2011)
5. Results
This chapter presents the result from the empirical data collection. It is structured to give a general understanding of energy companies, offered services and clients to start with. It follows with advantages and challenges. The results chapter ends with a section on regulatory instruments.

5.1 Company presentation

Table 2 - Company presentation, revenue shown in millions €

<table>
<thead>
<tr>
<th>Company</th>
<th>Origin</th>
<th>Ownership</th>
<th>Total revenue</th>
<th>Energy services revenue</th>
<th>Percentage energy service revenue of total revenue</th>
<th>No. of employed in business unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swedish</td>
<td>Public</td>
<td>831</td>
<td>22,4</td>
<td>2,4 %</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>Swedish</td>
<td>Public</td>
<td>310</td>
<td>5,5</td>
<td>1,8 %</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Swedish</td>
<td>Private</td>
<td>6296</td>
<td>5,6</td>
<td>0,1 %</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Swedish</td>
<td>Private</td>
<td>20251</td>
<td>16,5</td>
<td>0,08 %</td>
<td>30-40</td>
</tr>
<tr>
<td>5</td>
<td>Swedish</td>
<td>Public</td>
<td>294</td>
<td>0,22</td>
<td>0,07 %</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Danish</td>
<td>Public</td>
<td>246,6</td>
<td>3,1</td>
<td>1,3 %</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>Danish</td>
<td>Public</td>
<td>272,5</td>
<td>25,1</td>
<td>9,2 %</td>
<td>69</td>
</tr>
<tr>
<td>8</td>
<td>Danish</td>
<td>Private</td>
<td>7745</td>
<td>2</td>
<td>0,03 %</td>
<td>25</td>
</tr>
<tr>
<td>9</td>
<td>Danish</td>
<td>Public</td>
<td>270</td>
<td>6,7</td>
<td>2,5 %</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>Danish</td>
<td>Public</td>
<td>419</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
</tbody>
</table>

Numbers in table 2 are based on interviews and then confirmed either by published annual reports or e-mails with economically responsible representatives, converted from DKK or SEK to € on 4th May 2012. Total revenue concerns the year of 2010.

Public companies in Denmark and Sweden have generally a larger percentage of energy services compared to total revenue and the private companies have substantially larger revenues in total than the public.
5.2 Offered services

Table 3 - Offered services defined in chapter 1

<table>
<thead>
<tr>
<th>Company</th>
<th>Origin</th>
<th>Ownership</th>
<th>In-direct</th>
<th>Direct</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10 11</td>
<td>Numbers represent services presented in chapter 1</td>
</tr>
<tr>
<td>1</td>
<td>Swedish</td>
<td>Public</td>
<td>x x x x x</td>
<td>x x x x x</td>
<td>Additional services out over these definitions, 3 years contracts</td>
</tr>
<tr>
<td>2</td>
<td>Swedish</td>
<td>Public</td>
<td>x x x x x</td>
<td>x x x x x</td>
<td>5-20 year contracts for direct services</td>
</tr>
<tr>
<td>3</td>
<td>Swedish</td>
<td>Private</td>
<td>x x x x x</td>
<td>x x x x</td>
<td>District heating and private clients focus</td>
</tr>
<tr>
<td>4</td>
<td>Swedish</td>
<td>Private</td>
<td>x x x x x</td>
<td>x x x x</td>
<td>Reconstruction of organisation, and international expansion</td>
</tr>
<tr>
<td>5</td>
<td>Danish</td>
<td>Public</td>
<td>x x x x x</td>
<td>x x x x x</td>
<td>Offers an energy controller – a personal energy expert</td>
</tr>
<tr>
<td>6</td>
<td>Danish</td>
<td>Public</td>
<td>x x x x x</td>
<td>x x x x</td>
<td>Consultation mainly, but have a service division that can implement measurements therefor (x)</td>
</tr>
<tr>
<td>7</td>
<td>Danish</td>
<td>Public</td>
<td>x x x x x</td>
<td>(x) (x)</td>
<td>Aiming towards more direct services</td>
</tr>
<tr>
<td>8</td>
<td>Danish</td>
<td>Private</td>
<td>x x x x x</td>
<td>x x x x</td>
<td>50 % from private households</td>
</tr>
<tr>
<td>9</td>
<td>Danish</td>
<td>Public</td>
<td>x x x x x</td>
<td>x x x x x</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Danish</td>
<td>Public</td>
<td>x x x x x</td>
<td></td>
<td>Consultation</td>
</tr>
</tbody>
</table>
Danish energy companies also sell and buy their energy saving on an open market. This market has not reached a stable state yet with established market places and actors but attempts are made and this part of the obligation scheme is expected to grow with increasing targets.

Public and private companies offer the same range of services, seen in table 3, although Danish companies have a tendency to a higher degree offer only indirect services. However, energy companies have been offering consultation and advise to clients regarding energy questions over their existence and are traditionally seen as experiences in these matters.

A comment to the definitions on energy services included in this report is why they are not defined after the customer need but in accordance with the Swedish Energy Agency. Swedish energy companies mention them to create a hinder for the development of other energy services.

Both Danish and Swedish energy companies express that it being possible for flexibility for the above-mentioned services and that it is depending on what the client is searching for. Traditionally, energy companies in both countries have offered consultation to existing supply clients, but later it has been packaged into a payable option towards clients. Contract time varies and is depending on the client need.
5.3 Ownership

“I think the energy question is much more than a local question, you have to look at it from a greater perspective” – Company 1

Public companies in both countries express an advantage for them to have a closer relationship to their clients and private companies in Sweden express a disadvantage for not having this when offering energy services. Energy services are associated with a strong sense of trust and companies believe that this is increased by a closer relationship with clients. Publicly owned companies says it is good to be seen as the company where profits go back to the public owners. It is said that being part of a public energy company opens doors that would have been close to other actors within the municipality. It is stated from public companies in Denmark and Sweden that they have a responsibility towards the public owners. This is seen as a factor that has driven a successful development of energy services. Mainly to ensure that the clients are provided with possibilities to a more efficient use of energy and it usually work in cooperation with having a green strategy plan within the company.

It can be pointed out that Danish companies did not differ to the same extent between being either public or private as the Swedish companies due to the fact that they all are affected by and operating under the Danish obligation scheme.

Danish public energy companies are advised to search for energy saving outside of their supply area and out of their own energy arts, something that the Swedish companies feels restricted by, seeing since it would be out of their supply area. Swedish public companies mention that the public procurement act is a restrain in reaching out to public clients. It is said that other actors on the market can come with propositions for contracts within energy services that is economically unfeasible for them to offer. This because competitions have a belief that they could by offering the first energy service to a lower price regain this loss in further collaboration with the client, hence offering more energy services.

Private companies in Sweden, however, see an opportunity for them not be affected by the public procurement act, to such extend as publicly owned companies. It is stated by public companies in both countries that being publicly owned does not bring any advantages within the local municipality or with public clients within the supply area.

Private companies are seen to have a great potential for reaching a larger number of clients due to an already existing energy supply client stock and have the means to do so. Their involvement on the energy service market is equal to the public companies in terms of revenue for energy services.

Public and private companies in both countries agree that their own management need to have a commitment to providing energy services. Swedish public energy companies mention how the strategies towards energy services differ from different municipalities depending on the leading parties politics within that region and it is seen as a restrain to energy efficiency nationally. A
future strategy is to impose energy services as a part of a smart system for an entire city in order to get a closer relationship with clients and work with energy services out of a greater perspective mentioned by both public and private energy companies.

5.4 Clients

“If you want to reach a successful result, you need to have the clients with you” – Company 6

For Danish companies a majority of the clients belong to the industrial sector as well as the private household sector. For Swedish publicly owned companies, they have property and facility owners and housing cooperative as their main clients but also mention the industrial sector as a client. Private companies in Sweden refer to clients where heating is installed and private households. One Danish company offers subsides directly to private households that implement energy saving measurements. Other has partnerships with bank, contractors or their own service division that implement changes with private households. All companies in both countries find that the public segment is hard to reach out to and that it is said to be time consuming signing contracts. Companies not involved with private households, says that providing energy services except for energy statistic and customer service are economically unfeasible to that segment, other business models are needed to make is feasible.

Swedish companies often refer to industries as not having enough time to implement energy services, or that they have other priorities. All companies in both countries mention a disadvantage of not having enough knowledge to provide energy services within the production processes. They mainly offer energy services for support processes such as ventilation or a combination of both support and production processes for industries. Companies say it is important to be observant when controlling facilities and properties both of details but towards the in-house personal as well. Some Danish energy company offer services directed to small and medium sized companies, which are based on a set tariff.

Clients are found within the energy supply area, existing client stock or on occasion through networks, previous contacts or promotion through websites. In general all companies in both countries allocate their clients. Private households however report their energy savings online directly to the energy company website. The Swedish public companies rarely offer services outside their own supply area, whilst the Danish energy companies have the obligation scheme where it says that they are free to conduct energy services outside their own supply area, even though the main focus is still within.

In order for Danish companies to reach an obligation target, contracts and contact with external contractors are essential. Some energy companies give the client the opportunity to choose contractor themselves, based on their previous relation or opinion of a contractor, increasing the flexibility of a contract towards the client.
The level of knowledge for energy, energy efficiency and energy services is limited and varying among clients. General knowledge, such as turning lights off and not leaving radiators on, is considered high however, saying that there exists a public awareness in both countries. Companies in both Denmark and Sweden express a common belief that clients with a higher level of knowledge towards energy efficiency and its solutions are often where the clients gain the most from energy services. Lower level of knowledge and experience with energy services often results in a higher mistrust towards the initial investments cost, suggested solution and payback time. Essentially leading to a lower level of implemented energy service. The tendency among energy companies is that larger industrial client or more technical involved clients often have a better knowledge of what kind of energy services they need. Clients with a high energy use, or where energy costs are of substantial matter within the business, often has enough economical incentives to be interested in energy services says all companies participating in this report.

Swedish property and facility owners, housing cooperatives and in some cases public segment are clients that express a will to simplify an energy supply, with bundling energy services together with the energy invoice and here Swedish energy companies are often offering contracts which offers a packaged deal. Contract is often a guaranteed in-door climate where the companies take over service and make sure necessary investments are implemented based on the clients will.

Clients are often visited multiple times, exception for private household, both in order to establish a deeper relationship with the client and to introduce additional energy services in both countries. All companies express a strong belief that this increases credibility and success for implemented energy services. Danish and Swedish companies all express an educational, motivational factor and working with deeper relationships over time with the client as part of their approach towards clients. The essence of visualisation, explaining procedures and contracts to clients as well as keeping it simple is a common belief among participating Danish and Swedish companies.

5.5 Strategy and future development

“The more time you spend not implementing energy efficient measurements, the more money you loose” – Company 7

Energy companies highlight the educational and motivational factor in energy services as important, both in Denmark and Sweden. Both for the knowledge and experience that it leads to a better result in the end but also to being able to proactively offer additional services. A level of quality is required from the energy companies for delivered energy services in order for them to keep establishing themselves as trustworthy. Companies recognise that by improving knowledge, they are reducing potential barriers to energy efficiency associated with imperfect information, split incentives and bounded rationality.
An emphasis is put on the importance of being adaptable to the client and always tries to work with and improve client relationship. Flexibility is also mentioned as important and taking in account what the client can contribute with in an energy service and then use that to implement a successful service. It is often preferred to work with clients for a longer period of time, with longer contracts to reassure a larger energy saving for the client. This is common for both Danish and Swedish energy companies.

Danish companies have different strategies in order to motivate clients to implement suggested changes made during a first phase of a project or in association with providing in-direct energy services. It could be working with them over time in all different steps of a project, educational factors, an economic incentive in form of subsidies or a package deal with the energy supply. Most Danish companies are today able to fulfil their targets by themselves towards the obligation scheme but it is expected that a market for selling and buying energy savings is growing with an increasing demand.

There is a common will to reach clients at a strategic level of decision-making, and not only on an operational level. This to involve and adapt the energy services to the client perspectives. A first question is to ask what the client intend to use their analysis and their facilities for, in order for the analysis not be a report that is neglected. This approach has the possibility to increase the motivation with the client to implement energy services mentions companies in both countries.

For future development, energy companies in Denmark see a potential growth within all client segments, as the demands from the obligation scheme increases. There is a belief that the public and industrial segment will increase the most, and that the trading with energy savings will increase and proficient market places for that will develop.

From both countries is a thought that energy services will be offered more as a package deal, with energy supply and offering a solution that simplifies a clients everyday life. From Sweden, potential are seen as the delivery of a function, such as heating where energy service are considered a natural part of that function.

Private households are also seen as a potential area that could expand drastically, if the right business models are presented. Here, the Swedish private companies express a large potential impact of the energy service market when, due to their large existing client supply stock can reach out to them.

Danish and Swedish companies see themselves as having an important role in monitoring and measuring energy use and then visualising this use to the client. There is a common belief that energy companies will be an actor among others on both the energy service market but also in a future where energy use are seen together with smarter home and smartgrid, including factors such as micro energy production and electric vehicles.
All companies in both countries have identified energy services as an important strategic business area, and believe in a continuous delivery of energy services for the near future.

5.6 Advantages

"Everyone that works with energy, knows something about energy" – Company 6

A number of advantages for energy companies to offer energy services were mentioned under the interviews. To start energy companies are already an actor on the energy market, they have the equipment and infrastructure that handle energy conversion, distribution and supply daily. Energy companies stand for stability and consistency, and all have a strong and sustainable brand. They often have a relationship with the clients prior to energy services, through invoice or by reputation. They can offer a long-time commitment and have in-house knowledge and competence. They are able to offer package deals or full functions to clients, where an energy supply and energy service is included, which can through packaging, offer to simplify a client everyday life. They handle energy questions everyday, are updated within new technologies and can operate in client complex environment. They are financially strong and have access to energy data.

Energy companies are also able to see energy services out of a larger perspectives and can connect greater systems together, such as a the system of a city or a neighbourhood. They have an established network of actors and can easily connect with other actors and segment. They gained experience and can give examples of successful implemented energy services. Companies offer a green marketing platform that clients can take advantage for their own benefit, to launch themselves as green on a larger platform than they would not be able to reach by themselves. Energy companies’ management have established energy services as an important strategic business area and therefore offer a sense of contingency for energy services within the energy company. They can offer an objective seen on energy efficient products, not being bound to one contractor but to have a liberality to explore the full market of energy efficient products to provide the preferred alternative to the client.

These advantages cover both public and private energy companies in both countries. For Danish companies it is an advantage for them to have the Danish obligation scheme, both for an increased awareness and clients establishing them as energy service providers. Private companies in Sweden state that they can have a large impact on a wider spectrum of services and client segment.

5.7 Driving forces

"To build high efficient housing and facilities on the conversion side and then not take responsibility for an inefficient energy use at end-user side is not defendable and very unbalanced” – Company 4
Energy companies are driven by a number of forces; external, from clients and internal.

External driving forces have been identified as:
- International energy targets
- National energy policy
- Regulatory instruments and policies
- Increased competitiveness
- Increasing energy demand

Energy companies experience a number of driving forces that increase the demand from clients:
- A belief of a sustainable future
- A wish for a greener profile
- Higher energy prices
- Information and knowledge seeking
- A need to be helped with controlling, monitoring, measuring and visualising energy use

Internally within these energy companies the driving forces has been expressed as:
- Improve company’s green profile
- Improve client relationship and add value to existing offered products
- Market trend to offer energy services
- Increase their own competitiveness towards other energy companies
- Reduce fluctuation of clients
- Free space in supply networks which leads to a potential to sell to more clients
- Being represented in a whole market transformation – from conversion, distribution, trading and end-users
- New business area
- Reduce energy use peaks
- Decrease their own impact on the environment
- Decrease the pressure on existing infrastructure and reduce new investments on replacement of equipment for energy distribution and supply
- A complement to the other businesses and services within the energy company
- Have a responsibility against the society and the national economy
- Give clients a competitive advantage through a more efficient energy utilisation
- Higher energy supply security

Both Danish and Swedish energy companies identify above-mentioned driving forces.

5.8 Dual roles and other barriers
“There lie a paradox being both a energy company and a energy service provider but it is under those terms that the distribution part of our company has to operate” – Company 9

Imperfect information, a barrier, explaining the energy efficiency gap, is described as an information unbalance among affected parties prior, during and after a contractual agreement has been signed upon. Taking dual roles as energy companies do when they offer both energy as a commodity and service that decreases sales on this commodity can be seen as a dilemma by clients prior, during and after a contract has been signed between the energy company and client. In the lines of all energy companies, however, this is not seen as an issue or a dilemma in either Denmark or Sweden. As mentioned a motivational, educational and visualising strategy towards the client give the energy companies the opportunity explain when a client is doubtful.

The dilemma is understood by the energy companies when mentioned but they claim that experience say that neither clients nor energy companies are affected by this. Danish companies are organised through the obligation scheme, giving them the responsibility to fulfil a target, and this offers no other option than to deliver energy services. Additionally, both Swedish and Danish companies see energy services as a natural additive service to offer to clients and experience that clients feel the same. In the end, it is a matter of trusting the energy company. Clients gain trust from:

- A previous relationship with the energy company through invoices, campaigns or reputation
- They have a strong brand, where previous clients have trusted them and therefore they can be trusted by present clients
- They are consistent on the energy market and are associated with the term energy therefore can be trusted to know something about energy services
- Economical guarantees are left as security for assuring an incentive to implement energy services and to provide a guarantee for a fulfilled commitment upon contracting
- They can use information on their clients energy use to visualise the effects of the energy service
- Clients see professionalism associated with a long-time commitment, their brand and existing supply client stock

Swedish public companies mention that they are trusted by clients because of their closeness to the municipality and local region. Having had more contact and a previous relationship with clients, this earn them more time to explain energy services to client and educating them to an understanding that energy companies also gain from reducing clients energy use.

All companies in both countries mention that flexibility of contracting an energy service with the client and being seen as specialist within the fields of energy can help them both increasing their client stock for energy services but also to improve the trusting factor with existing clients. Essentially leading increased
implementation of energy services and therefore being a factor to potentially overcoming barriers associated with energy efficiency. To educate, motivate and develop deeper client relations during a longer commitment are strategy objectives existing with a result to decrease many of the theoretical barriers to energy efficiency such as imperfect information, split incentives and bounded rationality as mentioned before.

Energy companies presents several options to offer financial help to clients, either by being the loaning parts themselves or by having partnerships with banks. All companies offer either one or both options, reducing the risk and barrier of not having access to capital to implement energy efficient measurements for clients. Theoretical barriers to energy efficiency cannot be completely reduced by energy companies offering energy services, but many can be decreased. Lacking human capital is solved by arranging own educational agreements with educational institute and promoting a good company atmosphere, increasing incentives for prolonged engagement from employed.

5.9 Challenges

"It is a very heterogeneous market, which many actors just throw themselves into”
– Company 7

Meeting new demand and starting up a new business field involves overcoming a few challenges along the way and even though energy companies range in experience, from 20 years to a few months, similar challenges have been mentioned.

New organisational structures, working methods and routines that have to be implemented in the companies due to new regulations, this mainly appeals to Danish energy companies. Their lack of and maintaining human capital, skilled staff is often offered to change to a competitor. Having appropriate regulations and policies, Swedish companies see it as challenging to adopt to a situation that is unsure for a near future. Both Danish and Swedish companies say they lack of appropriate business models for all client segment and needs, especially those who lack economic incentives such as private households and smaller or medium sized companies with low energy usage. Clients having a negative previous experience and attitude towards energy services because of a unserious energy service provider or a failed implemented energy service give negative basis to start from for the energy company. A challenge for all companies that is mentioned as a primal challenge is going from an implemented in-direct energy service to implementing direct energy services and motivating the client into investment. For Danish companies, a conflict of interest with multiple actors can occur when a different contractor or similar is involved in a energy service. Finding a correct baseline to start from when offering direct services such as performance contracts is a challenge for those Danish and Swedish companies that do. Even though emphasise is put on increasing client knowledge and public awareness this is still mentioned as a challenge for both countries.
A unanimous national political system where all parties are not agreeing on one specific energy policy, creating stability within energy policy to last over several terms of office is mentioned as a challenge within the Swedish energy companies.

5.10 Regulatory instruments

"We want binding targets, otherwise it would not give anything – Company 6"

Multiple Swedish companies express a concern against a future obligation scheme, discussed in the Swedish Energy Agency's report from 2012 and in chapter 2 of this report. It is mentioned that it would possibly indicate a higher administrative cost and that there are other regulatory instruments today that affect the market already. There is a belief that energy saving documented would be theoretical and not implemented changes. Swedish energy companies think that there needs to be a change in the existing instruments offered.

In Sweden, energy companies feel affected by taxes and CO₂ pollution, voluntary agreement, the public procurement act, energy efficiency programme and energy audit subsidise. The latter is mentioned as a good instrument in order to get increased economic incentives with clients that lack that, but are seen an overall disappointment among Swedish energy companies. It does not bring enough incentives for implementing changes and lacks substantial control to reassure a quality level. Voluntary agreements are seen as a good instrument but exclusive to just larger companies and not all. The public procurement act in both Denmark and Sweden has been mentioned as a hindering factor for involvement with potential public clients. The programme for energy efficiency offers consultation in energy efficient matters and energy companies mention that this service create a platform for companies with less driving forces to implement energy efficiency to get a consultation in these matters.

This report focuses on the Danish obligation scheme out the regulatory instruments in Denmark and overall, Danish energy companies express themselves as content with the system. It is in line with the energy policy, and has been successfully fulfilling the targets set. It is seen as a tool to control the development of a market. The scheme is mentioned to impose a growth for energy services and allocating Denmark with experience from energy efficiency that they could potentially export. The option for not implementing an obligation scheme is seen as nothing, it is required an instrument that forces market growth. It has also promoted energy services among the general population.
6. Analysis
This chapter presents an analysis based on previous presented chapters. It follows according to the research questions.

6.1 What are the driving forces for energy companies to offer energy services?
Energy companies see energy services as a natural step for them to take by a few reasons. For example, they act and handle energy daily and have the knowledge, experience and infrastructure to simplify a development of energy services. They have a potential to overcome barriers explaining the energy efficiency gap such as shown in the results, imperfect information, split incentives and bounded rationality. Energy companies are all of substantial size to develop the energy service market and be front-runners in this development and therefore can set standards and routines for other actors on the market to follow.

Danish companies are driven by an obligation scheme but also see it as a duty and a responsibility to operate in accordance with the Danish energy policy. Danish companies also express a traditional idea and will to be independent of the imports of other countries energy forms and energy service increased energy supply security. This has forced a market to develop, in which the rules are free to establish for energy companies within the frames of the obligation system. The obligation system severally changed the Danish energy service market and none of the participating energy companies express an alternative to the scheme existing today. As mentioned, it would have been nothing. Surely a market existed pre-hand but not in all to the same extent as today. Energy companies operating in Denmark have a pressure to fulfil a target, leading to a more assertive approach to potential clients. Where as in Sweden, it can be taken as contradictive for energy companies to operate without any set market rules but based on their motivational, educational and visualisation approach to existing supply clients stock, they are seen as important actors on the Swedish energy service market.

In Denmark, energy companies where forced to adjust and make organisational changes and find human capital for the obligation scheme and had a change in routines that still are proven not to have been established by all energy companies yet.

Energy companies have traditionally had a role as experts within energy hence they were able to consultant clients in energy questions, much as energy services described in this report but free for clients. Taking a step further and expanding these services to include audits and more complexes contracts for example, is a chance for energy companies to extract a full market transformation – from conversion until end-user giving them another perspective to a wider energy spectrum.

Companies express energy services as a recognised strategically important business area and a service in line with both internal and public thinking of sustainability. There is an increase of demand for energy services and to satisfy clients and decrease fluctuations of clients, companies have an incentive to offer
energy services. This explained it being more profitable for them to offer energy services to clients and keeping the same clients, than to search for new clients, despite a decrease in energy use from existing clients. Since there are a number of more competitors that offer energy supply now than before the liberalisation of the energy market but still estimated the same amount of clients in both Denmark and Sweden, there is a larger market to compete on, making is essential to add value to existing products. This is however more noticeable in Sweden that does not act under an obligation scheme.

Also by offering energy service they increase their own competitiveness and their clients, giving them more efficient energy use. They are also driven on by technical advantages that lead on lower costs and decreased environmental impact, in line with all companies own environmental targets, which is seen with both management and employers as beneficial. Essentially leading to making it easier for companies to provide energy services and creating a long-time commitment towards them. As the obligation scheme and the Danish energy policy is seen as committed and long term, energy companies in Denmark get a national touchable push forward, much more than comparable to Sweden which indicate a needed modification of existing regulatory instruments in Sweden.

6.2 How does energy companies tackle the role of being both a supplier of energy and a provider of services that reduce energy use?

There is a common agreement among participating energy companies that there is nothing to overcome, energy companies meet the same barriers and challenges as any other actor on the energy service market, and they have taken measures to reduce these and implement successful energy services with clients. Measures include a strategic approach with motivational and educational purpose and flexibility towards the client.

However – the trust issue, which this dilemma diverges from, is essential to have between energy companies and client and there exist a dilemma that can be negative towards energy companies. Prior to first contact with a client, energy companies have the chance to promote their energy services through invoices and news directed towards their energy clients. In there, they can state an approach to energy services as something that is a natural step towards a market transformation from conversion to end-user, ending up as a marketing question rather than a trust issue for client not reflecting over them being a energy company offering energy services.

The Danish energy companies state that regulatory means bring this trust. Since Sweden lack direct regulatory instruments towards energy companies to the same extent as in Denmark, they state reasons as being a solid company with a good reputation and brand, which also is agreed in Denmark. Energy companies are also being associated with energy, implying that they are trusted to have knowledge and experience with the field of energy - conversion, distribution and supply - giving yet another factor to gain trust with clients.

A trend or a consideration is that energy companies are not only seen as provides of a commodity such as energy but more as deliverers of a full services.
Energy services are not a reduction of energy but mere the reduction around the costs of energy. This is highly sympathised by both countries energy companies. Energy is not seen as a commodity as a pair of pants or a lamp, there is majority of clients that have little understanding of what a kWh is, and therefore it is easier to bundle energy with additional services such as energy services. Energy is understood to simply work, especially in highly developed countries such as Denmark and Sweden and it would be natural to see to that it works in the most efficient way as well both for the energy company and the client.

Energy companies are not external actors trying to break into the energy service market, they have been dealing in terms of handling clients statistics, invoices and daily handling matters concerning energy, meaning that they already stand inside the energy service market defined in this report and have a potential to expand easily compared to other actors.

Energy companies also gain technical advantages by implementing energy services. Such as lowering energy use peaks and releasing capacity in nets and distribution as well as decrease new investments on existing equipment due to a lower pressure for energy demand. These forces create an incentive with clients to see that energy companies have something to gain by offering energy services, giving their additional products more value.

6.3 How are energy companies affected by regulatory instruments, both existing and future?

The Danish energy companies have successfully fulfilled the targets set by the Danish obligation scheme and proven by the participants, it is a scheme that functions well for them and implemented into their other line of business units. It has increase involvement with external actors and their overall attitude towards it is positive.

However the system is in need of constant improvement and monitoring. For example the lack of routine in the documentation of the energy savings is an issue that could be settled by experience, and after each energy saving, evaluate a possible way to standardise documentation. It has a successful rate of involving industries, which according to Swedish energy companies is a hard segment to reach. By clients involved, 80 % claim a satisfaction with the obligation scheme. However, a public debate in Danish newspapers claim that the so called free riding effect of this obligation scheme is high and that energy savings paid for by raised tariffs from the energy companies would have been implemented anyway, even without the obligation scheme.

For interviewed Danish and Swedish energy companies, many underline the importance of involving the whole value chain, from conversion, distribution, installer and user, something that is also recommended in the Danish and Swedish evaluations presented in chapter 2. This is referred to as a market transformation and is implied to be part of the future development for energy services.
From the overall opinion from Swedish energy companies is a negative attitude against an implementation of an obligation scheme with binding targets, however it is highlighted that there is a need of some sort of regulatory instrument whether it is an expansion of existing or new. Existing regulatory instrument does not have a greater impact on energy companies neither energy efficient programmes, subsidies for energy audits or voluntary agreement within the industry, but for existing instruments there could be increased affects of them to make sure of a greater impact. This, seeing as there already has been created routines and organisational changes in order to implement mentioned instruments. For the time being, it is to early to establish a confident guess on what to expect from the discussion between the European Council, Commission and Parliament.

A thought from the existing obligation system in Denmark and the energy efficient potential within the Swedish industry is that the industry presented in chapter 2 in Sweden could, if willing, play a great role if a scheme was to be reality in Sweden. One has to realise that a possible obligation scheme would require sever changes organisationally, extended monitoring and control in order to achieve a persistent scheme that benefits where it aims. Energy companies have a knowledge, experience and infrastructure that would be beneficial for a potential system and is an actor on the energy market already.

6.4 How do privately and publicly owned energy companies differ to each other when offering energy services?

Again, Danish companies did not differ to the same extent between being either public or private as the Swedish companies due to the fact that they all are affected by and operating under the Danish obligation scheme.

Comparing public and private companies percentage of total revenue offered as energy services, it could be concluded a substantially higher rate with public companies – also indicating a great potential for the energy service market if the private companies reach the same levels.

Swedish public companies offer a higher number of services than private who on the other hand has a focus on private households. Especially, public companies offer a higher number of direct energy services. For Danish companies, there are more companies that offer in-direct services and then involve external actors for the implementation of direct services.

Public companies have an advantage of being closer to their energy supply area and therefore their energy supply clients and they are often seen around the municipality in which they operate, giving clients a sense of relationship with them. This simplifies and opens door to potential energy service clients. It also brings a disadvantage to Swedish public companies of reaching out to clients with a relatively high energy saving potential – say an energy intense industry – if it is not located within their supply area.

With public owners, the public company has a responsibility to offer the most cost-efficient energy supply and this often involved offering energy services and
is taken into consideration when setting up strategies for both Danish and Swedish energy companies.

Swedish public energy companies have mentioned the public procurement act as a legislation that creates hinder for reaching out to the public segment. They are not favourable in a public arrangement or get an advantage for being public as well when it comes to contracting for energy services with a public organ.

The clientele differ for public and private companies – in Sweden public companies having a clear focus on property, facilities and housing cooperatives. The public companies also see it as an important factor as to increase the local clients competiveness towards others regions, reassuring a future local growth.
7. Conclusion

Energy services derive from a need of energy savings and are in this report defined as just that. When you create criteria for an energy service market, you also create criteria for a market of energy savings at the same time. Energy savings can exist without energy services, but energy services derive from the definition created from the need of energy savings.

Energy companies offering energy services in Denmark and Sweden participating in this report are driven on two separate markets for energy services. The Danish market is based upon an assertive regulatory instrument in forms of an obligation scheme for energy savings, creating conditions for Danish energy companies to rest upon. Swedish energy companies are not to the same extent influenced by regulatory instruments but are situated on an energy service market with few controlling and guiding measures. The majority of energy companies in Denmark are affected by the obligation scheme where as in Sweden, not all energy companies do offer energy services. Conditions on the Swedish energy service market can drastically change for energy companies as agreements come concerning a new European directive.

However - energy companies in both countries can and are reaching a wide spectrum of client segments and energy services. They often have the possibility to combine and package energy supply with energy services. They provide a trustworthy, motivational approach to clients, allowing flexibility within energy services. They can reduce many of the theoretical barriers to energy efficiency by offering energy services that increasing client knowledge and working with forces that reduce mistrust and incorporating this into their strategy. Both public and private companies focus on deeper client relationships and aim towards offering energy services as a part of a greener profile strategy.

Danish and Swedish energy companies are driven by a client need, less fluctuation of supply clients, business opportunities and a green profile strategy but also by allowing them to decrease heavy investment on existing equipment by having more control over their clients' energy use and reducing energy use tops. The Danish energy companies state that regulatory means bring this trust. Since Sweden lack direct regulatory instruments towards energy companies to the same extent as in Denmark, they state reasons as being a solid company with a good reputation and brand, which also is agreed in Denmark. Energy companies are also being associated with energy, implying that they are trusted to have knowledge and experience, giving yet another factor to gain trust.

Since both private and public energy companies in Denmark are obliged to the obligation scheme, their differences are not as noticeable as those for Swedish. Public companies feel a responsibility towards their public owners to offer an efficient energy supply and by having a local connection to the municipality they are able to increase competiveness in the region by offering energy services. Private companies are substantially larger than public companies and have a great potential to reach out to a larger number of clients through their existing supply client stock.
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APPENDIX A

In the time plan seen in table 1, internal deadlines were set after estimated workload and time frame. Task are divided into weeks and highlighted for a better overview of the working process.

* meaning finding companies, appropriate person, schedule interviews etc.
Numbers 1-20 indicates weeks starting from 30 January

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APPENDIX B

Interview guide

Tell me about your company!

- Historically
- Owners and organisation
- Tradition and mentality
- Development of energy services

- Which energy services do you offer?
- What is your revenue, both total and within energy services?
- With services that require financial help, how does that function with you?
- Do you offer third hand financing?

- Why is energy efficiency important?
  - Generally?
  - For the company?
- Why do you offer energy services?

- Does there exist a typical client with a typical energy service?
- How do you expand your client stock within energy services?
- How much do you experience that clients know regarding energy efficiency and energy services?
- Are there client segment which are harder to reach out to? Why?
- Where do you see a growing potential?
- How do you experience the clients thought prior, during and after an energy service?

- Describe a typical energy service implementation prior, during and after?
- Do you have a feedback system or network for finished energy services and client collaboration?
- How do you visualise and monitor results from energy services?

- Is there a need for regulatory instruments for increasing energy efficiency?
- How do you feel about the discussions about a new European directive concerning energy efficiency?
- What are your goals and targets for the next 5 and 20 years to come within energy services?
- How and where do you see yourself expanding? Why?
- How do you think the energy service market will change in the future?

- Why should an energy company selling energy, provide services that decrease an energy use? inskning av el förbrukandet?

- What advantages and challenges do you face when offering energy services?
# APPENDIX C

Contact list of energy companies in both Denmark and Sweden participating in this Master Thesis.

<table>
<thead>
<tr>
<th>Company</th>
<th>Contact Person</th>
<th>Email</th>
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<tr>
<td>DONG Energy</td>
<td>Palle Yde Poulsen</td>
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<tr>
<td>NRGi</td>
<td>Martin Dam Wied</td>
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<td>Göteborgs Energi</td>
<td>Mats Mårtensson</td>
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