Effects of the implementation of the Austrian Energy Efficiency Act on electric utilities - recent experiences and adaptations in business models to address energy efficiency

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Abstract

The importance of taking energy efficiency measures for electric utilities has increased since the Energy Efficiency Directive (2012/27/EU) was issued. This thesis focuses on the implementation of the Austrian Energy Efficiency Act and on how its legal obligation has affected electric utilities after the second reporting period. It provides insights in their experiences and adaptations in business models to address energy efficiency.

Primary data to answer both research questions were obtained through guided interviews based on Bortz and Döring (2014). The techniques of qualitative content analysis by Mayring (2014) were applied for the evaluation of the experts' interviews. In total, six representatives of five electricity utilities, with energy sales of more than 45 GWh during the last year and with more than 249 employees, were interviewed.

As a result, familiarity with procedures during the first reporting period allowed a smooth implementation of the second period's reporting requirements. The measures by the household sector were basically the same as reported in the first year. According to the interviewees, the only economically viable and scalable business models are in the heating sector (gas thermal value equipment and heat pump).

Overall, the interviewees strongly criticized the bureaucratic expenditure for reporting energy efficiency measures, in particular, as the energy efficiency measures taken at end customers by the energy suppliers do not necessarily lead to a decrease in the overall consumption of energy. In general, the interviewees see no challenges for their companies to report the obligated measures until 2020, but they are concerned about the framework that will be put in place for the years 2020 to 2030.

Key words: Energy Efficiency, Business Models, Electric Utilities, Energy Efficiency Services, Energy Efficiency Directive

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List of Acronyms and Abbreviations

a	annually
B2B	Business to Business
B2C	Business to Client
BM	Business Model
BMI	Business Model Innovation
ESD	Energy Service Directive
EED	Energy Efficiency Directive
EEO	Energy Efficiency Obligation
EU	European Union
EC	European Commission
GDP	Gross Domestic Product
GWh	Giga Watt hours
IEA	International Energy Agency
kWh	kilo Watt hours
LED	Light-Emitting Diode
MWh	Mega Watt hours
PJ	Petajoule
RCOV	Revenue, Costs, Organization and Value
TPES	Total Primary Energy Supply
Utility 4.0	Transformation from the supply to the digital energy service company
%	Percent
€	Euro

Executive Summary

This study explores the experiences of electric utilities in the implementation of the Energy Efficiency Act after the second reporting period as well as major services-oriented business models with regard to energy efficiency measures for households which electric utilities have so far developed. It focuses on Austria and covers the years between 2014 and 2017.

The principal motivation of this study was to gain a better understanding of the challenges that utilities face while implementing energy efficiency measures. Indeed, the discussion on the implementation of the EU Directive on Energy Efficiency (2012) as well as the preparations of the Austrian Energy Efficiency Act, particularly of §10 which outlines the obligation to energy efficiency measures by Austrian electricity suppliers, were rather controversial in Austria. While studies have warned that the Austrian energy efficiency target for utilities cannot be reached, the requirements of utilities for energy efficiency measures have been more than met after the first and second reporting periods.

Primary data to answer both research questions were obtained through guided interviews (Bortz and Döring, 2014). The techniques of qualitative content analyses by Mayring (2014) were applied for the evaluation of the experts' interviews. In total, six representatives of five regional electricity utilities, with energy sales of more than 45 GWh during the last year, were interviewed.

Contrary to the first obligation period, the interview partners stated that the procedure and the reporting of the energy efficiency measures were already known in the second period. Measures in the household sector were basically the same as reported in the first year, customers knew how to transfer energy efficiency measures to the utilities and they did not report them last minute. Furthermore, the second reporting period covered only one year while the first reporting period covered two years. However, the interview partners experienced problems with the database, called "Unternehmesserviceportal (USP). According to their views, it was not user-friendly and, even two years later, suggested improvements had not been implemented. In addition, the promised form to transfer measures from the first year

to the second year, did not exist. Furthermore, even though a method for the documentation of energy efficiency measures exists, the evaluation of certain measures is still unclear. Overall, the interviewees strongly criticized the bureaucratic expenditure of the energy efficiency measures.

In general, all interview partners found it difficult to define an economically viable and scalable energy efficiency service for households. In the broader industry context the installation of gas thermal value equipment and heat pumps as economically viable and scalable energy efficiency service, were key.

Concerning the energy management or external audit on a regular basis, all interview partners suggested that the deadline for the conduction should be over a longer time period. In their experience the quality of the audit suffers if all large companies in Austria need auditors at the same time.

As a result of the Energy Efficiency Act, other business segments have developed, e.g. for conducting energy efficiency audits and for trading energy efficiency measures on platforms. The average price for energy efficiency measures taken in households and for measures in the industry have declined and were 1,3ct-1,4ct/kWh between November 2016 and February 2017 on trading platforms.

In general, the interviewees see no challenges for their companies to report the obligated measures until 2020, because they have already fulfilled their obligations until 2020 to a big amount and because the price for energy efficiency measures has declined. However, one interviewee mentioned that 40 % of the savings need to be made at households and all “low hanging fruits”, e.g. switching to LED lamps; installing water-saving fittings, etc. have already been implemented. The other interviewees were more concerned about how the framework after 2020 would look like, e.g. if early actions will be considered. They stated that companies might not take further actions until the new regulation would be in place.

On the whole, the second reporting period saw a much smoother implementation of targets as compared to the first reporting period. The future of driving energy efficiency through those obligations would very much depend on the policy

development for the periods after 2020 which are currently being discussed within the EU's legal framework.

1 Introduction

> *"The cheapest energy, the cleanest energy, the most secure energy is the energy that is not used at all. Energy efficiency needs to be considered as a source of energy in its own right. It is one of the most cost effective ways to support the transition to a low carbon economy and to create growth, employment and investment opportunities". (European Commission, 2016b, p.2)*

The importance of taking energy efficiency measures for electric utilities has increased since the Energy Efficiency Directive (2012/27/EU) was issued. This thesis focuses on the implementation of the Austrian Energy Efficiency Act and on how the legal obligation has affected electric utilities. It gives insights in their experiences and adaptations in business models to address energy efficiency.

Under the Energy Efficiency Directive (2012/27/EU), European Union (EU) Member States are obliged to set up energy efficiency measures in order to help the EU to reach its 20% energy efficiency target by 2020 (European Commission, 2012). In particular, energy companies are required to save a certain percentage of their customers' energy end-use. Since January 2015, retail energy sales companies are required to initiate energy efficiency measures at end customers to the extent of 0.6 % of their last year's energy sales in Austria. Non-compliance results in paying compensation of 20 Cent/kWh (Bundesgesetzblatt, 2014).

As a consequence, incumbent power utilities have started providing energy efficiency services. Still, they struggle to define profitable, scalable offerings and to quantify the associated business opportunity (Leroi et al, 2013). Utilities need to innovate their business models and transform from commodity suppliers to service providers in order to stay competitive (Helms, 2016), particularly as there is an inherent tension between the classic energy business model and the new regulations (Kwasnik et al, 2014). Nevertheless, the path to a service business is currently seen difficult due to factors, like value dilemma (the willingness to pay for innovative services), asset transformation and the difficulty to simultaneously manage a utility and a service business and leverage fostering relationships (Helms, 2015 and

Priessner, 2014). As new regulations unfold energy efficiency obligations, the need for further analysis arises.

1.1 Problem Statement and Research Questions

The discussion on the implementation of the EU Directive on Energy Efficiency (2012) as well as the preparations of the Austrian Energy Efficiency Act, particularly of §10, which outlines the obligation for energy efficiency measures by Austrian electricity suppliers, were controversial in Austria. While studies have warned that the Austrian energy efficiency target for utilities cannot be reached (Deloitte, 2014), the requirements for utilities for energy efficiency measures have been more than met after the first reporting period, on 14 February 2016 (Simader, 2016). Recently, on 14 February 2017, utilities needed to release their energy efficiency obligations to the control authority called "Monitoringstelle" for the second time (Enspol, 2016). Therefore, the first research question focuses on explaining this new, scientifically unexplored set of data:

What are the experiences of electric utilities in implementing the Energy Efficiency Act after the second reporting period?

Furthermore, there is limited research on how Austrian's electric utilities integrate energy end-use efficiency into their business models in the context of liberalized electricity markets which have dramatically changed the utilities' operating environment (Apajalahti et al., 2015). The transition from a product-oriented, capital-intensive business model based on tangible assets, towards a service-oriented business model based on intangible assets is expected to present great managerial and organizational challenges (Helms, 2016). Literature suggests utilities to start new business models in the energy efficiency area. However, there is a lack in research about the implementation on the Energy Efficiency Act after the second reporting phase in Austria, based on the learning of the first period and which chances and challenges electric utilities have to deal with by implementing new business energy efficiency services. Therefore, the second research question of this thesis is:

Which major service-oriented business models have so far been developed with regard to energy efficiency measures for households by electric utilities?

1.2 Methodological Approach

This thesis combines secondary and primary sources. As secondary data, an analysis of the existing research data on findings related to the implementation of the energy efficiency directive in Austria or on innovative business models in the energy efficiency area is used.

Primary data to answer both research questions was obtained through guided interviews (Bortz and Döring, 2014), a common technique with a pre-defined set of questions. For the evaluation of the expert interviews the techniques of qualitative content analyses by Mayring (2014) were applied.

As this study focuses on power utilities in the Austrian energy industry, providing energy services, in particular energy efficiency services to their clients, in total six representatives of five regional electricity utilities with energy sales of more than 45 GWh in the last year were interviewed. Large utilities have been selected because they have traditionally followed an asset-centric business model for generating and distributing power and look for business opportunities to compensate their losses driven by the rise of distributed energy and reduced demand for energy (Leroi, 2013).

The first part of the questionnaire covers the implementation of the Energy Efficiency Act. Following the concept of Osterwalder and Pigneur (2009), the second part of the interview focuses on business models along four elements: value proposition, customer interface, infrastructure, and revenue model. This concept has for example also been used by Richter (2012), Gsodam (2014) for innovative renewable business models and by Priessner (2014) and Helms (2016) for sustainable business models for energy efficiency to relate real world experiences to findings from previous studies.

1.3 Structure

This thesis is divided into six parts. The introduction provides a general overview and describes the motivation for the topic. The second chapter focuses on Energy Efficiency and Business Models. It provides insights into the current status quo of the implementation of the Energy Efficiency Directive in the EU Member States and particularly in Austria. Furthermore, chapter two illustrates traditional business models in the energy industry and potential new business models for energy efficiency services. The third chapter specifies the applied methodology, followed by chapter four illustrating the empirical findings from the expert interviews. Chapter five discusses the results by comparing the theoretical and the empirical lessons learned. The final chapter derives conclusions and reflects managerial and policy implications.

2 Literature Review

This chapter covers literature in the two key fields of this thesis, Energy Efficiency (EE) and Business Models (BM), with three objectives. Firstly, it aims at providing insights into the current status quo of the implementation of the Energy Efficiency Directive in EU Member States, particularly in Austria. Secondly, it illustrates why incumbent utilities are trying to develop new business models for energy efficiency services. Thirdly, it presents an overview of traditional and new BMs in the energy industry.

2.1 Energy Efficiency

According to the International Energy Agency (2016b, p.284) "energy efficiency needs to be at the heart of any strategy to guarantee secure, sustainable and inclusive economic growth. It is one of the most cost-effective ways to enhance security of energy supply, to boost businesses' competitiveness and to reduce the environmental burden of the energy system."

2.1.1 Terminology

Energy Efficiency is defined as "the ratio of output of performance, service, goods or energy, to input of energy" (European Commission, 2012, p.10).

While "energy saving" means avoiding the unnecessary use of energy, "energy efficiency" refers to a higher yield in the unavoidable expenditure of energy (Bausch et al., 2009, p. 749). Still, the end-goal of both is to reduce the total demand for energy. The European Commission (2016b, p.2) states in its proposal for amending Directive 2012/17/EU: "energy efficiency is one of the most cost effective ways to support the transition to a low carbon economy and to create growth, employment and investment opportunities." The International Energy Agency (2016b) defines energy efficiency as "the first fuel". It may be seen as the one energy "resource" that all countries possess in abundance in light of increasing demand for energy. Therefore, strong energy efficiency policies are vital to improve energy security and on top may also help to achieve the key energy-policy goals of reducing energy bills,

addressing climate change and air pollution, improving energy security, and increasing energy access. (IEA, 2016a)

The amount of total primary energy supply used to generate a unit of gross domestic product is called energy intensity (TPES/GDP) which decreased between 1990 and 2014 (IEA, 2014). As shown in Figure 1, energy consumption and economic development have decoupled globally, with the gross domestic product increasing by more than 90% while total primary energy supply grew by 56% from 1990 to 2014 (IEA, 2016b).

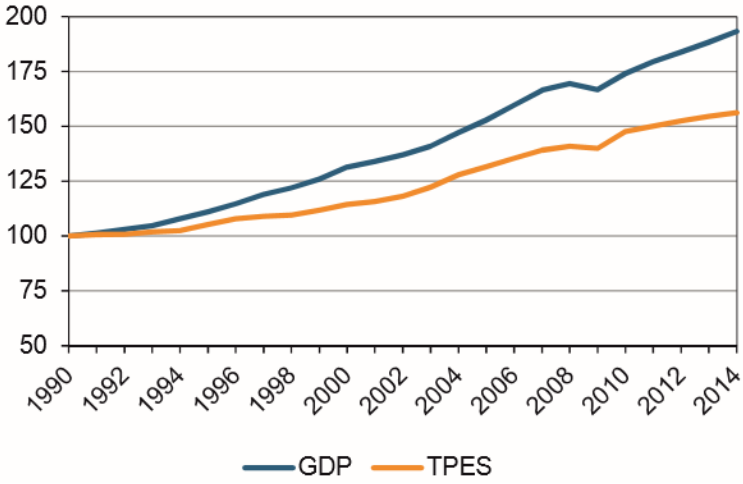

Figure 1: World GDP and TPES Trends; 1990=100 (IEA, 2016b)

The energy intensity of a country is often used as an indicator of energy efficiency. It is a proxy measurement for the energy required to satisfy energy services demanded and it can be used to evaluate and compare countries. A country with relatively low energy intensity, however, does not necessarily have high energy efficiency: A small service-based country with a mild climate would have a lower intensity than a large industry-based country in a cold climate, even if energy was used more efficiently in the latter one. Thus, energy efficiency contributes to defining intensity levels and trends, but also other factors have to be included, e.g. the structure of the economy, the geographical size of the country, the overall climate together with weather variations and the exchange rate. (IEA, 2016b)

While energy consumption has steady growth rates in Austria, energy efficiency has improved as shown in Figure 2. The declines in the years 2011 until 2014 were

strongly influenced by mild weather conditions (BMWFW, 2016). According to the progress report of the European Commission (2017a, p.7), there were almost small improvements in energy intensity in Austria in 2014 compared to 2005.

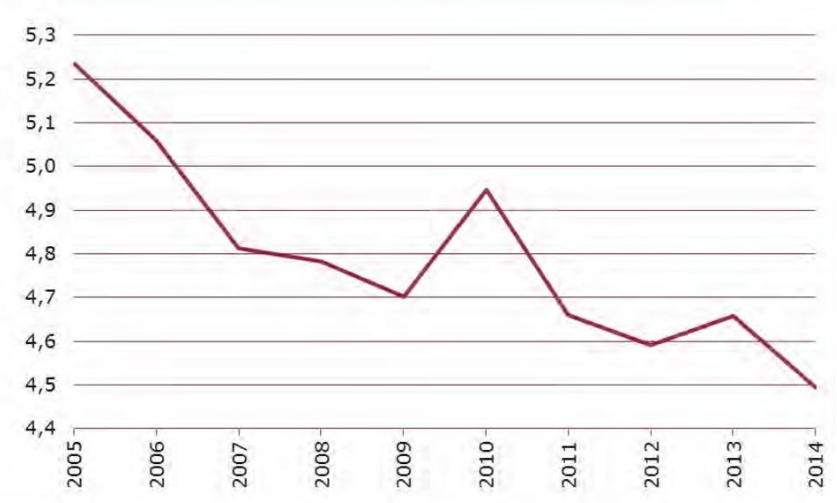

Figure 2: Energy intensity in Austria - Gross domestic consumption per gross domestic product in TJ per Mio. € (BMWFW, 2016)

2.1.2 The Energy Efficiency Directive

The Energy Service Directive (ESD – 2006/32/EC) was the first step set by the EU to reach its 20% energy efficiency target by 2020, however did not have binding targets for the Member States (MS). The EU mid-term evaluation of the ESD showed that there was still need to reach the full energy saving potential of the sectors by 2020 (Figure 3).

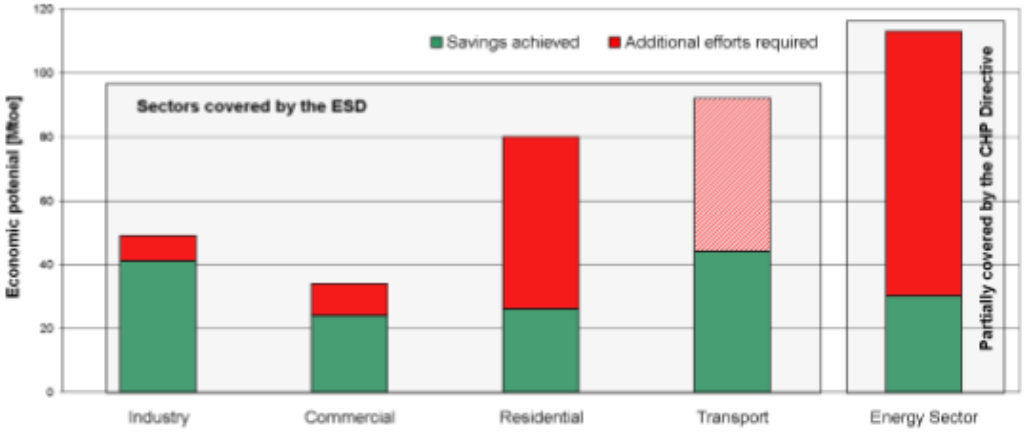

Figure 3: Expected improvements by 2020 and need for additional efforts per sector (European Commission, 2011)

The Energy Efficiency Directive (EED - 2012/27/EU), was adopted on 25 October 2012, repealing the Energy Services Directive (ESD – 2006/32/EC) as well as the Cogeneration Directive (2004/8/EC). It was to be transposed by all MS by 30 June 2014 in order to help the EU to reach its 20% energy efficiency target by 2020 (European Commission, 2012). Under the EED, all Member States are required to use energy more efficiently at all stages of the energy chain from its production to its final consumption. New national measures have to ensure major energy savings for consumers and industry alike, according to the measures set out in the following articles with corresponding requirements: (European Commission, 2016a):

Article 1-3 EU countries need to set national energy efficiency targets for 2020;

Article 4 EU countries need to establish long-term strategies to facilitate investment in the renovation of all buildings;

Article 5 EU governments need to carry out energy efficient renovations annually on at least 3 % of the buildings they own and occupy by floor area;

Article 6 The public sector in EU countries need to purchase energy efficient buildings, products and services;

Article 7 Energy distributors or retail energy sales companies have to achieve additional 1.5 % energy savings per year through the implementation of energy efficiency measures until 2020;

Article 8 Large companies need to make audits of their energy consumption

to help them identify ways to reduce it, and SMEs that benefit from incentives to undergo energy audits;

Articles 9-11 Energy consumers need to be empowered to better manage consumption. This includes easy and free access to data on consumption through individual metering;

Articles 14-15 Member States need to promote efficient heating and cooling and high efficiency cogeneration.

This thesis focuses mainly on Article 7 "energy efficiency obligation schemes" (EEO). It requires all energy distributors or retail energy sales companies to help their clients save 1.5% of their energy bills annually, until 31 December 2020. For calculation purposes, the annual energy sales volume was averaged over the last three years prior to 1 January 2013 (European Commission, 2012).

In addition to Article 7, this thesis will also briefly cover Article 8 conducting "energy audits and energy management systems" with its implementation in the Austrian Energy Efficiency Act.

Today, 14 countries of the EU are implementing an EEO scheme, which represents half of the 28 EU Member States in terms of number of countries, and more than 58% of the final energy consumption of the EU28, in 2014 as shown in Figure 4.

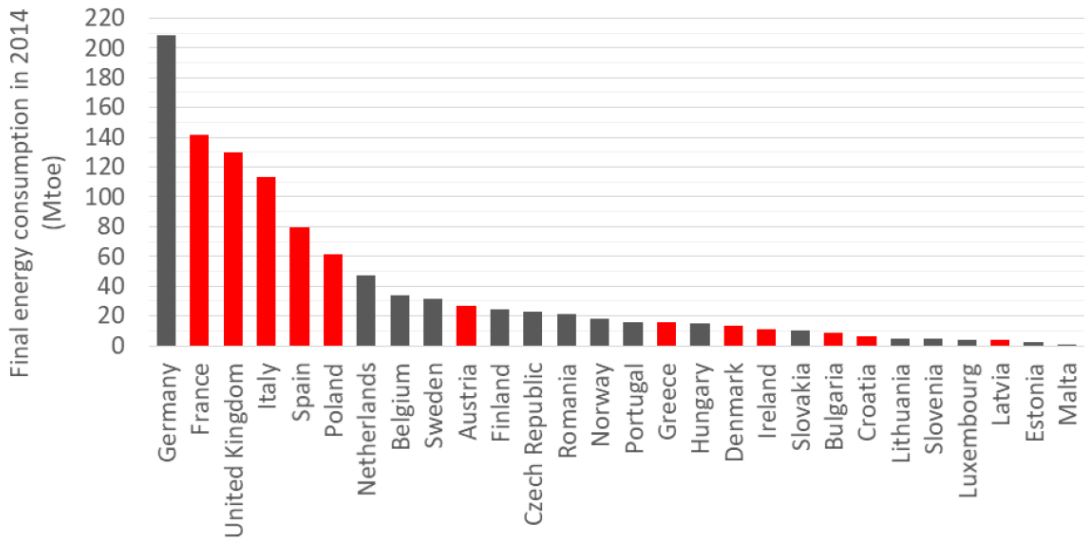

Figure 4: Final energy consumption in 2014 (in Mtoe) for the 28 EU Member-States (in red countries with an EEO; in grey countries without EEO); Source: (ATEE, 2017)

The obligations in terms of energy types and end-use sectors vary between the 14 countries that have introduced an EEO as presented in Table 1:

Country	Austria	Ireland	Slovenia	France	Bulgaria	Denmark	Poland	Croatia	Greece	Spain	Italy	Luxemb.	UK	Latvia
Energy types covered														
Electricity	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Natural gas	x	x	x	x	x	x	x	x	x	x	x	x	x	
Heat (district heating)	x	x	x	x	x	x	x							
Oil products (for heating)	x	x	x	x	x	x		x	x	x				
Oil products (for transport)	x	x	x	x				x	x	x				
Other types of energy sold	x	x	x		x									
Sectors														
Residential	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Services	x	x	x		x	x	x	x	x	x	x	x		
Industry	x	x	x		x	x	x	x	x	x	x	x		
Transport	x	x	x	x				x	x	x				

Table 1: Scope (energy types and sectors) used to set the obligations; Source: (ATEE, 2017)

Large overachievements of more than 200% are observed for two of the recent schemes in Austria and in Slovenia. In the case of Austria, it can be partly explained as actions implemented in 2014 could also count for the achievements of the 2015 target. In the case of Slovenia, the target was relatively low in the first year of the scheme in order to ensure a smooth start. It can be noted that the Austrian and Slovenian schemes are also the only two schemes with a significant share of energy savings delivered in transport, with 27% for Austria and 39% in 2015 and 33% in 2016, respectively for Slovenia. A rapid take off can also be seen for Ireland where the underachievement in the first year (2014) is largely compensated by the overachievements in the subsequent years (2015 and 2016)", ATEE (2017, p.10).

The three countries had in common that the EEO was the reinforcement of previous voluntary agreements. Therefore public authorities and obligated parties were familiar with the way of how to implement the EEO scheme. (ATEE, 2017)

According to the 2017 assessment report, most Member States have decreased their primary and final energy consumption between 2005 and 2014 and would thus meet their primary and final energy consumption targets by 2020. With regard to primary energy consumption, the exceptions are Estonia, Malta and Sweden; for final energy consumption, the exceptions are Austria, Belgium, Germany, Lithuania, Malta and Slovakia. (European Commission, 2017b)

As data for the assessment has only been available since 2014, the comparison did not take into account the impact of recently implemented energy efficiency measures in meeting the new obligations under the EED. This is in particular relevant for Austria as the Federal Energy Efficiency Act was only implemented on 9 July 2014.

Table 2 presents the progress made by Member States in 2014 towards the national energy efficiency targets for 2020 and towards the implementation of the Energy Efficiency Directive 2012/27/EU (European Commission, 2017a).

	Trend to reach the 2020 target		Short term trend		Energy Intensity whole economy
Indicators	PEC 2005-2014 trend compared to PEC 2005-2020 trend to reach the 2020 target*	FEC 2005-2014 trend compared to FEC 2005-2020 trend to reach the 2020 target*	Change of PEC 2014 compared to PEC 2013 in %	Change of FEC 2014 compared to FEC 2013 in %	2005-2014 average annual change of PEC energy intensity in % (PEC in Mtoe/GDP in M€'10)
Source and extraction date	Eurostat 31/08/2016	Eurostat 31/08/2016	Eurostat 31/08/2016	Eurostat 31/08/2016	Eurostat 31/08/2016 and 02/09/2016
EU28	+	+	-4.0%	-4.1%	-2.2%
BE	+	-	-7.5%	-5.8%	-2.4%
BG	+	+	5.7%	2.7%	-3.0%
CZ	+	+	-2.7%	-3.5%	-2.6%
DK	+	+	-7.2%	-3.9%	-1.8%
DE	+	-	-3.9%	-4.0%	-2.2%
EE	-	+	1.3%	-1.9%	0.9%
IE	+	+	-0.4%	0.3%	-2.2%
EL	+	+	0.3%	1.5%	-0.3%
ES	+	+	-1.5%	-1.9%	-2.2%
FR	+	+	-4.4%	-6.7%	-1.9%
HR	+	+	-4.9%	-5.0%	-1.7%
IT	+	+	-6.1%	-4.3%	-1.9%
CY	+	+	1.9%	0.1%	-1.4%
LV	+	+	0.0%	0.8%	-1.5%
LT	+	-	-1.0%	2.0%	-5.6%
LU	+	+	-2.8%	-3.1%	-3.8%
HU	+	+	-0.5%	0.7%	-2.5%
MT	-	-	1.7%	3.5%	-3.1%
NL	+	+	-5.2%	-8.3%	-1.9%
AT	+	-	-3.8%	-3.9%	-1.8%
PL	+	+	-4.2%	-2.7%	-3.5%
PT	+	+	-1.8%	-0.3%	-1.7%
RO	+	+	-0.6%	-0.6%	-4.3%
SI	+	+	-3.3%	-4.0%	-1.7%
SK	+	-	-4.3%	-5.2%	-4.9%
FI	+	+	1.4%	-1.1%	-0.3%
SE	-	+	-1.8%	-1.2%	-2.0%
UK	+	+	-6.5%	-5.4%	-3.2%

Table 2: Overview indicators; Source: Eurostat, DG ECFIN, Odyssee-Mure (European Commission, 2017a)

Note: Symbol "+" is used if Member States decreased their primary and final energy consumption between 2005 to 2014 at a rate which is higher than the rate of decrease which would be needed in the period 2005 to 2020 to meet the 2020 primary and final energy consumption targets. Symbol "-" is used for all other cases.

2.1.3 Austrian Federal Energy Efficiency Act

The Federal Energy Efficiency Act seeks to implement the EU Energy Efficiency Directive (2012/27/EC) by stabilizing the final energy consumption to 1,050 Petajoule (PJ) in Austria through energy efficiency measures until 2020. The objective of total energy savings of 310 PJ should be reached by energy efficiency measures of energy suppliers in the amount of 159 PJ as well as by strategic measures of public authorities amounting to 151 PJ. (Austrian Energy Agency, 2016)

This thesis focuses on §10 of the Austrian Federal Energy Efficiency Act, introducing an energy efficiency obligation scheme (EEO) for energy suppliers. It contributes to the implementation of Article 7 of the EED and should achieve final energy savings in the amount of 159 PJ between 2015 and 2020 (Bundesgesetzblatt, 2014). The EEO scheme replaced voluntary agreements with energy suppliers set from 2009 to 2014 (ATEE, 2017).

Since January 2015, retail energy sales companies are required to initiate energy efficiency measures at end customers to the extent of 0.6 % of their previous year's energy sales in Austria. It covers all retail energy sales companies selling more than 25 GWh in the previous year across all energy carriers: electricity, natural gas, district heating, biomass, coal, mineral oil and transport fuels. Non-compliance results in paying compensation in the amount of 20 Cent/kWh (Bundesgesetzblatt, 2014).

2.1.3.1 Reporting Energy Efficiency Measures

A monitoring body, the so called “Monitoringstelle”, was installed in 2015 which is responsible for the administration of the scheme. Up to 2017, energy sales companies had to report their energy saving measures for the years 2014 and 2015 until 14 February 2016 and for the year 2016 until 14 February 2017 to the monitoring body (Austrian Energy Agency, 2016).

By 14 February 2016 and 2017, energy suppliers must have properly implemented the efficiency measures or acquired them from a third party. The latter includes:

- Approach their own customers;
- Approach external end customers; (companies that take efficiency measures may transfer them to energy suppliers);
- Purchase energy efficiency measures from trading platforms;
- Purchase measures from measure traders.

The measures must originate from the commitment year. Measures are eligible if it is proven that they reduce the final energy consumption at a final customer (Enspol, 2016). In order to assess the impact of the measures on energy consumption, generalized methods or individual evaluations can be used. The definition of an 'energy efficiency measure' and the way cost savings will be calculated are defined in Section 5 of Energy Efficiency Directive Regulation, in conjunction with Appendix 1 which provides a list of possible categories of energy efficiency measures in all end-use sectors (residential, services, industry, transport, agriculture). Rules for conducting individual assessments came into force on 1 January 2016 (Monitoringstelle, 2017a).

If an energy supplier cannot reach the savings target of 0.6% with its energy efficiency measures, it has to pay a federal compensation amounting to 20 Cent/kWh for the remaining gap.

By the option of third parties, a trading market for energy efficiency measures was established (Schönherr, 2016). In fact, several energy efficiency trading platforms, like ETHUS, OneTwoEnergy, Save Energy Austria GmbH, SYNECO, ACT, e-Effizienz, effizienzmeister.at and EnergiebonusHandels GmbH have been established to meet this demand (Energieinstitut der Wirtschaft, 2017).

2.1.3.2 Energy Information Centre, Energy Management or Energy Audit Obligation

In addition to the EEO, energy sales companies with more than 249 employees or more than 50 Mio € turnover and total assets of more than 43 Mio. € have to establish an Energy Management System (EMS) or conduct an external Energy Audit (EA) on a regular basis.

Furthermore, energy sales companies with more than 49 employees and a turnover or total assets of more than 10 Mio. € were required to establish an information centre about energy efficiency, energy consumption, energy costs and energy poverty by 2015. An overview of all obligations for energy sales companies is shown in Figure 5:

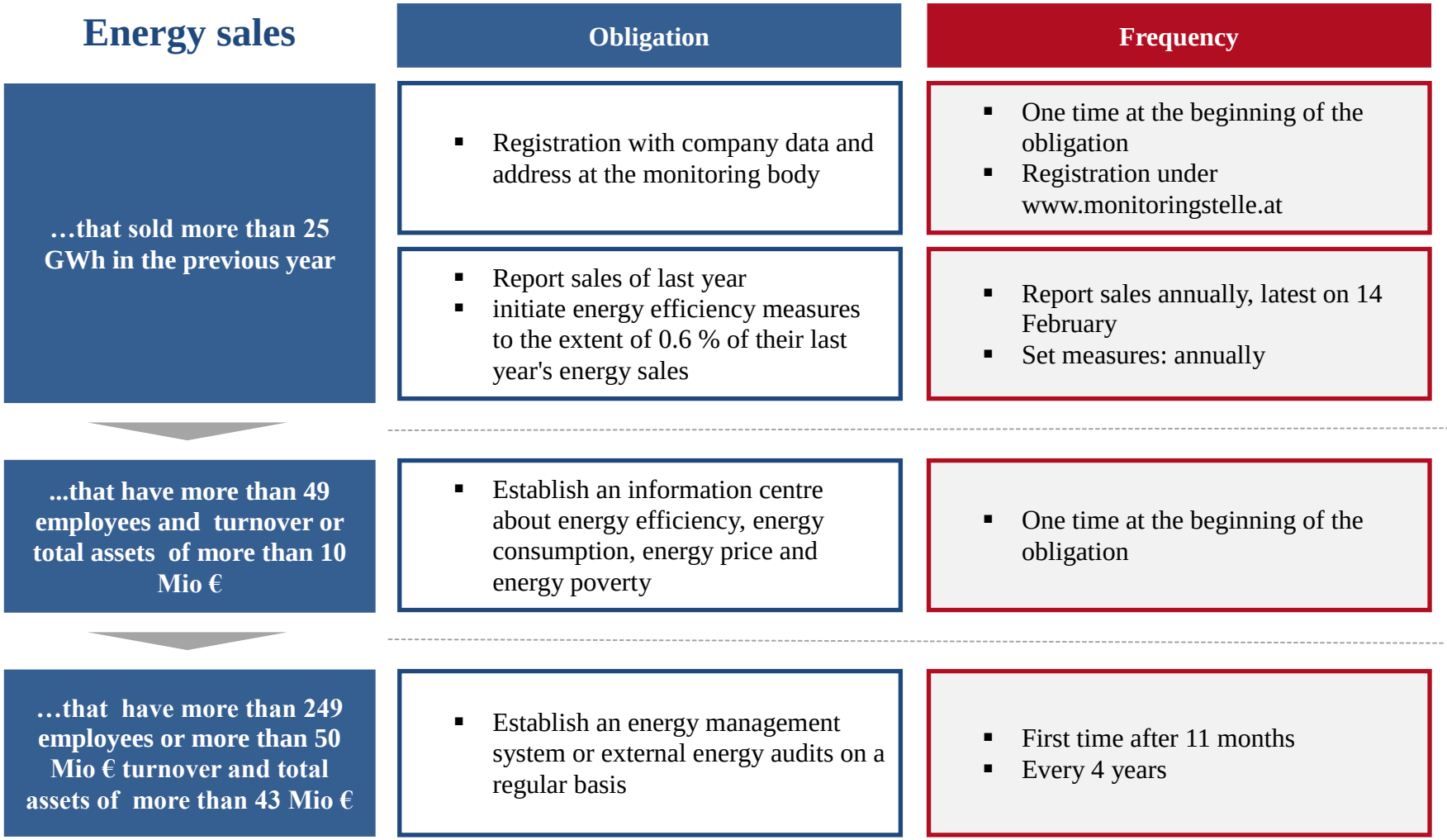

Figure 5: Overview of all obligations for energy sales companies (author's representation; Monitoringstelle 2017a)

2.1.3.3 Progress in Austria

As already mentioned in the previous chapter, the implementation of the Energy Efficiency Directive was discussed quite controversially. This was due to the fact that the first period covered two years, starting from 1 January 2014, while the Austrian Energy Act was issued afterwards in November 2015. The registration of the energy efficiency measures at the so called "Unternehmensserviceportal" had to take place before 14 February 2016. The obligated parties (OPs) are almost all energy suppliers selling more than 25 GWh/a, covering about 600 companies and about 85% of Austrian final energy consumption.

The requirements for utilities for energy efficiency measures have been more than met in the first reporting period (Simader, 2016). Energy suppliers reported 13.496 energy efficiency measures to the monitoring body, amounting of total energy savings of 86,7 PJ (Austrian Energy Agency, 2016). There is no ex-ante validation of the actions - verifications are done ex-post (ATEE, 2017).

As a result, energy suppliers have already fulfilled 55% of their obligation until 2020 (159 PJ) within the first year. The EEA requires energy suppliers to set energy efficiency saving in the amount of 40% at households. Table 3 presents the distribution of savings at households by category:

Category	%	GWh/a	PJ/a	Reported energy savings
Heating systems and hot water	56	1.777,4	6,4	5.363
Building envelope	25	789,9	2,84	640
Lighting	7	234,0	0,84	1.777
Mobility	6	201,4	0,72	868
Savings without category	3	98,9	0,36	1.384
Others	3	93,0	0,33	1.961
Sum	**100**	**3.194,6**	**11,50**	**11.993**

Table 3: Distribution of savings at households by category (Austrian Energy Agency, 2016)

First annual targets could be met and were even overachieved globally. But about 22% of obligated parties (OPs) did not meet their individual target in 2015 (ATEE, 2017).

On 14 February 2017, utilities had to release their energy efficiency measures to the monitoring body for the second period. According to the report by ATEE (2017), 52% of energy savings achieved in 2016 came from actions with households, 19% with companies and 27% from actions on transport. 42 categories and more than 250 standard methods (formula + deemed savings) are available. An official methodology set guidelines for other types of actions. (ATEE, 2017)

2.1.4 Rebound Effect

Energy efficiency policies are seeking to reduce the amount of environmental pressures per unit on a product, e.g. kilowatt-hour, or function/service, e.g. energy services such as lighting. However, not all ways of implementing these policies or all behavioral actions are desirable to achieve energy efficiency targets. While energy and resource efficiency has been continuously increasing in the past, largely due to technological innovation, absolute environmental pressure has continued to rise for many indicators, e.g. on primary energy consumption or raw material consumption. (Vivanco et al., 2016)

The reduction of the cost of an energy service following an energy efficiency improvement, may lead to a potential increase in the demand of this energy service. This mechanism is generally known as the rebound effect theory, which has been defined as "the additional energy consumption from overall changes in demand as a result of behavioral and other systemic responses to energy efficiency improvements" (Vivanco et al., 2016, p.115).

The best known way to estimate the direct rebound effect is through the use of elasticities (Freire-González, 2017). It can be defined as:

$$\vartheta\alpha(xE) = \vartheta\alpha(SE) - 1$$

where ϑα(xE) is the efficiency elasticity of the demand for energy and ϑα(SE) is the energy efficiency elasticity of the demand for useful work for an energy service. "When energy efficiency elasticity of the demand for useful work for an energy service is equal to zero, there is no direct rebound effect" (Freire-González, 2017, p.271).

The indirect rebound effect can come from required energy to produce and implement the measures that improve energy efficiency. This effect is actually produced, in fact, before the energy efficiency improvements occur. Furthermore, the effect can arise after the implementation of the measure from indirect energy consumption resulting from energy efficiency improvements. (Freire-González, 2017)

Freire-González (2017) estimated the direct and indirect rebound effect of energy efficiency in households for the EU-27 countries, using direct rebound effect values of 30% and 50% in households (DIREp30 and DIREp50) and weighting them by GDP, population, etc.

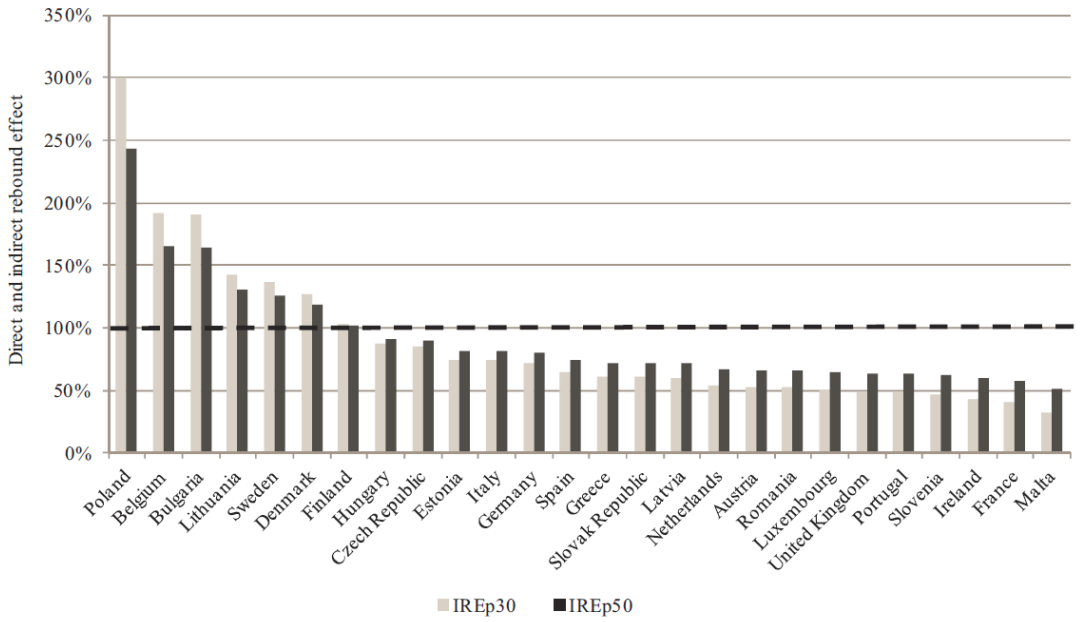

Figure 6: Direct and indirect rebound effect estimates of the EU-27 countries, under a proportional re-spending scenario (Freire-González, 2017, p.273)

Although most of the economies present values below 100%, there are seven countries situated above this critical threshold leading to backfire: Cyprus, Poland, Belgium, Bulgaria, Lithuania, Sweden, Denmark and Finland. The other ones are below this threshold, but most of them over 50%, indicating that half of expected energy savings form energy efficiency measures are counteracted by the rebound effect. By weighting individual estimates by GDP, an average value for the overall EU-27 economy has been found between 73.62% and 81.16%. These results recommend that the energy policy at the European level should be rethought if efficiency measures should pursue reducing energy consumption and tackling climate change. (Freire-González, 2017)

Studies published have identified a number of potential policy pathways for rebound mitigation: For instance, van den Bergh (2011) identifies five policy pathways for

rebound mitigation in the context of energy conservation: information provision and “moral suasion”, command-and-control, price regulation, subsidies and tradable permits. Maxwell et al. (2011) define the following pathways: design, evaluation and performance of policy instruments, sustainable lifestyles and consumer behavior, awareness raising and education in business, technology and innovation, economic instruments and new business models.

2.2 Business Model Concept

Incumbent power utilities have started providing energy efficiency services, but struggle to define profitable, scalable offerings. Indeed, the business opportunities have not yet been quantified (Leroi et al, 2013) and the progress in scaling the energy service market is slow (Apajalahti et al., 2015). Utilities need to innovate their business models and transform from commodity suppliers to service providers (Helms, 2015, 98).

Business models have received significant attention from both, practitioners and academics. However, there is no common accepted definition for the concept of "business model" so far (Schallmo, 2013). One common definition is provided by Magretta (2002, p. 4) who sees business models as "stories that explain how enterprises work. A good business model answers Peter Drucker's age old question: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?" Skarzynski and Gibson (2008, p.112) define a business model as "a conceptual framework for identifying how a company creates, delivers and extracts value. It typically includes a whole set of integrated components, all of which can be looked on as opportunities for innovation and competitive advantage."

Whole industries like the energy and health sectors are undergoing a radical transformation, and "their companies have to rethink the way they do business" (Grassmann et al., 2016, p.2). Therefore, Business Model Innovation (BMI) has become an important management issue for all companies under margin and competitive pressures to fit the changing political, technical and customer environment.

Chesbrough and Rosenbloom (2002) were among the first professors to advance the field by presenting a tangible classification of a business model. They defined six functions of a business model, namely value proposition, market segment, value chain, cost structure and profit potential, value network and competitive strategy.

The business model provides a valuable new tool for analysis and management in research and practice (Zott et al., 2008).

Demil and Lecocq (2010) stress the importance of dynamics that affect the development of a business model by introducing the RCOV framework of business models, which stands for the key components they define. These are revenue, costs, organization, and value proposition. They find that these elements are in permanent disequilibrium and therefore a firm must possess the capability of dynamic consistency to sustain performance while changing its business model.

So far there is no common accepted definition for the business model concept and business model innovation, because it is used in different disciplines, e.g. management and business sciences, information's systems and business informatics, etc. (Schallmo, 2013).

Altogether, for the purpose of this thesis, a business model is defined in line with Osterwalder and Pigneur, 2009, p.14 as "the rationale of how an organization creates, delivers, and captures value". Their business model concept which is described in Table 4 has been extensively tested in practice and for example been used by Richter (2012) and Gsodam (2014) for innovative renewable business models and by Priessner (2014) and Helms (2016) for sustainable business models for energy efficiency.

Business model pillar	Description
Value proposition	Is the bundle of products and services that creates value for the customer and allows the company to earn revenues.
Customer interface	Comprises the overall interaction with the customer. It consists of customer relationship, customer segments, and distributions channels.
Infrastructure	Describes the architecture of the company's value creation. It includes assets, know how, and partnerships.
Revenue model	Represents the relationship between costs to produce the value proposition and the revenues that are generated by offering the value proposition to the customer

Table 4: Business model conceptualization (Osterwaldner and Pigneur, 2009)

The next section gives insights about the change of traditional business models in the energy industry and business models for energy efficiency services. In the energy context, energy services have been discussed as means resulting in energy efficiency

and savings. Recent studies relate energy services also to the topics of distributed energy, smart grids or demand side management (Boston Consulting Group, 2012 and Richter 2013).

2.3 Change of the Traditional Business Model in Energy Industry

The traditional electricity business model consists of the generation-transmission-distribution-retail pathway from energy source to end use as shown in Figure 7. The end-customers play a passive role. They receive reliable and universal power at reasonable rates, for which they offer providers reciprocal value in the form of intermittent (usually monthly) revenue. (Valocchi et.al, 2010).

Figure 7: Traditional electricity value chain as base of the traditional business model (Valocchi et.al, 2010)

The entire electricity sector is in a period of transition. The reasons for the turbulences in the European electricity market are manifold and will be discussed in the following section. Energy efficiency and electricity production out of renewable energies have gained importance on the political agenda. The European Commission (EC) is striving for cost-efficient ways to make the European economy more climate-friendly and less energy-consuming. In its low-carbon economy the EC (2010) suggests that the EU should cut emissions to 80% below 1990 levels by 2050 and the power sector should almost totally eliminate CO_2 emissions by 2050 with serious implications for the energy system forcing utilities to transform their power mixes and invest in energy efficiency measures. Thus, traditional power supply companies have to make far-reaching changes to their business models. Major changes are due to low energy prices, change in electricity consumption, more volatile renewable energy and demanding customers which will be discussed in the next sections.

2.3.1 Low Energy Prices

The history of energy prices and costs shows major changes. In the 1970s and 1980s, restrictions by oil suppliers drove up prices and triggered economic shocks. More recently, new energy supplies and growing use of alternative energy sources have boosted supply, while energy efficiency measures combined with weak growth have reduced demand (European Commission, 2016a). Both together has reduced wholesale prices, they cut into utility revenues and forcing unanticipated closures of newly unprofitable base load coal or gas plants (Kwasnik et al, 2014).

In recent years wholesale electricity markets in Europe have undergone major changes with the development of an internal market. In almost all EU Member States, wholesale electricity exchange markets have been established to provide day-ahead, forward and intraday trading that reduce market inefficiencies and put further pressure on prices. Prices are driven by fuel mix, cross-border interconnections, market-coupling, market supplier concentration and weather conditions. Similarly, consumer and industry demand, demand management, energy efficiency and the weather further influence the 'demand side' of the market. (European Commission, 2016a)

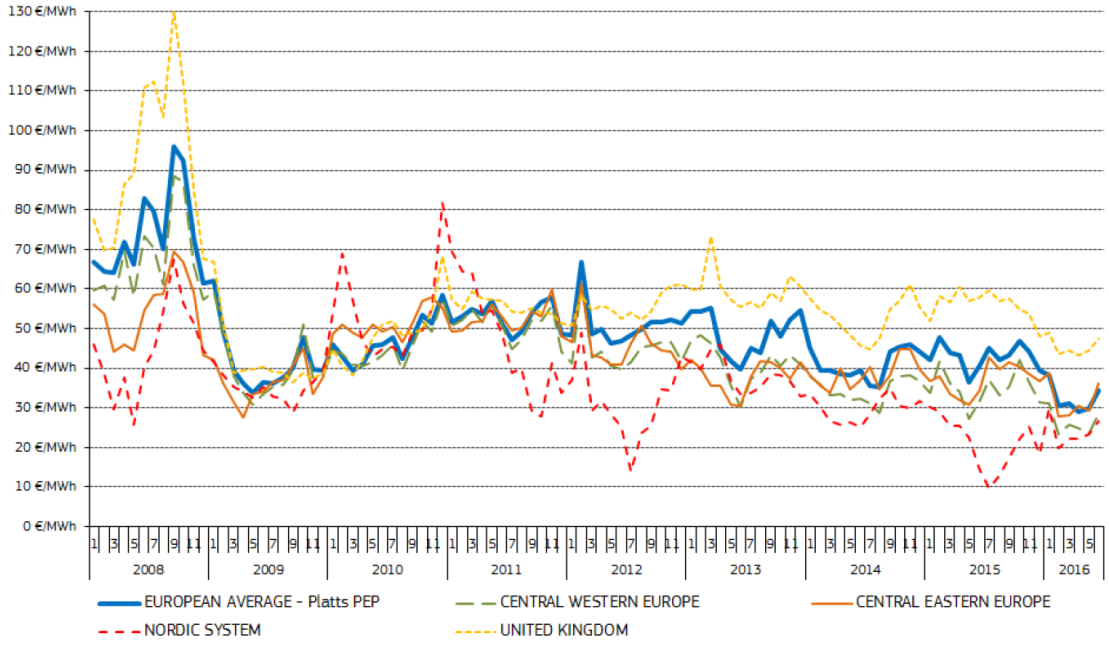

Figure 8: Trends in EU wholesale electricity prices (European Commission, 2016a)

This is reflected in the market. As shown in Figure 8, European wholesale electricity prices peaked in the third quarter of 2008 and, apart from a slight recovery in 2011, have been falling ever since. Prices have fallen by almost 70 % since 2008, by 55 % since 2011 and reached levels not experienced for 12 years in 2016. (European Commission, 2016a)

Figure 9: EEX Base TerminMarket (E-Control, 2016)

Figure 9 shows that the day-ahead contracts for the German-Austrian power price zone amounted to 31.5 €/MWh in 2015, year-ahead contracts amounted to 31€ /MWh compared to 35€/MWh in the previous year.

2.3.2 Change in Electricity Consumption

As already mentioned electricity consumption is dropping due to low economic growth levels and increasing energy efficiency. Figure 10 shows the change in electricity consumption in GWh and % during the last 60 years. In Austria, electricity consumption rose by 1,7% in 2015 after four years of stagnation according to the information from E-Control (2016). A significant factor was the cooler weather conditions compared with the very mild previous year.

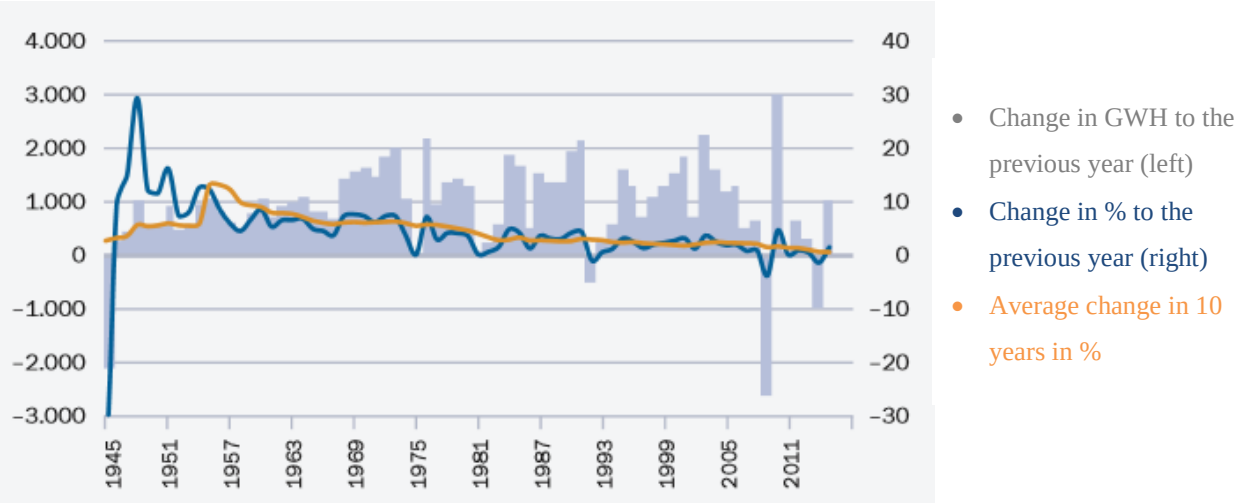

Figure 10: Change in electricity consumption in GWh and % in Austria (E-Control, 2016)

Electricity generation capacities are rising as a consequence of investment subsidies, especially for renewable energy sources, as presented in Figure 11 (E-control, 2016). In Austria, the electricity production from wind power rose by 25,9 % and photovoltaic by 19,3 % from 2014 to 2015 (Statistik Austria, 2016).

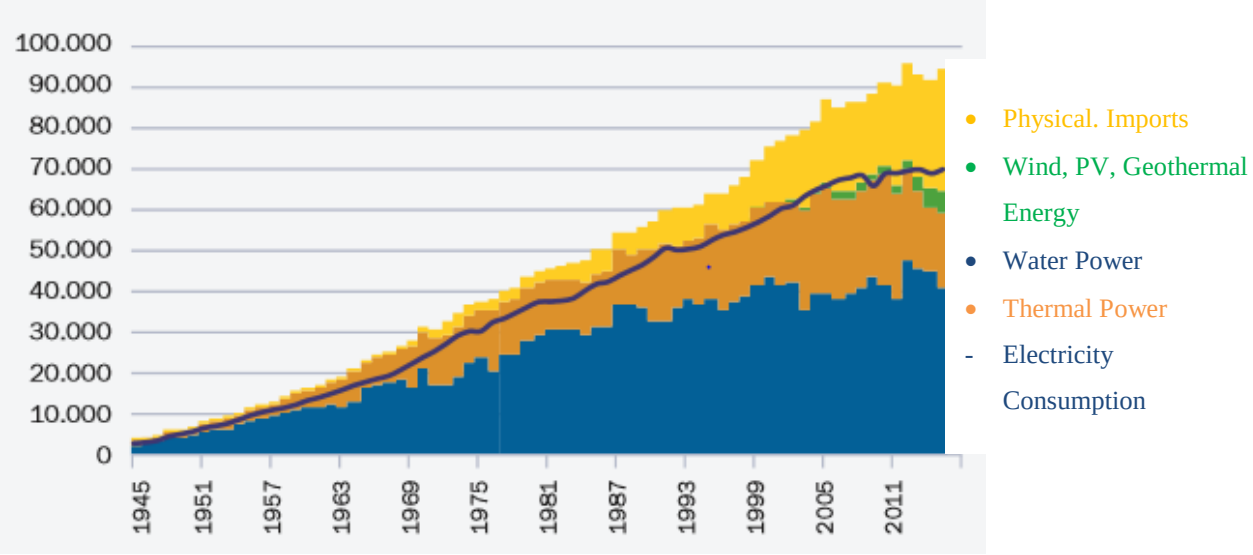

Figure 11: Electricity consumption in GWh and its supply by source (E-control, 2016)

2.3.3 Volatile Renewable Energy

The volatile nature of energy generation from power plants producing energy from renewable sources means that greater flexibility is needed in electricity generation and in grid operations (VERBUND, 2015). The technological changes refer to the

introduction of smart grid, distributed electricity generation, demand side management and storage technologies, making the network more complex as power and information move in multiple directions (Valocchi et al. 2010). Figure 12 provides an overview of a functional scheme for distributed generation. Electric utilities must deal with the increasing integration of renewable energy into the energy mix and the replacement of an aging grid (Broberg et al, 2015). Renewables, distributed generation and smart grids demand new capabilities and therefore are triggering new business models for a digital transformation (Booth, A. et al. 2016).

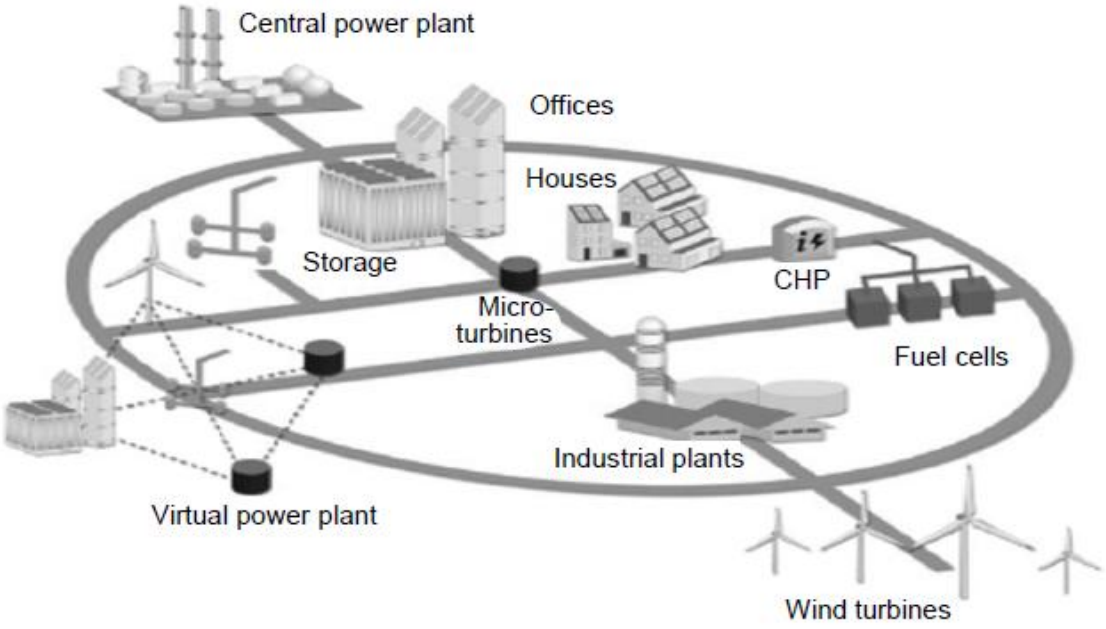

Figure 12: Functional scheme for distributed generation (Commission of the European Community, 2006)

2.3.4 Demanding Customers

Today, demanding customers expect to receive more from utilities than reliable power supply at reasonable rates. They look for more control about their energy consumption to save energy, money and to be more environmentally friendly (Gsodam, 2012). In addition, formerly passive consumers will become prosumers with their own PV system, storage and electric vehicle (Valocchi et al, 2010).

As a result, the traditional business model with its one-way flow of energy and information is impacted in several ways by a new information model, a new relationship with consumers and the introduction of distributed energy, as visualized in Figure 13.

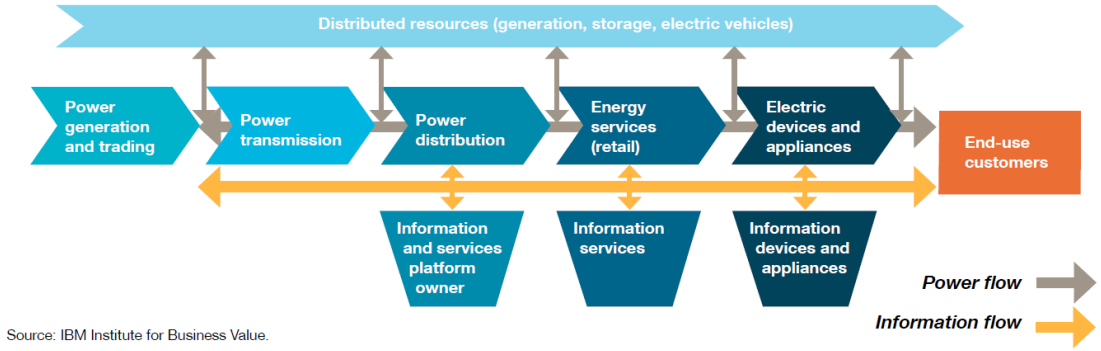

Figure 13: Emerging electricity value chain (Valocchi et.al, 2010)

Traditional power supply companies therefore have to change their business models drastically. Firstly, the value chain will grow more complex and involve new players who traditionally have not been directly involved in the industry. Secondly, the consumers, who were passive recipients as explained before, will become empowered value chain participants (e.g. with their own PV system, storage, electric vehicle, etc.) requiring integration into the network. Thirdly, information and power will flow in multiple directions and new business models that leverage the increase in information flow on the network will emerge. Fourthly, power generation will be decentralized.

As shown in Table 4, Doleski (2016) collected new business fields of utility 4.0 arguing that the traditional business models of the energy industry become obsolete in the face of digitalization and decentralization.

Energy Services		Decentralization	Infrastructure and Platforms
Energy related[1]	**Energy based**[2]		
Ambient Assisted Living (AAL)	Billing Service	Local Power Generation	Asset Management
Augmented-Reality-Application	Demand Response (DR)	Local Load Management	Asset Services
Energy Performance Certificate	Demand Side Management (DSM)	Power-to-Gas	Lighting Technique
Energy Consulting	Energy Broker	Regional Marketplaces	Big-Data-Applications
Energy Controlling	Energy Management	Clouds for Storage	Contracting (Infrastructure)
Energy Dialog	Energy Harvesting	Storage Services	E-mobility
Energy Monitoring	Energy Supply Service/"Tenant electricity"	Virtual Power Plant	Energy Data Management (EDMS)
Fleet of Cars Management (E-Mobility)	Prosumer Services		Internet-Service-Provider
Health Care	Smart Building		IT-Provider
Mobility Services (E-Mobility)	Smart Home		Platform Service
Security	Smart Metering		Smart City
Thermograph	Energy Storage Contracting		Smart Grid
	Heating Service (Sub Metering)		Smart Infrastructure
			System Integration
			TC-Provider
			Value based Maintenance

Table 5: Business fields of utility 4.0 (Doleski, 2016)

The electric utility market is entering a major transformation to fit the changing political, technical and customer environment. The transition from a product-oriented, capital-intensive business model, based on tangible assets, towards a service-oriented business model, based on intangible assets, is expected to present great managerial and organizational challenges (Helms, 2016). In response, electric

[1] Energy related services mean offers without supply of energy at the same time

[2] In case of energy based services, energy supply is always carried out in combination with a defined service

utilities try to innovate their business models in order to stay competitive and to fulfill obligations resulting from new regulations. This thesis will focus on business models for energy efficiency services.

2.4 Business Models for Energy Efficiency Services

In the context of energy services, recent studies relate energy services to the topics of distributed energy, smart grids or demand side management (Boston Consulting Group, 2012 and Richter 2013). A review of current scientific literature (Kwasnik et al, 2014) underlines the inherent tensions between energy efficiency and the utility business model that relies on selling electricity to recoup significant capital investments. Helms (2016) explored barriers to servitization within selected Swiss and German utility companies through a series of interviews with utility managers. The interviewees gave insights into the major challenges faced, e.g., value dilemma (the willingness to pay for innovative services), asset transformation, and the difficulty to simultaneously managing utility and service business and leveraging fostering relationships. Priessner (2014) identified similar market barriers to the development of energy efficiency services and developed some preliminary insights on how companies are trying to overcome them.

Helms (2016) also collected offered or planned energy services among selected German and Swiss utility companies as shown in Table 6:

Energy Services	Service offerings	Specification	b2b customers (energy companies)	Large (industrial and commercial) customers	Small customers (e.g., households)
Supply	Energy supply contracting	May comprise planning, installation, management and financing of small generation, such as Combined Heat and Power (CHP) units	-	✔	✔
	Renewable energy generation	May comprise planning, sale, installation, of small scale renewable energy units	-	✔	✔
	Virtual power plant and direct marketing	Pooling and marketing for small distributed producers to market flexibility and participate on markets	-	✔	✔
	Power plant optimization	Optimization of generation assets for third parties	✔	✔	-
Distribution	Grid services	Engineering and optimizations services for other grid operates, including micro grids; commercialization of smart grid solutions	✔	✔	-
Consumption	Performance contracting	Takeover of investment and financial risk for efficiency measures, financial participation on energy savings	-	✔	✔
	Demand response measures	Provision of services allowing consumer to market flexibility and participate on markets	-	✔	✔
	Energy efficiency	Energy efficiency measures, starting with consulting, up to installation	-	✔	✔
	Energy management	Holistic energy and emission management and reduction starting with consulting up to holistic energy controlling	-	✔	-
	Energy procurement	Procurement, trading and origination for large energy consumers	✔	✔	-
	Smart home solutions	Smart home solutions increasing comfort, efficiency and security for households	-	-	✔
	E-mobility solutions	Sale, installation and management of public and private charging solutions	✔	✔	✔

Table 6: Offered or planned energy services among participating utilities (Helms, 2016, p.69)

Leroi et al (2013) finally lists six rules for building a successful energy efficiency services business:

1. **The B2B business opportunity is more significant than B2C.** According to Leroi (2013) businesses respond more actively to savings opportunities and their average investment and account value is significantly higher than that of households. To tap this market, energy-efficiency service providers will need to define a clear value proposition for businesses, often tailoring the solutions to the industry.
2. **Build energy-efficient services on growth waves.** Regulatory waves such as the European Energy Efficiency Directive increase the focus on energy efficiency, as commercial and residential customers adopt measures to meet new guidelines.
3. **Successful energy-efficiency service lines supplement existing business platforms.** Successful energy-efficiency offerings capitalize on existing strengths, whether those include technical expertise, customer relationships or a place on the energy-delivery chain.
4. **Business models need to work with long-term economics.** Many opportunities in energy efficiency (e.g., switching to LED lighting) can generate significant savings of up to 50% annually. The payback can, however, take years, sometimes up to 25 years for building enhancements.
5. **The opportunity is about heat and electricity**. Providers will need to offer a broad range of technological options in order to provide the best solutions, from working with facility owners to improve the insulation capabilities of buildings to upgrading heating and cooling networks and enhancing metering and automation to make better use of heat systems.
6. **Local market share matters**. Energy-efficiency services, like most service businesses, require knowledge of local regulations and contacts.

3 Methodology

As stated, the two purposes of this thesis are to investigate experiences which electric utilities have made by implementing the Energy Efficiency Act after the second reporting period and to illustrate which major service-oriented business models with regard to energy efficiency measures for households they have developed so far. Due to the lack of existing theoretical and empirical studies, after the second reporting period of the Energy Efficiency Act, the grounded theory approach was applied. It is identified as "building theory from case studies as research strategy which involves using one or more cases to create theoretical constructs, propositions and/or midrange theory from case-based, empirical evidence" (Eisenhardt and Graebner, 2007, p.25) For this thesis several case studies have been conducted. According to Yin (2009, p.17) the essence of a case study is that "it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result." The case study method as a research method according to Yin (2009) follows a linear, but iterative process, as shown in Figure 14:

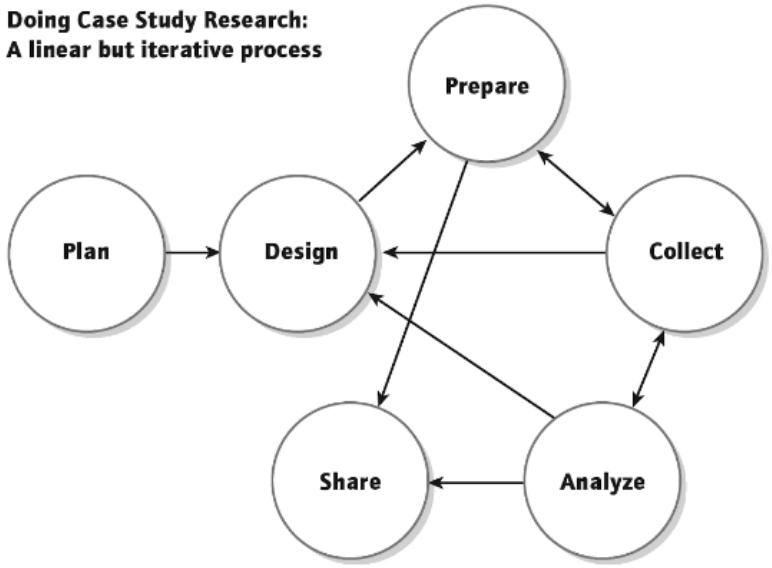

Figure 14: Carring out Case Study Research: A linear but iterative process (Yin, 2009)

This thesis chose a multiple over a single case design. It is seen to be a robust and rigorous ground for quality research based on the triangulation of evidence from multiple cases (Marwan, 2010). Three steps were followed: As a first step, case study

companies were selected with theoretical sampling (Eisenhardt and Graebner, 2007). As a second step, the data collection method and the evaluation method were decided. As a third step, the interviews were conducted as guided interviews, in line with Bortz and Döring (2009). The final evaluation of the interviews, the fourth step, was performed following the qualitative content analyses according to Mayring (2014).

3.1 Sample of Case Study Companies

This study focused on large power utilities in the Austrian energy industry, providing energy services, in particular energy efficiency services to their clients. According to Yin (2009), there are six different sources of evidence one can draw from case study research: documents, archival records, interviews, direct observation, and physical artifacts. For the purpose of data triangulation and as background for the interviews, data from publicly available sources such as annual reports, sustainability reports, media reports and companies' websites, was collected. On the one hand, this information permitted more detailed questioning during the interviews and on the other hand, it served as confirmation of the suitability of the selected companies.

Case study companies had to fulfill the following criteria:

- Electricity utilities need to have energy sales in 2015 amounting to more than 25 GWh.
- Secondly, turnover needed to be of more than 50 Mio. € or they needed to have more than 249 employees.
- Thirdly, incumbent power utilities that have traditionally followed an asset-centric business model for generating and distributing power looking for business opportunities to compensate their losses driven by the rise of distributed energy and reduced demand for energy (Leroi, 2013).

The final dataset consisted of expert interviews of responses with six individuals from five companies of electric utilities in Austria. In one case, the Energy Efficiency Officer and the managing director were available for an interview. All interviewees were experts in the field of energy efficiency.

3.2 Data Collection and Evaluation Method

The semi-structured guide used for the interviews provided a clear set of instructions for the interviewer for a reliable and comparable qualitative data collection (Cohen, 2006). Furthermore, the guided interview left the interviewer room to ask questions spontaneously or address topics that arise during the conversation (Bortz and Döring 2009).

Prior to the interviews, detailed information on the companies was collected. In a second step, the potential interview partners were contacted and asked for an interview in an e-mail. Thirdly, all interviews were scheduled and took place in February and March 2017.

Table 7 provides an overview of the interview partners:

Interview	Position	Gender	Age	Date	Duration in min.
A	Energy Efficiency Officer	M	44	21.2.2017	79
B	Energy Efficiency Officer	F	42	27.2.2017	59
C	Managing Director Energy Efficiency Officer	M M	53 34	28.2.2017	52
D	Energy Efficiency Officer	F	39	28.2.2017	46
E	Energy Efficiency Officer	M	56	16.3.2017	54

Table 7: List of interview partners (own representation)

The names of the interview partners are not stated as some interview partners asked to stay anonymous. Furthermore, the quotes in Chapter 4 are provided without reference to the name of the interview partner or employer.

All interviews were provided with the prepared interview guidelines upfront. At the beginning of each interview, the research project was explained and the interviewees were asked for recording permission. No interview partner raised objection. As the interviews were conducted in German, the interview guideline was also prepared in German language. The original interview guideline is shown in the Appendix.

The questionnaire is split into two sections. In the first part of the questionnaire, the energy efficiency managers are asked about their experience with the implementation of the Energy Efficiency Act. Specific questions are asked about the reporting of

energy efficiency measures, different challenges in the first and second commitment period, the implementation of an advisory center and a management system or energy audit.

Following the concept of Osterwalder and Pigneur (2009), the second part of the interview focuses on business models along four elements: value proposition, customer interface, infrastructure, and revenue model. As already mentioned, this concept has been used by Richter (2012) and Gsodam (2014) for innovative renewable business models and by Priessner (2014) and Helms (2016) for sustainable business models for energy efficiency. The matrix by Helms (2016) that is provided on page 6, was taken in order to gain valuable insights in Austrian utilities, especially which energy services they have in place to achieve energy savings and which business models for energy efficiency services and products in households they have developed so far. Both parts ask for an evaluation of existing processes as well as the potential for improvement.

3.3 Quantitative Content Analysis for Evaluation

The techniques of qualitative content analyses by Mayring (2014) were applied for the evaluation of the expert interviews. Mayring (2014, p.63-106) distinguishes between three different approaches:

The **summary analysis** focuses on reducing the material in such a way that the essential contents remains, in order to create a comprehensive overview of the base material through abstraction which is, nevertheless, still an image of it.

The **explication analysis** provides additional material on individual, doubtful text components (terms, sentences, etc.) with a view to increasing understanding, explaining and interpreting the particular passage of text.

The **structuring analysis** filters particular aspects of the material, a cross-section through the material, according to pre-determined ordering criteria, or to assess the material, according to certain criteria.

The steps of evaluation in this thesis are based on the summary analysis technique. Each interview was recorded and transcribed. The records helped to collect data for

the analysis and to avoid misunderstandings. The written protocols were sent to the interviewees to get clearance on the content. Finally, these transcripts were used to analyze and compare the interviews with each other.

As a next step, categories were generated to further process the interviews. The two categories fulfillment of “energy efficiency obligations” and “experiences after the first and second reporting period”, were derived inductively as well as deductively. Inductive means that the categories are based on and derived from the processed text, whereas deductive means that the categories are created theory-driven (Bortz and Döring, 2009). Thus, the categories were created based on the interview transcripts, the interview guideline and the current state of research.

After the categories were generated, text passages that were perceived to be interesting for answering the two research questions were color-coded and assigned to the appropriate category. Through this process it was assured that all meaningful quotes were assigned to the appropriate categories. In the following step, equal or similar text passages were deleted.

Finally, all five interviews were summarized. Within the categories of the summaries, comparisons and differences have been made and first results were formulated. Additional information on energy efficiency services from the homepages of the utilities were taken into consideration when writing the results.

4 Results

Chapter 4 presents the results of the conducted interviews with five energy efficiency officers and one managing director. The first part considers the experiences electric utilities made while implementing the Energy Efficiency Act. The second part deals with service-oriented business models for energy efficiency.

Quotes within this chapter are translations from German. The quotes of the interview partners provide a picture of how the Energy Efficiency Act has been implemented by selected Austrian utilities and describe the development of business models for energy efficiency services.

As already highlighted in the theoretical part of this thesis, retail energy sales companies are required to initiate energy efficiency measures at end customers to the extent of 0.6 % of their last year's energy sales in Austria since 2015. If an energy supplier does not take enough measures to reach the savings target of 0,6 %, it must pay a federal compensation amounting to 20 Cent/kWh for the remaining gap. (Bundesgesetzblatt, 2014). In February 2017, retail energy sales companies had to fulfill the obligation for the second time.

Part I

4.1 Reporting Energy Efficiency Measures

In general, all interviewed representatives reported that their companies had fulfilled their obligations in the first and second commitment periods. The first period ended on 14 February 2016 and the second period ended on 14 February 2017. The first period comprised the years 2014 and 2015. Table 8 provides an overview of possibilities for energy utilities and their energy efficiency measures taken in the 1st and 2nd reporting period:

ommitment Period (2015)	Commitment Period (2016)
✓ Measure has been set by the company itself	✓ Measure has been set by the company itself
✓ Purchased from a third party	✓ Purchased from a third party
□ Together with other obligated energy suppliers set within the framework of the industry obligation (§ 11 EEffG)	□ Together with other obligated energy suppliers set within the framework of the industry obligation (§ 11 EEffG)
□ Directly assigned	□ Directly assigned
□ Called for tenders	□ Called for tenders
□ Paid compensation penalty of 20 Cent pro kWh	□ Paid compensation penalty of 20 Cent pro kWh
□ Not fulfilled	□ Not fulfilled

Table 8: Possible measures of setting energy efficiency in the first and second obligation period (author's own presentation)

Energy efficiency measures in blue color were seen by all interview partners as the most relevant ones (Table 8). As 40 % of yearly savings need to be achieved with measures at households, a closer look showed the different measures set for households and for the remaining 60 % of savings that can be achieved in any end use sector (households, services, industry, transport, agriculture).

4.1.1 Energy Efficiency Measures Taken at Households

For households, the energy efficiency officers reported that their companies have set mainly energy efficiency measures for their own products. The most commons ones the interviewees mentioned are:

- LED promotions
- A +++ refrigerators and freezers
- Gas thermal value equipment
- Heat pumps
- Circulation pumps

Most of the interview partners stated that they did not implement new measures as their company had already reached the target long before the Energy Efficiency Act was in place, as supported by the following statements:

"For more than 15 years, we are implementing energy efficiency measures, e.g. heat pumps for customer loyalty. In this area we have a lot of experience and there was no need to introduce additional measures, because of the Act" (Interview partner E)

"Energy efficiency, energy services, energy consulting are not topics that have emerged through the Energy Efficiency Act, but may have gotten more attention by law." (Interview partner D1)

All interview partners announced that their companies fulfilled the obligation of 40% of yearly savings at households. Interview partner E stated that his company fulfilled the obligation by 250%, company A by 450% in the first year.

"A reason for exceeding the obligation to this great extent was due to the contracts made with producers of white goods (Miele, Bosch, Siemens) and with REWE." (Interview partner A)

4.1.2 Energy Efficiency Measures Taken in the Industry

In the industry sector, three of five interviewees reported that they have mainly purchased the measures from third parties (from their customers), whereas Energy Efficiency Officer A and Energy Efficiency Officer D told that very individualized measures were set in the industrial sector.

The Energy Efficiency Officer of company A highlighted that his company did not pay for the measures from customers, they just transferred the measures. A contract with the industry customer signed in advanced allowed them to pass on to customers the unexpected costs for the energy supplier due to the Energy Efficiency Act. Furthermore, he explained that many customers had transferred measures for several years upfront, for example, measures for four years in case the electricity supply contract has been closed for the years 2014-2017. This had led to target completion rate of 380% within the first period whereas the second year showed a rate of less than 100%. As measures may be transferred between years overall targets were more than fulfilled.

Energy Efficiency Officer E also reported about a big surplus in the first year, explaining that the company had set energy efficiency measures for customer loyalty long before the Act was in place. However, due to technical reasons with the company service portal called "Unternehmensserviceportal" (USP), the surplus could not, and still cannot, be transferred to the subsequent period.

> *"A form is obligatory which shall come in the near future. For more than a year we are talking about it, but it is still not technically possible." (Interview partner E)*

4.2 Challenges of the First Commitment Period

§10 of the Austrian Federal Energy Efficiency Act introduces an energy efficiency obligation scheme (EEO) that contributes to the implementation of Article 7 of the EED.

Overall, all five interview partners reported that the implementation of the Act was very chaotic and required significant administrative processes during the first obligation period. Interview partner B even named the process a "madness of bureaucracy".

Primarily, this was seen linked to the fact that obligations of the Austrian Federal Energy Efficiency Act for utilities were issued in November 2015 and the deadline for a first registration of all measures was already set for February 14, 2016.

> *"This means the obligations had to be fulfilled before the legal framework was in place" (Interview partner D2)*

The registration of the measures was available late and with an unfavorable closing date as pointed out by the interviewees, e.g.:

> *"It was a beta version and the closing date was on a Sunday during semester break, on Valentine's Day." (Interview partner A)*

Secondly, it was unclear which measures were accepted as energy savings measures in 2015:

> *"Especially the situation of heat pumps, which were promoted by the federal state government and by the company, was not clear if they were accepted. In the end, we had many stranded investments as double promotion was not allowed." (Interview partner B)*

Thirdly, interview partner B explained that the supplier himself constantly had to solve all the ambiguities in long discussions and at the expense of customer loyalty as the law left room for interpretation and the monitoring agency did not provide adequate guidance. For example, for every measure an energy supplier bought, he had to pay tax. Customers responded with statements such as "you're so complicated when adopting the measure" (Interview partner B).

Furthermore, interview partner C stated that they had to "consult" the consultant who registered an energy saving measure for the client as their knowledge of how to evaluate a measure was insufficient.

All interview partners criticized the usability of the database "Unternehmesserviceportal (USP). Several limitations were named during the interviews (interview partner B):

- Actions entered in the USP are not editable;
- Documents are limited to a size of 2 MB. When sending large customer contracts / reports, they need to be scanned in order not to exceed the file size;
- Quality assurance in the USP is very difficult;
- The surface is not user-friendly and intuitive, which causes many mistakes. Errors arise due to the different requirements of the measures: some measures are asked in kWh, others in MWh;
- A form is obligatory which should be made available in the near future. At present, it is technically not possible to transfer the surplus to the subsequent period.

In particular the banking of measures (the transfer of the surplus of measures to the next year) by big companies was seen very critically, because the interviewees questioned how the Monitoringstelle could control and validate the banking data. For

example, if an energy supplier implements measures in 2016 from a customer who has "banked" the measures in 2015, then the customer is required to mark the measure as inactive, after the energy supplier has entered it in the USP with implementation year 2015. However, there is no way to control and validate this process yet. Interview partner concluded:

> *"The entire energy efficiency legislation together with the software for the USP is a patchwork of different lobbying requirements" (Interview Partner B)*

4.3 Experiences of the Second Commitment Period

In the second obligation period, the company and the customer were already familiar with the procedure according to interviewees:

- Customers knew how to transfer energy efficiency measures and they did not report them last minute;
- The last year comprised two obligation periods, from 1.1.2014 to 31.12.2015; this year only covered the period 1.1.2016 to 31.12.2016;
- The total of efficiency measures reported amounted to four times the size of the previous year;
- The measures in the household sector were basically the same as reported in the first year.

While all interviewees criticized that the Federal Ministry of Science, Research and Economy did not provide a form to transfer the measures from the first to the second obligation period, the monitoring agency received excellent feedback, especially from interview partners A and E.

4.4 Implementation of an Advisory Center and Management System/Energy Audits

All interview partners stated that an advisory center for end users on energy efficiency had already existed in their company prior to the new legislation. Interview partner D1 explained that energy efficiency, energy services, energy consulting were not topical only due to the Energy Efficiency Act, but might have reached more attention due to the law. In his perception, the advisory center was not used more frequently, which was also the information from interview partner B.

Interview partner A mentioned that requests could be made via homepage or hotline. Energy consultants provide information free of charge. At the beginning, three people were employed to this position, whereas due to the low interest of customers, two energy consultants are now covering this position.

With regard to the obligation outlined in §9 "implementation of a management system or regular energy audits" for companies with more than 249 employees, four out of five companies introduced an energy audit. The deadline for conducting the energy audit for the first time was 15 November 2015. According to the interviewees, this led all obliged companies in Austria carrying out their audits at the same time. However, the number of auditors was limited. Two interviewees pointed out that,

> *"[…] there were a lot of companies who needed the energy audit during a very short period which may have influenced the quality of the audit." (Interview partner A and D)*

Thus, it is favorable for both, companies and auditors, to improve this process. As companies need to find auditors every four years and auditors need regular workload and less time pressure to provide good services, a staggered approach may be considered.

Interview Partner A added that there were big differences in the quality of the audits so that he questions some measures and rejects them as he worries that a "wrong" energy efficiency measure has a bad reputation for his company. Most of the time the

interview partner verifies measures himself and if it is too technical, he solicits professional expertise.

Furthermore, two interviewees presumed that the Energy Efficiency Act was a kind of workplace procurement, because a new professional branch of energy auditors has emerged. Interview partner B stated that “there has been a certain gold-digger mood among the energy service providers”.

4.5 Development of Business Models for Energy Efficiency Services and Products

The interview partners were asked how the business for energy efficiency services and products developed since the energy efficiency act had been implemented.

Regarding hiring new employees, the answers were quite diverse. While interview partner B and E reported that no new staff was hired since the implementation of the Energy Efficiency Act, interview partner C and D mentioned that the business field energy efficiency is staffed by two full-time and one half-time jobs.

Interview partner A informed that an own company has been founded with 25 employees that has its focus on energy efficiency solutions. The company plays an active role and tries to expand the product range. Energy efficiency has gained priority in the company and has reached the top management. Interview partner A said that energy efficiency issues are reported directly to the chairman of the board of directors. However, “[…] innovations are not as easy as originally thought. The new service business does not play any role in the consolidated accounts. Many of the products have negative cash flow, however, if a customer uses more products from one particular company, it is harder for the customer to switch to another supplier (cross-selling)."(Interview partner A)

Interview partner B stated that the Energy Efficiency Act was named “cause prima” during the first year, because of the compensation payment of 20 Cent/kWh, but has lost its priority already in the second year as the obligations of the act were already fulfilled. Regarding the budget, the interview partners reported that accruals were made in case energy efficiency measures had to be purchased.

Regarding the portfolio of new energy efficiency services, most of the interview partners said that they did not implement additional products, but enhanced or extended their existing portfolio, mostly with increased budgets.

Interview partner B mentioned that his company already fulfilled their obligations and therefore is free to design products for the market again: “We are independent from the Energy Efficiency Act, in the sense that we do not have to fight for every kilowatt hour anymore. For example, e-mobility is subsidized by the federal government. With regard to the Energy Efficiency Act, this means that the company should not concentrate on this topic, because it would result in double promotion and thus the company cannot take the energy efficiency savings. However, in some cases the market needs the federal government and companies to develop new products and services. We have the opportunity now to develop products for the market and make them attractive for the customer”, interview partner B added.

Part II

The second part deals with service-oriented business models for energy efficiency.

4.6 Service-oriented Energy Services in Place to Achieve Energy Savings

A broad list of distinct services-oriented energy services to achieve energy savings at end costumers have been listed by Helm (2016) and were asked to the interview partners. An overview of service-oriented energy services that are already in place at their company are shown in Table 9:

Energy services	Specification	Companies offering services
Performance Contracting	Takeover of investment and financial risk for efficiency measures, financial participation on energy savings	A, C, D, E
Demand Response Measures	Provision of services allowing consumer to market flexibility and participate on markets	A, C
Energy Efficiency Consulting	Energy efficiency measures, starting with consulting, up to installation	B, C, D A and E only hotline
Energy Management	Holistic energy and emission management and reduction starting with consulting up to holistic energy controlling	B, C, D, E
Energy procurement	Procurement, trading and origination for large energy consumers	A, C, D, E
Smart Home Solutions	Smart home solutions increasing comfort, efficiency and security for households	A, B, C, D
E-Mobility Solutions	Sale, installation and management of public and private charging solutions	A, B, C, D, E

Table 9: Overview of service-oriented energy services by companies to achieve energy savings (author's representation; sources according Helm, 2016)

Interview partner A, B and C added that the following business models for energy efficiency services contributing to fulfill the obligations of the Energy Efficiency Act are also very important from their perspective:

- Installation of photovoltaic systems is theoretically an energy carrier question, but according to the method document of the Energy Efficiency Act it is also an energy efficiency measure;

- Installation of heat pumps;
- Boiler exchange;
- Window exchange;
- Compressed air analysis;
- LED installations;
- Device replacement (products of white goods and brown goods);
- Sale of energy efficient products via web shop;
- Awareness raising for energy efficiency in schools;
- Research projects regarding battery storage; power-to-gas, large storage topics.

In general, the interviewees commented that these are service-oriented energy services where they do not expect to make significant profits. Overall, interview partner A summarized the services as follows: contracting is economically reasonable, demand response is good, primarily for the customer, energy management is for enhancing customer loyalty, energy procurement is a core task and Smart Home Solutions are not lucrative. E-mobility is a long-term project with a political background and may become economically reasonable one day.

In addition, interview partner A explained why he sees no economic business case for smart home solutions. The largest pitfalls may be in data security and the high WLAN consumption which contradicts the energy efficiency aspect. Smart home solutions work well via power LAN (power cable), Zigbee or Z-Wave in single-storey family homes that are not made of reinforced concrete.

> *"Things cost a lot and do not look very nice because there is always an intermediate plug somewhere and the customer only benefits if he has a PV system. I do not see the benefit for the mass-market. […] if providers from completely different areas such as Google or Amazon offer something for lifestyle and convenience, then smart home solutions may come at incredible low costs. However, then the focus is no longer on energy efficiency, where we as energy suppliers try to find solutions.“(Interview partner A)*

4.7 Service and Product for Households in Terms of Energy Efficiency

In general, all interview partners had difficulties to define an economically viable and scalable energy efficiency service for households. That was the reason why the question was extended also to economically viable business models for energy efficiency services in the industry.

Interview partner A described a tool for demand response as the most important service for the industry customer since 2014. The production and consumption flexibility is automated, intelligently bundled and marketed on the control power market. The pool partners generate attractive added revenue through flexible management of their generation and production. There is a very intense relationship with the customer, due to the regular exchange of data. The customer sets a price limit, and if this price situation is reached on the market, he is ready to put an action. With the installation of hardware with internet connection and signal transmitter, the process can take place automatically. Revenue is generated simply by being willing to respond with flexibility, if needed. Interview partners B and E as well as C and D described the same business models of installing gas thermal value equipment or heat pumps and highlighted their network of heat pump manufacturers and installers. As this is not a new business model, it is not described in detail in this thesis.

As reported by the interviewees, a very positive aspect of the Energy Efficiency Act is that the law has managed to put the energy efficiency issue on the top management level. In addition, energy efficiency contributes to customer loyalty as some companies have given more energy efficiency measures than they are contractually obliged to the energy supplier.

> *"This issue is a step backwards for the liberalization of the market."*
> *(Interview partner A)*

4.8 Potential for Improvement

There was agreement among all interviewees about the significant size of improvement potential regarding the process of the implementation of the Energy Efficiency Act. According to the interviewees, significant last minute amendments have been made and a lot of associations of interests have influenced the act. The whole process was seen very critical. Interview partner D commented that "[…] the Energy Efficiency Act has led to administrative burdens. The LED industry has probably benefited the most from the Energy Efficiency Act, because the measures were simple and easy to implement. As a result the added value is in China not in Austria." Interview partner B stated that "[…] in the last two years, no single additional efficiency measure has been set at industrial customers that would have been done anyway."

Also, interview partner E was not in favor of the obligations by the energy supplier, mentioning that it is counterintuitive for incumbents, on the one hand, to sell energy and on the other hand to advise their customers on how to consume less energy. He appeals to the principle that the polluter should pay.

Interview partner B suggested that the SME sector would have the largest potential for energy efficiency measures, however, the sector is not obliged to take energy saving measures by the Austrian Energy Efficiency Act. The interviewee also pointed out the reward system for energy efficiency measures in Germany:

> *"In Austria, you have to fulfill the obligation, otherwise you pay. In Germany they have a reward system, e.g. for conducting energy audits." (Interview partner B)*

Even though, interview partner A sees potential for improvement, including also the second reporting period, e.g. the improvement of the process from the point a company undertakes an energy efficiency measure until the measure is accepted by the monitoring agency, he stated:

> *"Meanwhile, Austria has successfully implemented the Energy Efficiency Directive and BENELUX countries are thinking of implementing the Austrian model." (Interview partner A)*

Interview partner B raised another problem that the market, as shown on the different energy efficiency trading platforms, is totally saturated, especially with water-saving fittings. As a consequence, the prices for energy efficiency measures will continue to decrease and no more measures are likely to be made until 2020. Interview partner D1 added that "[…] today, the prices for energy efficiency measures on platforms are € 10/MWh (5% of the compensation amount). Nobody buys measures, because the energy companies do not need any measures." Interview partner B suggested certificate trading as a probably superior method.

In addition, interview partner D2 highlighted that energy efficiency measures taken at end customers by the energy suppliers do not automatically lead to a decrease in overall consumption of energy.

4.9 Outlook until 2020

Four out of five companies see no challenges in fulfilling their companies' obligations in the period until 2020, as stated by interview partners A and B:

> *"We have already fulfilled our obligation. The post 2020 framework is a key issue in order to be successful." (Interview partner A).*

> *"We are missing 10-20 GWh by 2020, which can easily be reached with our own products, e.g. with a LED promotion." (Interview partner B)*

Only interview partner E mentioned that it might be a challenge as all "low hanging fruits" for fulfilling the obligation have already been implemented. He mentioned that the rating for the efficiency measure "exchange of a household lamp to a LED lamp" got very low and for example water-saving fittings have been restricted. Interview partner E sees challenges for the energy efficiency measures which have to be taken in households in the near future, because "[…] the potential is clearly in the heating sector and every measure we have taken so far, is not relevant anymore as heating systems have a life span of more than 20 years."

However, in general, the interviewees agreed that their companies are familiar with the procedure by now, making it unnecessary to improve the processes further. Nevertheless, potential for improvement for subsequent laws is seen, particularly after 2020:

> *"What will be the obligations for the next commitment period from 2020-2030? Will early actions be considered?" (Interview partner C)*

Also interview partners A and D1 asked similar questions regarding the framework beyond 2020. They argue that no further actions will be taken until the new legal regulation, if the new law does not count early actions. Furthermore, interview partner B stated: "Nobody is taking an effort to document every measure, because the administration costs money."

“If the government wants companies to make further energy efficiency measures, a reasonable transitional regulation is necessary from the first to the subsequent law." (Interview partner A)

5 Discussion

The main aim of this thesis is to relate real world experiences regarding the implementation of the Energy Efficiency Act from five Austrian utilities with findings from previous studies on utilities business models in order to broaden the basic knowledge on the topic. In this chapter the research findings are discussed by comparing the results of the interviews with present literature and finally answer the two research questions. In addition to the conducted interviews, homepages of the utilities as well as reports were taken into consideration. Furthermore, limitations of the presented study are discussed and implications for further research are given at the end.

5.1 Comparison of the Theoretical and the Empirical Lessons Learned

Various studies (see for instance Valocchi et.al, 2010, Leroi, 2016) conclude that energy efficiency poses a threat to utilities and their current business model. Kwasnik et al. (2014) even argue that there are inherent tensions between energy efficiency and the utility business model that relies on selling electricity to recoup significant capital investments. However, since the Austrian Federal Energy Efficiency Act was issued in 2015, utilities selling more than 25 GWh in the previous year are obligated to initiate energy efficiency measures at end customers to the extent of 0.6 % of their last year's energy sales in Austria.

By the 14 February 2016 and 2017, energy suppliers must have had properly implemented the required amount of efficiency measures or acquired them from a third party. The measure must originate from the commitment year. For eligibility a measure has to be proven to reduce the final energy consumption at a final customer (Enspol, 2016).

Consequently, utilities had to define profitable and scalable energy efficiency offerings and quantify the business opportunity as non-compliance would result in paying compensation in the amount of 20 Cent/kWh (Bundesgesetzblatt, 2014).

So far, energy sales companies had to report to the monitoring body their energy saving measures for the years 2014 and 2015 until 14 February 2016 and from 2016 until 14 February 2017 (Austrian Energy Agency, 2016). Even though studies have warned that the Austrian energy efficiency target for utilities cannot be reached (Deloitte, 2014), utilities have fulfilled their energy efficiency obligation after the first and second reporting period as also underlined by all interview partners.

The first obligation period covered two years, starting from 1 January 2014, even though the Act was issued afterwards, in November 2015. The registration of the energy efficiency measures at the so called "Unternehmensserviceportal" had to take place until 14 February 2016.

In line with the results of the questionnaire conducted by Energieinstitut der Wirtschaft (2016), shown in Figure 15, all six interview partners responded that most of the measures had been set by their company itself or purchased from own clients in both obligation periods.

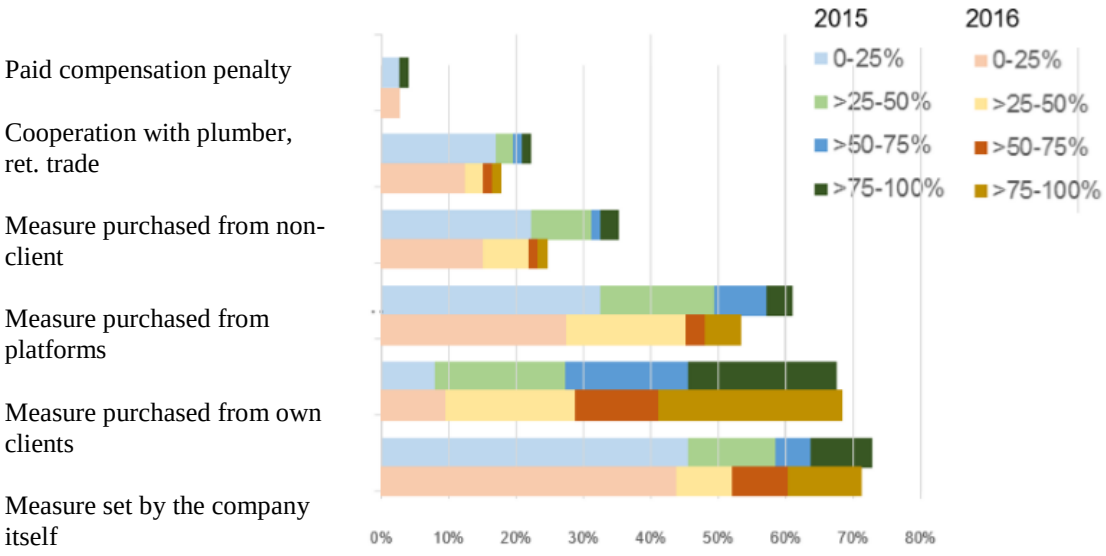

Figure 15: Fulfillment of the supplier commitment 2015 and expectation for 2016 (Energieinstitut der Wirtschaft, 2016, p.4; Basis: Obligated energy suppliers, March 2016)

In the first year, the interviewees made negative experiences with the reporting of the energy efficiency measures. First of all, the process of how to report the measures was unknown, the database was not user friendly and on top it was not clear which energy efficiency measures would get accepted by the monitoring body. Even though, the whole process of registering energy efficiency measures was and still is

an administrative burden, the interviewees came to the conclusion that they were finally familiar with the procedure, so they were not in favor to change the procedure now.

As reported by the monitoring body, a total of 9,668 energy efficiency measures were reported in the second obligation period from 1 January to 31 December 2016:

- 5,885 of these measures were reported by obligated energy suppliers;
- These energy savings amount to 7.21 PJ, whereas only 5.07 PJ were obligatory based on the energy sales notifications;
- Further 3,813 energy efficiency measures were reported voluntarily by companies.

These numbers are the first evaluations of the reports according to the Monitoringstelle, which will be proven in detail during the year (Monitoringstelle, 2016).

As already described in the previous chapter, an energy supplier has to buy his way out, if he cannot reach the savings target of 0,6 % with its energy efficiency measures. Companies must pay the federal government 20 Cent/kWh of the remaining gap as a compensation payment. Since the tariff has a penalizing character, energy suppliers are required to purchase efficiency measures from third parties on a large scale with the following options:

- Approach their own customers;
- Approach external end customers; (companies that take efficiency measures may transfer them to energy suppliers)
- Purchase energy efficiency measures from trading platforms;
- Purchase measures from measure traders.

Thus, the act seeked to establish a trading market for energy efficiency measures (Schönherr, 2016). Due to the decrease in prices for buying an energy efficiency measure, interview partner A stated that “from the commercial point of view, it was

perhaps not the best step, since the price of the measures had forfeited, but it was a hedge in case measures did not get accepted". (Interview A)

According to the energy efficiency price radar, prices for energy efficiency measures taken in households were 1,3 ct/kWh on average between November 2016 and February 2017 on trading platforms. In Austria, several energy efficiency trading platforms have been established, like ETHUS, OneTwoEnergy, Save Energy Austria GmbH, SYNECO, ACT, e-Effizienz, effizienzmeister.at and EnergiebonusHandels GmbH. (Energieinstitut der Wirtschaft, 2017).

In the industry sector, the interviewees reported that they had mainly purchased the measures from third parties (from their customers). Strong criticism came for the banking of energy efficiency measures by companies because the interviewees questioned how the monitoring body could control and validate the banking. The average price for efficiency measures in the industry on trading platforms was 1,4 ct/kWh between November 2016 and February 2017. Figure 16 shows the decrease in prices on platforms for energy efficiency measure in the industry and household sector over time since the Energy Efficiency Act had been issued.

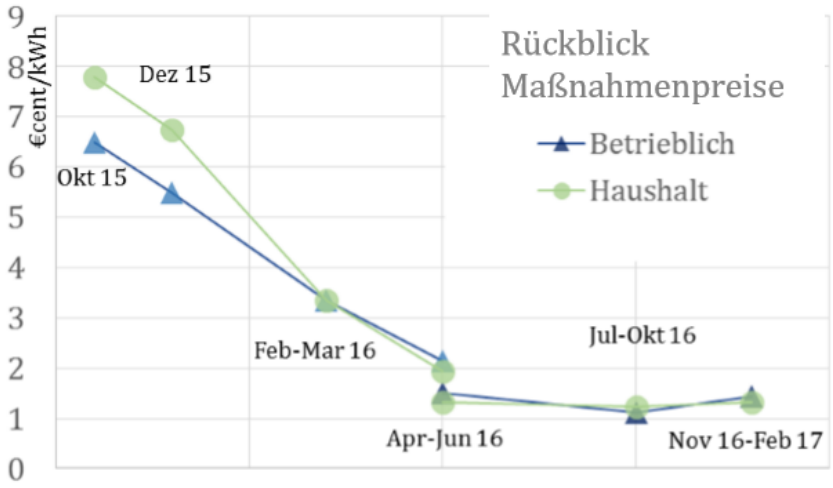

Figure 16: Decrease of prices on platforms for energy efficiency measures in the industry (in blue) and households sector (in green) (Energieinstitut der Wirtschaft, 2017, p.4)

As shown in Figure 16, the prices on platforms for energy efficiency measures are low. In general, most interviewees see no challenges for companies to report the obligated measures until 2020. However, one interviewee mentioned that 40 % of the

savings had to be made at households. While all low hanging fruits, e.g. switching to LED lamps; installing water-saving fittings have already been done, this could become problematic.

Whereas literature suggests providers to offer a broad range of technological options, from working with facility owners to improve the insulation capabilities of buildings to upgrade heating and cooling networks, and enhance metering and automation to make better use of heat systems (Leroi, 2016). Interview partner D was careful with the potential of energy efficiency measures in the heating sector. He argued that every energy efficiency measures taken in the heating sector so far might fall short as heating systems have a life span of more than 20 years and thus the measure becomes irrelevant for the next decades.

The other interviewees were more concerned about the framework 2020, especially if early actions will not be considered. They stated that companies might not take further actions until the new regulation is in place.

This is in contrast to the statements from the interview partners, who mentioned that energy efficiency, energy services and energy consulting are not issues which have arisen through the Energy Efficiency Act. The reason why they have gotten more attention was because of the compensation penalty of 20 Cent/kWh. As a result of the accruals which were made in case energy efficiency measures have to be purchased, the issue “energy efficiency” was put on the top management level and even named “causa prima” in one company.

Finally, one interview partner addressed the paradox of selling energy as main business model and having the obligation to make energy efficiency measures to the extent of 0.6 % of their last year's energy sales.

A very important aspect the interviewees highlighted was that energy efficiency measures taken at end customers by the energy suppliers do not automatically lead to a decrease in overall consumption of energy.

As a conclusion, the interview partner suggested different methods for reducing the overall energy consumption:

- collect money for big energy efficiency projects instead of small energy efficiency measures;
- introduce obligations also for the SME sector;
- introduce a reward system instead of an obligation system;
- introduce a certificate trading scheme.

Regarding the business models, all interview partners had troubles to define an economically viable and scalable energy efficiency service for households. This is in line with literature recommendation of Leroi (2013) that business models need to work with long-term economics: Many opportunities in energy efficiency ,for example, switching to LED lighting, can generate significant savings, up to 50% annually. But the payback can take years, sometimes up to 25 years for building enhancements.

In general, the interviewees commented that they do not expect to make big money from the service-oriented energy services. Overall, interview partner A summarized the services as follows: contracting is economically reasonable, demand response is good, primarily for the customer, energy management is for enhancing customer loyalty, energy procurement is a core task and Smart Home Solutions are not lucrative. E-mobility could be seen as a long-term project with a political background and may become economically reasonable one day.

According to the interviewees, the only business models that are profitable, are in the heating sector (gas thermal value equipment and heat pump) and a demand respond tool in the industry sector. The B2B business opportunity seems to be more significant than B2C. According to Leroi (2013) businesses respond more actively to savings opportunities and their average investment and account value is significantly higher than that of households. To tap this market, energy-efficiency service providers will need to define a clear value proposition for businesses, often tailoring the solutions to the industry.

5.2 Answers to Research Questions

1) What are the experiences of electric utilities of implementing the Energy Efficiency Act after the second reporting period?

In the second obligation period, the procedure was already known according to interviewees. The measures in the household sector were basically the same as reported in the first year: customers knew how to transfer energy efficiency measures and they did not report them last minute; the second year covered only one year (2016) and the reporting of the energy efficiency measures was known from the previous year.

The energy efficiency officers reported that the company has set mainly energy efficiency measures with their own products. The most commons ones the interviewees mentioned were LED promotions, A +++ refrigerators as well as freezers, gas thermal value equipment, heat pumps and circulation pumps. As a result, the interview partner stated that they did not implement new measures as their company has already set energy saving measures long before the Energy Efficiency Act was in place. All interview partners announced that their company had fulfilled the obligation of 40% of yearly savings at households in both years.

However, the interview partners made negative experiences with the database, the "Unternehmesserviceportal (USP). According to them, it was not user friendly even after two years. They strongly criticized that the form to transfer measures from the first year to the second year did not yet exist. While all interviewees criticized that the Federal Ministry of Science, Research and Economy did not provide a form to transfer the measures from the first to the second obligation period, the monitoring agency received very good feedback for their service.

The experiences with the establishment of an information centre about energy efficiency, energy consumption, energy price and energy poverty were almost the same from all the interviewees. They reported that an advisory center has already existed and the energy efficiency officers believe that it was not used more often than before.

Regarding the energy management or external audit on a regular basis, the interview partner suggested form the experience that the deadline for the conduction should be over a longer time period as the quality of the audit may suffer if all big companies in Austria need auditors at the same time. Table 10 gives an overview of the experiences of utilities after the second reporting period.

Obligation	Experiences
▪ Registration with company data and address at the monitoring body	▪ All interviewed representatives reported that their company fulfilled their obligation in the 1st and 2nd obligation period ▪ 1st obligation period – strong criticism: – issued in November 2015 and the registration of all measures had to be done until February 14, 2016; – functionality of the database; burocracy – two obligation periods, from 1.1.2014 to 31.12.2015; ▪ 2nd obligation period – system was known: – no time pressure – did not provide a form to transfer the measures
▪ Report sales of last year ▪ initiate energy efficiency measures to the extent of 0.6 % of their last year's energy sales	
▪ Establish an information centre about energy efficiency, energy consumption, energy price and energy poverty	▪ All interview partners told that an advisory center has already existed and was not used more often after the law was in place
▪ Establish an energy management system or external energy audits on a regular basis	▪ Four out of five companies introduced an energy audit. As many companies need an energy audit during a very short period, this might influence the quality of the audit.

Table 10: Experiences of utilities after the second reporting period (author's representation)

2) Which major services-oriented business models with regard to energy efficiency measures for households have electric utilities so far developed?

The main statement of all interview partners was that they had troubles to define an economically viable and scalable energy efficiency service for households. That was the reason why the question was extended also to economically viable business models for energy efficiency services in the industry. The following table shows utility-side business model elements for energy efficiency. Business model elements are based on Osterwalder and Pigneur (2010) and Osterwalder (2004) and were extended and checked with the interview partners.

	Value Proposition	Customer Interface	Infrastructure Management	Financial Aspects
Demand Response Tool (production and consumption flexibility is automated, intelligently bundled and marketed on the control power market)	The pool partners generate attractive added revenue through the flexible management of their generation and production.	Very intensive exchange with the customer because there is a regular exchange of data. The customer sets a price limit, and if this price is reached on the market, he is ready to put an action.	Hardware device with internet connection and signal transmitter, so that this process can take place automatically.	Revenue is generated simply by being willing to respond with flexibility if needed.
Heat Pump	Reduction of installation costs and operating costs.	Partner network Fair Energy Partner (heat pump manufacturers and installers who are also rewarded by a small premium)	Market partners network and large fairs; Information sheets with comparison of different heating systems and with all energy carriers listed.	Profitable and scalable.
Gas thermal value equipment and heat pump	More efficient heating system for a lower price and as a result energy savings for the next years	Partly partner company, partly own company team; mostly existing customers were asked whether they wanted a heater replacement, but offers are also for new customers	We have our own heating installation team, which is very professional, but customer relations was trained in order to promote the product	Profitable and scalable.

Table 11: Economically viable and scalable business models for energy efficiency services (author's representation)

The reason why only three different business models are listed is because interview partner B and E as well as C and D described the same business models.

5.3 Limitations

The interview sample size of five companies may be considered small, however, given that energy efficiency officers made similar experiences with implementing the Energy Efficiency Act after the second reporting period and did not develop new services-oriented business models. Hence, there is the opportunity to increase the sample size in a future research in order to confirm the thesis findings or to gain further interesting insights.

Furthermore, interviews were made with energy efficiency officers from big electric utilities. A more heterogeneous sample with energy efficiency officers from smaller utilities or from utilities from the gas or oil sector could improve the ability to generalize the findings. Thus, the thesis does not provide a full overview of the industry.

In general, this thesis shall provide an insight of the perspectives of utility executives towards the challenges and opportunities facing the electricity sector with energy efficiency measures. The findings may contribute to the discussion on business model literature and provide recommendation for utility manager. However, the results may be case specific due to the qualitative approach and should be regarded within their geographical and temporal contexts.

6 Outlook

The European Union legal framework was constructed around an energy efficiency target of 20 % for 2020 which now needs to be reset with a 2030 perspective.

On the basis of the Energy Efficiency Directive, the European Council has endorsed an indicative energy savings target of 27% by 2030 to be reviewed by 2020, the European Parliament's resolution calling for a 40% binding target. In November 2016, the Commission proposed to strengthen this policy area beyond 2020 by aiming at a binding 30% EU energy efficiency target for 2030 (European Commission, 2016c) through several pillars:

- aligning energy efficiency targets with the EU 2030 climate and energy framework;
- extending the energy saving obligation beyond 2020 which require energy suppliers and distributors to save 1.5% of energy each year from 2021 to 2030 with a view to attracting private investment and supporting the emergence of new market actors. In order to enable tailor-made policies that take account of national specificities, Member States can also meet this requirement through alternative measures that have the same effect, such as energy efficiency support schemes;
- improving metering and billing of energy consumption for heating and cooling consumers.

The negotiations aiming for a binding target for energy efficiency are still ongoing. The proposal for a revised Energy Efficiency Directive is part of a package entitled “Clean Energy for All Europeans”. The package includes eight legislative proposals in the field of energy efficiency, renewable energy, electricity market design, security of electricity supply and energy governance and aims at better aligning EU energy legislation with the 2030 energy and climate goals. The final negotiations of the “Clean Energy for All Europeans” are foreseen under the Austrian Presidency of the Council of the European Union.

7 Conclusion

This thesis presents the results of a qualitative study based on interviews on the Austrian EEO scheme. Being the first investigation on the experiences and challenges that utilities face while implementing energy efficiency obligations after the second reporting period, it provides multiple scientific insights that add to the current stack of knowledge.

In comparison with other EU countries, the Austrian EEO scheme – together with the schemes from Ireland and Slovenia – covers all energy types and all end-use sectors, encompassing a large number of obligated parties. Consequently, this large scope distributes the burden and offers flexibility to the obligated parties.

Following a number of quite controversial discussions about the obligation scheme in Austria, the first annual targets could be met and were even overachieved globally. The scheme is a reinforcement and an extension of the previous voluntary agreements. Therefore experience gained provides a profound basis for the start of the now obligatory policy. It was however surprising to see that about 22 % of obligated parties did not meet their individual targets.

The scheme is managed with an approach favoring continuous improvement, in particular through regular contacts between the monitoring agency and obligated parties. The EEO regulation is updated approximately once a year. In general, despite technical problems with the "Unternehmensserviceportal", familiar procedures known from the first reporting period allowed a smooth implementation of the second period's reporting requirements. The measures in the household sector were basically the same as reported in the first year - customers were familiar with the way of transferring energy efficiency measures and they avoided reporting them last minute.

Overall, the interviewees strongly criticized the bureaucratic expenditure of the energy efficiency measures, in particular as the energy efficiency measures taken at end customers by the energy suppliers do not necessarily lead to a decrease in the overall consumption of energy.

If policy makers aim at reducing global energy consumption, additional measures to the EU Directive on Energy Efficiency are essential, even if the direct rebound effect is low. Energy policy planning may include energy taxation measures to catch monetary savings and avoid re-spending effects. Moreover, another possibility would be to use energy efficiency to stimulate the economy and economic growth. In this case, rebound effect is desirable and no additional measures are needed. Consequently, the final policy target is key in deciding on the steps to take for an additional energy efficiency improvement.

Interviewees consistently suggest the following different methods for alternative policies to reduce the overall energy consumption:

- invest money in larger energy efficiency projects rather than in small energy efficiency measures;
- introduce obligations that also include the SME sector;
- introduce a reward system instead of an obligation system;
- introduce a certificate trading scheme.

Main reasons for suggested revisions of the scheme are new provisions in the future revised EED or if annual targets would no longer be met or to simplify the measurement, control and validation procedures.

Today it is uncertain if EEOs continue to deliver energy savings in an efficient way once the easiest potentials are depleted. This has also implications for policy makers as EEOs are expected to bring a significant share of the results to meet the national targets relating to Article 7 of the EED. An important sector for reaching the targets is the transport sector which represents a large share of the final energy consumption in most countries, but specific energy efficiency measures in transport were not investigated in this study. So far, the focus was put on the condition that 40% of energy savings have to be set in households in order to avoid strategies which are focusing merely on large projects in industry or commercial buildings.

This obligation has proven to be more difficult than initially expected. One interviewee also pointed out that “low-hanging fruits”, particularly regarding measures in the heating sector, have already been implemented. This is further

underlined by the typical lifespan of heating devices of 20 years or more. The challenge is to promote actions that require more investments but produce more energy savings in the long term, such as “deep” retrofit of buildings.

In this context, a very interesting aspect for households is that providers from completely different areas, such as Google or Amazon from the technology industry, develop new business models to offer smart home solutions. Even if they have the intention of developing a service for lifestyle and convenience rather than an energy efficiency service, smart home solutions may come at incredibly low cost in the near future.

A clear result from the interviewees was that a scalable energy efficiency service for households appears to be hard to define as all interviewed parties still struggle in defining economically viable models. With regard to the industry sector, the installation of gas thermal value equipment and heat pumps was seen as potential future models. In this context, B2B business opportunities seem to be more significant than B2C. In line with Leroi (2013) businesses respond more actively and faster to saving opportunities. Their average investments and account values are significantly higher than those of households.

Apart from that, further new business segments have been developed, e.g. for conducting energy efficiency audits and for trading energy efficiency measures on platforms. With regard to the energy management or external audit on a regular basis, the interview partners suggested that the deadline for the conduction should be extended over a longer period as the quality of the audit would suffer if all large companies in Austria need auditors at the same time every four years.

The experiences made with the establishment of an information centre on energy efficiency, energy consumption, energy price and energy poverty were almost the same by all the interviewees. The energy efficiency experts confirmed that an advisory center has already existed and they believe that it was not used more often than before. This could be an indication of whether these information centers are helpful or not in their current set-up.

Nevertheless this thesis indicates some very interesting and prospectively fruitful ideas for further research in multiple scientific domains. The questionnaire used can be applied for future research work to analyze the experience of even more experts.

This topic will gain more importance in light of the negotiations for a new energy efficiency target with a perspective towards 2030. Overall, the European Union legal framework was constructed around an energy efficiency target of 20 %. As a consequence of pending investment decisions in energy efficiency measures, companies call for a stable policy framework after 2020. Negotiations on the European level have already started, aiming at a 30 % EU binding energy efficiency target for 2030. The future energy efficiency framework 2030 will set the course for decreasing energy consumption in the European Union. Austria will take an important part as final negotiations of the Energy Efficiency Directive are foreseen under the Austrian Presidency of the Council of the European Union in 2018.

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9 Annex

Interviews

Interview partner A, 21.2.2017

Interview partner B, 27.2.2017

Interview partner C1 and C2, 28.2.2017

Interview partner D, 28.2.2017

Interview partner E, 16.03.2017

10 Questionnaire

Sehr geehrte Damen und Herren,

Ich bin Studentin des General Management MBA an der TU Wien in Kooperation mit der Donauuniversität Krems und würde mich freuen, Sie für ein Experteninterview zu gewinnen. Im Rahmen meiner Masterarbeit beschäftige ich mich mit der Implementierung des Energieeffizienzgesetzes und der Entwicklung von neuen Geschäftsmodellen für Energieeffizienz Dienstleistungen.

Ziel dieser Forschungsarbeit ist es, einerseits die Auswirkungen des Energieeffizienzgesetzes auf Energieversorger nach der 2. Verpflichtungsperiode zu analysieren. Andererseits soll erforscht werden, wie Energieversorger mit Herausforderungen bei der Einführung neuer Geschäftsmodelle im Energieeffizienz-Bereich umgehen.

Die Interviewdauer beträgt ungefähr 40 Minuten und wird in deutscher Sprache durchgeführt; die Master Thesis wird in englischer Sprache verfasst. Das Gespräch wird aufgezeichnet und die Ergebnisse in englische Sprache übersetzt. Gerne sende ich Ihnen anschließend die Zusammenfassung des Interviews zur Durchsicht und Freigabe.

Herzlichen Dank für Ihre Unterstützung!

DI Marie-Theres Bristela

ALLGEMEINE INFORMATION

Wie lautet Ihr Jobtitel/Beschreibung der Funktion im Unternehmen?

Wie lange arbeiten Sie in der Firma/in der Industrie?

Geschlecht & Alter?

Part I: ENERGIEEFFIZIENZGESETZ (EEffG)

(1) Haben Sie Ihre Lieferantenverpflichtung gemäß §10 EEffG[3] für die 1. und für die 2. Verpflichtungsperiode erfüllt?

1. Verpflichtungsperiode (2015)	**2. Verpflichtungsperiode (2016)**
☐ selbst gesetzt? (Hauptmaßnahme?)	☐ selbst gesetzt? (Hauptmaßnahme?)
☐ von einem Dritten zugekauft	☐ von einem Dritten zugekauft
☐ im Rahmen einer Branchenverpflichtung (§ 11 EEffG) gemeinsam mit anderen verpflichteten Energielieferanten durchgeführt	☐ im Rahmen einer Branchenverpflichtung (§ 11 EEffG) gemeinsam mit anderen verpflichteten Energielieferanten durchgeführt
☐ direkt vergeben	☐ direkt vergeben
☐ ausgeschrieben	☐ ausgeschrieben
☐ eine Ausgleichszahlung mit schuldbefreiender Wirkung von 20 Cent pro kWh geleistet	☐ eine Ausgleichszahlung mit schuldbefreiender Wirkung von 20 Cent pro kWh geleistet
☐ nicht erfüllt	☐ nicht erfüllt

(2) Welche Erfahrung haben Sie bei der Anrechnung der Energieeffizienzmaßnahmen im Rahmen des Energieeffizienzgesetzes in der 1./2. Verpflichtungsperiode gemacht?

(3) Welche Erfahrung haben Sie mit der Errichtung einer Beratungsstelle für Endverbraucher zu den Themen Energieeffizienz, Energieverbrauch, Energiekosten und Energiearmut gemacht?

[3] Energielieferanten, sofern sie die Mindestabsatzgrenzen von 25 GWh im Vorjahr überschritten haben, müssen zum 2. Mal bis 14.2.2017 ihre Energieeffizienzmaßnahmen im Ausmaß von 0,6 Prozent ihres Vorjahresabsatzes melden.

(4) Welche Erfahrung haben Sie mit der Einführung eines anerkannten Managementsystems inkl. Energieaudits oder Durchführung eines regelmäßigen Energieaudits gemacht?

(5) Wo sehen Sie Verbesserungspotenzial des Energieeffizienzgesetzes?

(6) Welche Herausforderungen sehen Sie zukünftig beim Setzen von Energieeffizienzmaßnahmen im Ausmaß von 0,6 Prozent ihres Vorjahresabsatzes bis 2020?

Part II: SERVICE-ORIENTIERTES BUSINESS MODEL FÜR ENERGIEEFFIZIENZ

(7) Wie hat sich der Geschäftsbereich Energieeffizienz-Dienstleistungen und Produkte seit in Kraft treten des Energieeffizienzgesetzes entwickelt hinsichtlich:

a. Mitarbeiter
b. Budget
c. Stellenwert im Unternehmen

(8) Welche Service-orientierten Energiedienstleistungen bietet Ihr Unternehmen Kunden an, um Energieeinsparungen zu erzielen?

a. Performance Contracting
b. Demand Response Measures
c. Energy Efficiency (Consulting up to installation)
d. Energy Management
e. Energy Procurement
f. Smart Home Solutions
g. E-Mobility Solutions
h. Bitte ergänzen Sie: _____

(9) Bitte beschreiben Sie das wichtigste Service/Produkt für Energieeffizienz für Haushalte[4] hinsichtlich:

Value proposition	Welchen Nutzen hat das Service für Kunden?
Customer	Welche Art von Beziehung pflegen Sie zu den Kunden?

[4] mindestens 40 Prozent der Maßnahmen müssen bei Haushalten im Sinne des Wohnraums oder des privaten Mobilitätsbereichs oder im öffentlichen Verkehr wirksam sein

Interface Wie arbeiten Sie am Aufbau, der Pflege und Erweiterung der Beziehung? Auf welchem Weg erreichen Sie Ihre Kunden?

Infrastructure Welche Ressourcen/welche Infrastruktur werden benötigt, um das Produkt/ Service anbieten zu können?
Assets:
Human capital: Wurde das Umsetzungsteam speziell für das Service geschult? Mussten Experten zugekauft werden?
Partnerships: Gibt es Kooperationen mit anderen Unternehmen?

Revenue Ist das Business Model skalierbar und profitabel? Was sind die Kunden bereit für das Service zu zahlen? Welchen prozentuellen Anteil werden durch die Einnahmen aus dem Service im Verhältnis zu allen Dienstleistungen, die Ihr Unternehmen im Energieeffizienzbereich anbietet, erwirtschaftet? Wie groß ist der prozentuelle Anteil im Verhältnis zum gesamten Betriebseinkommen?

(10) War das Energieeffizienzgesetz für das Entwickeln dieser Service-orientierten Dienstleistung ausschlaggebend oder haben Sie diese bereits davor angeboten?

Geplante zukünftige Weiterentwicklung

(11) Welche Ziele verfolgen Sie bis 2020 im Bereich EE?

(12) Welche politischen Rahmenbedingungen sind erforderlich, damit Ihr Geschäftsmodell für Service-orientierte Energieeffizienz-Dienstleistung erfolgreich sein kann?

ABSCHLUSS DES INTERVIEWS

(13) Gibt es Ihrer Meinung nach noch offene Punkte, die Sie gerne ergänzen möchten?

(14) Darf ich Sie nochmals kontaktieren, wenn ich während der Analyse der Interviews auf Unklarheiten stoße bzw. wenn weitere Fragen auftauchen?

(15) Gerne kann ich Ihnen die Zusammenfassung des Interviews zur Durchsicht schicken, nachdem ich es fertiggestellt habe.

Vielen Dank, dass Sie sich Zeit für das Interview genommen haben und für die ausführliche Beantwortung der Fragen!