IIIEE Theses 2010: 21

Energy service contracting in Slovenia

Comparison of the barriers and drivers for Energy service contracting development in Germany and Slovenia

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Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, September 2010

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ISSN 1401-9191

Acknowledgements

My supervisors facilitated a great deal the accomplishment of this thesis. I am very grateful for the insights and suggestions provided by Beatrice Kogg and Philip Peck.

I would also like to thank Lars Strupeit (IIIEE), for his valuable suggestions during the research.

Also, I would like to thank to all those who answered my survey questions or were ready for an interview and made the research possible.

Abstract

"We will leave a steam engine free of charge to you. We will install these and will take over for five years the customer service. We guarantee you that the coal for the machine costs less, than you must spend at present at fodder (energy) on the horses, which do the same work. And everything that we require of you is that you give us a third of the money, which you save." [James Watt, 1736-1819]

Increased energy efficiency is identified as a key strategy to tackle three energy-related challenges (energy security, climate change and economic development) with low trade-offs and huge win-win opportunities. Energy service contracting represents an instrument of the demand side energy management that enables cost-effective energy savings. However, the instrument implementation is many times hindered by the market barriers and failures. In Slovenia, the biggest barriers to its uptake come from the lack of information about the instrument, lack of trust in providers and unsupportive legislation. Lack of information causes high transaction costs to all actors on the market. It can partly be attributed to the poor policy mix in Slovenia. The lack of trust in providers is another barrier that is frequently mentioned and a large share of scope for providers' opportunistic behaviour comes from the limited competition on the market. The most restrictive to the Energy service contracting in the public sector, that has been identified as the most promising potential client, is unsupportive legislation.

Executive Summary

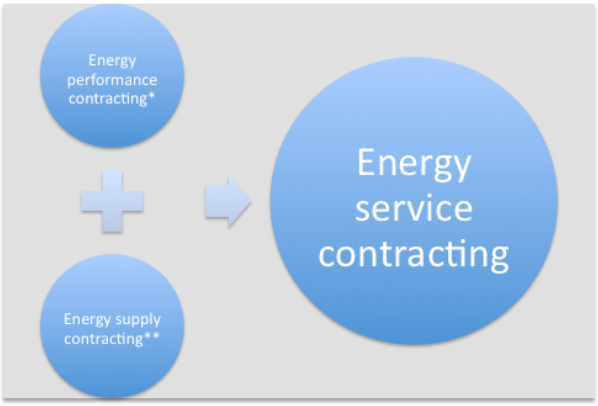
Background and a research objective

The increasing demand for energy, volatile oil and gas prices, climate change, growing dependence on energy imports are the energy-related issues that are shaping the European Union policy in recent years. These issues have gained even more focus during the recent economic downturn, because energy plays an important role in economic growth.

As it has been recently discussed in academic literature (Stahel, 2006; Tukker & Tischner, 2006; Steinberger, Niel & Bourg, 2009; Mont 2004), selling services or functions instead of selling products or, when applied to energy sector, energy performance delivery instead of energy delivery can bring environmental and social benefits and can prove economically viable at the same time. The idea of the performance economy is to reduce the material flow of the economy, which implies maximization of energy savings, reduction of environmental impact and total economic savings in the energy chain (Steinberger et al., 2009).

Within this context, recent European energy policy addresses the importance of the energy efficiency improvements in all sectors. It also stresses the importance of the demand side management and also Energy service contracting to achieve better energy efficiency performance. Energy service contracting is a measure of the demand side management that deliver higher energy efficiency and can contribute to the performance based economy.

Energy service contracting is a comprehensive, yet modular tool to implement energy efficiency investments. The energy service company (ESCO) provides the energy service that the client orders. It consists of Energy performance contracting, which can be (not necessarily) complemented by Energy supply contracting. Energy performance contracting means that an ESCO guarantees energy savings to the customer and that its investment into energy efficiecy improvements is repaid through the energy savings achieved by this investment. Therefore it can be also perceived as a form of financing. Energy supply contracting means that an energy supply company or ESCO provide useful energy to the customer



Despite the fact, that Energy performance contracting is recognized as an economically viable instrument to achieve energy savings through improved energy efficiency and despite some efforts to promote its development lately, the instrument has been rarely used in Slovenia.

Slovenia belongs to the group of European countries with a very low uptake in Energy service contracting. There are barriers to its development on the market; some have already been previously identified.

The objective of the research is to contribute to the knowledge about the barriers and incentives for the Energy service contracting in Slovenia. By achieving this objective, the research helps to promote and facilitate the further uptake of the instrument in the country.

To address the objective of the research, I aim to answer the following research questions:

- Which are the drivers and barriers on a developed (German) market and undeveloped (Slovenian) market that have been identified in the previous research?

- Which are the additional drivers and barriers that are identified by different stakeholders as important in the context of Slovenia and are beyond the insights of the existing surveys.

- Which of the barriers and drivers from this set are important when they are explored through the transaction cost economics framework.

Such evaluation of the barriers and drivers is needed to gain a better understanding of which policy measures could be used to address the Energy service contracting development in Slovenia

Research Methodology

The conceptual frame and the theory that serves a starting point of the research and guides the observations is a theory of transaction costs economics

According to the transaction cost economics, I look into barriers (also market failures) and drivers for Energy service contracting. Then I look into determinants of the transaction costs to see the extend of transaction costs caused by these barriers. The determinants under observation are, following the Sorrell (2007) framework: political, economic, legal and financial framework of Energy service contracting market in Slovenia and Germany, competitiveness on the Energy service contracting in both countries and asset specificity and task complexity of Energy service contracting in both countries. The transaction costs deriving from these areas according to Sorrell (2007) determine the economic viability of the contracts when they are compared to the production costs of the investment. I also look into determinants of the production costs that are according to Sorrell (2007) economies of scale and market incentives.

For data collection I use various sources to increase objectivity. The research included literature review, survey and interviews. For data analysis transaction cost analysis was used. It provides a descriptive overall assessment of the barriers and drivers on the Energy service contracting market.

Main findings

Limited information and limited competition seem to be the two most important market failures that drive the opportunistic behaviour and moral hazard on the Energy service contracting market. The *lack of information* about the instrument is identified as one of the biggest barriers to Energy service contracting market development and causes transaction

costs to potential clients that look for the information on energy service contracting possibilities. It can partly be attributed to the poor policy mix in Slovenia. Also *lack of best practice examples* and information raises the transaction costs for commercial banks that are unwilling to offer cheap project financing, which consequently raises the production costs of contracting.

Lack of trust in providers is another barrier that is frequently mentioned. A large share of scope for opportunistic behaviour on the side of contractors comes from the limited competition on the market.

Lack of information about the instrument and lack of trust in providers point to the problem discussed by Mills et. al (2006) about the lack of understanding of financial and performance risks of energy savings projects. If the information about the risk and volatility is not provided, investors tend to avoid the projects.

Unsupportive legislation, complicated administrative procedures and non-compatible accounting rules are also among the most frequently mentioned regulatory barriers.

A lack of technical knowledge is another frequently reported barrier that raises the transaction costs of contracting. There is a lack of technical knowledge on the side of potential clients in the public sector, which results in complete denial of the project or in tender offers for energy efficiency projects that are unclear, non-comprehensive and sometimes unfavourable to energy service contractors.

There are two important barriers reported on the side of determinants of production costs: *long pay-back periods and no economies of scale*.

A legislation that would allow the energy service contracting seems to be a necessary condition for the energy service contracting uptake. Among the variables that compose a sufficient condition for the energy service contracting uptake is better and easily available information about the instrument. However, the problem (a market failure) of limited competition remains.

Concluding remarks

This research responded to the lack of knowledge about the barriers and possible drivers for the Energy service contracting development in Slovenia. The research examined the determinants of the transaction and to the lesser extent also production costs of the Energy service contracting in Slovenia and outlined the barriers and incentives that are important from the perspective of transaction (and production) costs and from the perspective of the actors on the market. A legislation that would allow the energy service contracting is among the biggest barriers on the Slovenian Energy service contracting market. Its importance comes from the fact that it represents a necessary condition for the Energy service contracting uptake. If this barrier is not removed, the removal of the other would not improve the uptake. Other determinants of the transaction costs compose sufficient conditions for the energy service contracting uptake. Among the later, the most important is a favourable political framework that would allow better and easily available information about the instrument. Other important conditions are available standard methods for project risk evaluations, and better technical knowledge on the energy related issues in the public sector. However, the problem (a market failure) of limited competition remains.

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Abbreviations

EES = Energy efficiency service

EPC = Energy performance contracting

ESC = Energy service contracting

ESCO = Energy service company

ESD = European Directive 2006/32/EC on energy end-use efficiency and energy services

EUR = Euro

Exajoule (EJ) = (10^{18} J)

Gigajoule (GJ) = one billion joules (10^{9} J)

Kilojoule (KJ) = one thousand joules (10^{3} J)

KWh = Kilowatt hours (

Megajoule (MJ) = one million joules (10^{6} J)

MWh = Megawatt hours (

Terajoule (TJ) = one trillion joules (10^{12} J)

1 Introduction

This chapter aims to present the background and a framework of the research. It includes the problem definition, objective of the research and the research questions, it explains the scope and the limitations of the research and addresses the target audience. The end of the chapter outlines the content of the thesis.

1.1 Background of the research

In the background of the research I shortly present the importance of increased energy efficiency for the sustainable development and the unexplored potential in energy efficiency, energy policy in the European Union that acknowledges the value of energy efficiency improvements, and the role of Energy performance contracting in energy efficiency improvements.

1.1.1 Energy challenges and current strategies to limit green house gas emissions in the European Union

The increasing demand for energy, volatile oil and gas prices, climate change, growing dependence on energy imports[1] are the energy-related issues that are shaping the European Union policy in recent years. These issues have gained even more focus during the recent economic downturn, because energy plays an important role in economic growth. The European Commission estimates that EUR 1 trillion is needed over the next 20 years to meet expected energy demand and replace old infrastructure in EU (European Commission, 2006). Decoupling economic growth from energy consumption has become one of the priorities of the EU. In December 2008, EU Heads of State and Government set a series of demanding climate and energy targets to be met by 2020, collectively they are known as the 20-20-20 targets and they mean a reduction in EU greenhouse gas emissions of at least 20% below 1990 levels, 20% of EU energy consumption to come from renewable resources and a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency (European Commission, 2010).

Current strategies to limit green house gas emissions either target emissions directly (e.g. carbon taxes and carbon quotas), or promote renewable energy production or energy efficiency measures through regulation and market-based instruments. The later usually impact the supply side management, so the fundamental structure of the energy market remains largely unchallenged. However, there are efforts on the side of EU policy to strengthen the demand side of energy services. The Directive 2006/32/EC on energy end-use efficiency and energy services in the 7th article says that the aim of the Directive is not only to continue to promote the supply side of energy services, but also to create stronger incentives for the demand side. As it has been recently discussed in academic literature (Stahel, 2006; Tukker & Tischner, 2006; Steinberger, Niel & Bourg, 2009; Mont 2004), selling services or functions instead of selling products or, when applied to energy sector, energy performance delivery instead of energy delivery can bring environmental and social benefits and can prove economically viable at the same time. The idea of the performance economy is to reduce the material flow of the economy, which implies maximization of energy savings, reduction of environmental impact and total economic savings in the energy chain (Steinberger et al., 2009). A performance based energy economy is one aspect of transforming an energy system that we

[1] EU energy dependency is 55% and it is predicted to rise (European Commission, 2009)

know today into sustainable energy system and the Energy performance contracting is one of the demand side management measures that endorse the performance based energy economy. The Energy performance contracting means that the Energy service company (ESCO) guarantees certain energy savings instead of (just) energy delivery. It is an instrument that is used to achieve higher energy efficiency.

1.1.2 The role of energy efficiency

Increased energy efficiency is identified as a key strategy to tackle three energy-related challenges (energy security, climate change and economic development) with low trade-offs and huge win-win opportunities. There is a significant potential for reducing energy consumption in EU, especially in residential and commercial buildings, energy-intensive industry and transport (Ferrari, 2008). International Energy Agency (IEA) estimates that up to 83 EJ (Exajoule) energy could be saved by 2030 only with implementation of range of cost-effective energy efficiency measures (IEA, 2007). A substantial amount of literature provides calculations of the energy efficiency potential improvements. Among the well known are the International Panel on Climate Change (IPCC) report from 2001, which shows that half of the needed carbon emissions reduction by 2020 could be achieved through cost-effective energy efficiency improvements (IPCC, 2001), and the global carbon abatement cost curve developed jointly by McKinsey and The Vattenfall Institute of Economic Research (Mc Kinsey, 2007) that provides a map of the world's abatement opportunities and shows that almost 40 percent of potential abatement would earn a positive economic return. There are several other studies that support the view of around 40% in a technical potential of a reduction (Ferrari, 2008).

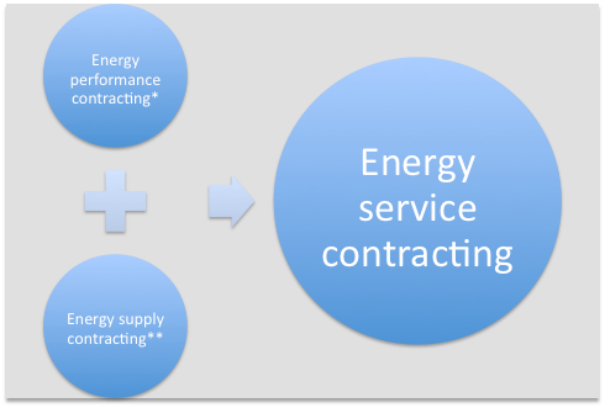
1.1.3 Energy efficiency gap

Yet, there is an energy-efficiency gap (energy efficiency paradox), which means that there is a gap between actual and optimal energy use. Adam B. Jaffe and Robert N. Stavins (1994) discuss the meaning of the optimal energy use and explain it through economic, hypotetical, narrow social and the true social optimum (Jaffe & Stavins, 1994). For the purpose of this paper we use the economists' economic optimum and use the definition that is also used by International Energy Agency: "The energy efficiency gap is the difference between the actual level of energy efficiency and a higher level that would be cost-effective from the individual's or firm's point of view" (OECD, 2007; IEA, 2007). This energy-efficiency improvement potential is well discussed in the academic literature. The neo-classical economists explain the gap with market barriers and market failures. Behavioural economists support the later view with the transaction cost economics (Golove & Eto, 1996). Market failures in a form of transaction costs on energy-efficiency market are a basis for government intervention (Golove et al., 1996) because market failures mean a departure from the Pareto efficiency. McKinsey (2010) concludes that we need new policies, regulatory frameworks, and institutions that would address market failures and enable the use of abatement opportunities and help to reach critical emissions targets. Also market barriers that are not necessarily market failures are many times subject of national policies if they want to achieve certain environmental, social or other targets.

1.1.4 Energy performance contracting as a part of Energy service contracting

According to OECD/IEA (2010) much of the increasing energy efficiency can be achieved through low-cost options. The European Commission has put forward Energy performance contracting as an important measure to improve energy efficiency and urges member countries to use such financial instruments for energy savings, particularly in the public sector (Directive 2006/32/EC). Energy performance contracting is usually a part of broader energy services contracting offered by energy service companies (ESCOs) (Androschin & Ungerböck, 2009) and is therefore discussed together with Energy supply contracting (see box below). In this paper, Energy performance contracting together with the Energy supply contracting is categorized as Energy service contracting.

Energy service contracting is a comprehensive, yet modular tool to implement energy efficiency investments. The energy service company (ESCO) provides the energy service that the client orders. It can be focused on a single energy efficiency improvement, using only part of the energy package that energy service companies usually offer (planning, financing, operation and maintenance, measurements, verification etc.) or it can mean implementation of comprehensive energy efficiency solutions.



**Energy performance contracting* means that an ESCO guarantees energy savings to the customer. ESCO's investment in energy efficiency improvements is repaid through the energy savings achieved by this investment.

***Energy supply contracting* means that an energy supply company or ESCO provide useful energy to the customer

ESCOs are a diverse group, but they all share one characteristics - their revenue is linked to delivering energy savings. Only a few international reviews of ESCOs have been carried out to date, most comprehensive among them are Vine (2005) and Bertoldi et al. (2006). Bertoldi et al. (2006) focuses on Europe, Vine (2005) is an international ESCO study. Recently, European Commission (under the Intelligent Energy Europe Programme) initiated two projects that look into energy service market in the EU. The first one is commissioned by the Berliner Energieagentur (Berlin Energy Agency) and is called EESI – European Energy Service Initiative. It aims to broadly promote the implementation of Energy performance contracting in Europe. The second one is commissioned by the Wuppertal institute and is called Change Best Program. It aims to promote the development of an energy efficiency service market.
These studies show a large number of differences that exist among ESCOs and types of

contracts between them and clients. They also show that there is a huge market potential for ESCOs within Energy service contracting. Energy service contracting has proven to be both environmentally and economically viable; however, it has been very little discussed in the academic literature. Hansen & Weisman (1998), Sorrell (2004), Langniss & Praetorius (2006), Andersen et al. (2009), Jackson (2010) are among few authors that are discussing the economics of energy service contracting. Usually, the theoretical framework used for reasoning is the concept of transaction cost economics, which is also used in this paper.

1.1.5 Energy service contracting in Slovenia

In Slovenia, Energy service contracting is poorly developed. There have been some efforts to promote its development lately, because of the requirements of the EU Directive 2006/32/ES on energy end-use efficiency and energy services. According to the Article 5 of the Directive, the public sector should take an exemplary role in applying energy efficiency measures. The Slovenian National Energy Efficiency Action Plan (NEEAP) accordingly names a few measures that the public sector will undertake, among them also the Energy performance contracting. In the NEEAP, Energy performance contracting is identified as a financial instrument that should be used, particularly in the public sector. It is also named among the multisectoral instruments that should be promoted in the industrial sector (NEEAP Slovenia, 2008). The NEEAP also acknowledges that the EU Directive 2006/32/ES requires from the member states to remove the legal barriers that inhibit the use of innovative forms of financing like Energy performance contracting and promote the development of standard contracts for these instruments. The main aim of using Energy performance contracting in the public sector, as recognized in the NEEAP, is to include the private investors in the activities to increase energy efficiency and have no obligation on the government side to use its own budget. Despite the fact, that Energy performance contracting is recognized as an economically viable instrument to achieve energy savings through improved energy efficiency and despite the NEEAP that encourages its use, the instrument has been rarely used in Slovenia.

According to the director of the Energy efficiency centre in Slovenia, Mr. Stane Merse, the comprehensive knowledge on the important barriers that hinder the Energy service contracting in Slovenia is still missing. There are some important barriers identified, however the list is too limited to provide a clear picture to the decision makers of what are the issues that the main actors find the most disturbing. To provide a more comprehensive list of barriers and drivers for Energy service contracting development in Slovenia, different relevant actors are interviewed or asked to provide answers to the survey that I have conducted among Slovenian municipalities.

1.2 Problem definition

Within the research background it has been argued that the Energy service contracting represents an instrument of the demand side energy management that enables cost-effective energy savings. The European Commission has required from the member states to implement policy measures that are necessary to promote Energy service contracting (Directive 2006/32/EC). They are expected to use the instrument particularly as a financial instrument for energy savings in the public sector (Directive 2006/32/ES). Up to date the Energy service contracting has been widely used in some European countries, but not in the others.

Slovenia belongs to the group of European countries with a very low uptake in Energy service contracting. There are barriers to its development on the market; some have already been previously identified. However, according to Mr. Merse, Energy Efficiency Centre Head at the Jozef Stefan Institute, the leading Slovenian scientific research institute, there is still a lack of knowledge about the magnitude of these and potential other barriers. Also there may be some important drivers for the development of the instrument that have not been explored yet. There seem to be insufficient understanding of the barriers and drivers for the Energy service contracting in Slovenia.

1.3 Objective and research questions

The Energy service contracting has remained underdeveloped in Slovenia despite the efforts on a side of the European Union to promote the instrument in all member states and despite the recognition of the importance of the instrument in the Slovenian National Energy Efficiency Action Plan (NEEAP) (NEEAP Slovenia, 2008). Obviously, the barriers to its development are bigger then the drivers. In contrary, in Germany, where the Energy service contracting has also been recognized in the NEEAP (NEEAP Germany, 2007), the drivers seem to prevail over the barriers, because the instrument has been widely used.

The purpose of the research is to contribute to the knowledge about the barriers and incentives for the Energy service contracting in Slovenia. By achieving this objective, the research helps to promote and facilitate the further uptake of the instrument in the country.

To address the purpose of the research, I aim to answer the following research questions:

- RQ 1: Which are the drivers and barriers on a developed (German) market and undeveloped (Slovenian) market that have been identified in the previous research?
- RQ 2: Which are the additional drivers and barriers that are identified by different stakeholders as important in the context of Slovenia and are beyond the insights of the existing surveys.
- RQ 3: Which of the barriers and drivers from this set are important when they are explored through the transaction cost economics framework.

Such evaluation of the barriers and drivers is needed to gain a better understanding of which policy measures could be used to address the Energy service contracting development in Slovenia.

1.4 Scope and Limitations

This research is limited in scope and time and there are several aspects of the research border and other limiting factors that need to be addressed. Within the time and resources available for the work, only a small subset of possible comparisons is feasible.

The research is geographically limited. Energy service contracting is looked into from the perspective of EU regarding the energy efficiency policy and general barriers to energy efficiency; however two countries are taken under the closer observation, Germany and Slovenia. Slovenia falls into a group of EU member counties where Energy service contracting market is relatively underdeveloped. In this research it is compared to the German Energy service contracting market that is relatively well developed comparing to the rest of EU. Germany has been chosen, because it offers numbers of best practice examples to learn from. In order to identify the barriers that could be removed and identify the drivers that are missing to achieve a higher uptake of the Energy service contracting comparison with the country that

succeeded to bring the Energy service contracting to the higher level. Besides, there is no country in the European Union with similar market structures to Slovenia that would have a relatively well developed Energy service contracting market and would be a good example to learn from. However, there are limitations deriving from such a choice. When comparing Germany to Slovenia, we have to be aware of the difference in the market size and market structures.

The research is also limited by the types of the energy efficiency service providers included. There are many types of energy efficiency service providers on the market. Energy companies, ESCOs, energy agencies, consultancy and engineering companies, equipment providers. In this paper the focus is on ESCOs that are able to provide Energy performance contracting, together with, or without Energy supply contracting and other energy services. European Directive 2006/32/EC on energy end-use efficiency and energy services defines ESCOs as "a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in doing so. The payment for the services delivered is based (either entirely or in part) on the achievement of energy efficiency improvements and/or on meeting other agreed performance criteria" (Article 1i, Directive 2006/32/EC). Also energy companies can act as ESCOs, delivering Energy service contracting as one of the energy services that they offer.

In terms of contracting forms, this paper considers both types of Energy service contracting, Energy performance contracting and Energy supply contracting. The contracts that are often used in energy efficiency services contain elements of both. Energy performance contracting has been identified by the European Commission as a more effective tool for energy efficiency improvements comparing to Energy supply contracting. I have decided to broaden a scope from the Energy performance Contracting to Energy service contracting that also includes the Energy supply Contracting. The reason for that is that there is only one pure ESCO in Slovenia, offering the Energy Performance Contracting. Other companies offer different kinds of the Energy service contracting and the biggest energy company in Slovenia combines the Energy performance contracting with the Energy supply contracting. This company has conducted most of the Energy service contracting projects on the Slovenian market.
Energy supply contracting focuses on useful energy streams delivery, mainly in industry. *Energy performance contracting*, however, focuses on final energy services, mainly in public and commercial buildings. Typical technologies of Energy supply contracting focus on boilers, heat pumps, refrigeration, compressed air and industrial gasses. Typical technologies involved in Energy performance contracting are HVAC (Heating, Ventilating and Air Conditioning), lightning, motors, building insulation. Therefore, ESCOs are in case of Energy supply contracting providers of primary energy conversion equipment and in case of Energy performance contracting providers of secondary conversion equipment. Anticipated production costs savings are higher for Energy performance contracting then for Energy supply contracting, however, also anticipated transaction costs are higher for Energy performance contracting (Sorrell, 2007). The usual base for ESCO revenues is a unit price for delivered energy for Energy supply contracting and reduction in the total cost of final energy services from the baseline for Energy performance contracting (Helle, 1997). The usual ESCO services include developing, designing, financing energy efficiency projects, installing the energy efficient equipment and providing the operations & maintenance, measuring and monitoring the energy consumption and verifying the energy savings of the project during the contract lifetime (Bertoldi et al, 2006; Suerkemper, 2010).

There are also limitations in the considered financing options. Client financing usually means that the capital is provided by the client, but backed by an ESCO energy savings guarantee. Clients can also finance the project and as a borrower provide a guarantee to the financing institution,

however the guarantee of savings by ESCO is missing and such arrangement can no longer be called Energy performance contracting (Bertoldi et al., 2006). In it's purest form Energy performance contracting is financed by an ESCO or a third party. In this paper all types of financing are included in the research scope in order to be able to get an overview of the barriers to Energy performance contracting also in the area of financial framework. Third-party financing is the most widely used form of financing energy efficiency projects. Unlike other forms of third-party financing (e.g. leasing), third-party financing in energy efficiency projects means that a payment is directly linked to the success of the implemented measures, i.e. energy savings in Energy performance contracting. In the Slovenian National Energy Efficiency Action Plan (NEEAP), there is an explanation of how should the Energy performance contracting be used in the public sector, particularly for financing investments in energy efficiency improvements in public buildings (e.g. hospitals, schools and kindergartens). The contractor is perceived in NEEAP as the one who carries the financial and performance risk. That means that the contractor should provide the financing, and not the client.

Another limitation comes from the *size of the sample* from the conducted survey among Slovenian municipalities. The survey about the barriers to Energy service contracting development was sent to all municipalities (there are 210 municipalities in Slovenia), however there were only 19 answers. The two answers among the received 19 answers, however, represent more then one municipality (each of them around 30). The answers from the biggest municipality (Ljubljana) are missing. Also, there was no response from the government level; therefore the research lacks the answers about how the government level perceives the importance of certain barriers and drivers.

1.5 Methodology

Here I present the design of the research, a plan of how to get from objectives and research questions to the research answers and conclusions. First I position the research into the conceptual frame, then I explain the methods for data collection, afterwards I present the method for data analysis.

The conceptual frame and the theory that serves a starting point of the research and guides the observations is a theory of transaction costs economics. According to Sorrell (2007) the transaction costs have to be evaluated for the certain Energy service contracting and then compared to the savings in the production costs enabled with contracting to see if the option is economically viable. Therefore, to be able to test the viability of the investments, the determinants of transaction costs have to be identified and assessed. This research focuses only on this preliminary stage, on finding the important determinants of transaction costs i.e. market barriers and failures. The findings can be used in further research work to test the economic viability of the Energy service contracting in Slovenia.

According to the transaction cost economics, I look into barriers (also market failures) and drivers for Energy service contracting. Then I look into determinants of the transaction costs to see the extend of transaction costs caused by these barriers. The determinants under observation are, following the Sorrell (2007) framework: political, economic, legal and financial framework of Energy service contracting market in Slovenia and Germany, competitiveness on the Energy service contracting in both countries and asset specificity and task complexity of Energy service contracting in both countries. The transaction costs deriving from these areas according to Sorrell (2007) determine the economic viability of the contracts when they are compared to the production costs of the investment.

1.5.1 Methods for data collection

In this research I use triangulation, a method of data collection from different sources, to increase objectivity of the research and diminish uncertainty (Fischer, 1995; Mickwitz, 2006). I use literature review, interviews and a survey.

To build the conceptual and theoretical framework of the research and examine the context of the Energy service contracting, I reviewed the books, research papers, different institutional publications and reports. To make a comprehensive list of barriers and drivers that have already been identified, I used different institutional and national reports, publications, and discussion papers. Particularly useful were the reports of the European Energy Service Initiative and reports of the Change Best Program, the two studies funded by the Intelligent Energy Europe programme (a part of the competitiveness and Innovation Framework Programme of the European Union). Under the European Energy Service Initiative the participating countries have prepared the national reports on the 'Framework Conditions for Energy Performance Contracting' and have identified the bottlenecks, challenges and opportunities for the Energy performance contracting development. Under the Change Best program, the energy efficiency service market in the participating countries was explored. Both studies provide an insight into barriers and drivers of the Energy service contracting markets.

Interviews and a survey. To identify the important and additional barriers and drivers to those that have already been discussed and to identify the perceived importance of certain barriers and drivers by the actors involved, I have performed a survey in the public sector (public sector has been identified in the Slovenian NEEAP as a target sector for Energy service contracting) and conducted interviews with the larger actors on the Energy service contracting market.

Survey. I have conducted a survey among all Slovenian municipalities (210 municipalities). I have chosen public sector to access barriers in the demand side, because the public sector is identified in the Slovenian NEEAP as a sector with highest potential for development (relatively high technical potential in public buildings and sector that has an informative role in introducing energy efficiency measures task). The method involves structured-response questionnaire and some open-end questions. I have asked more specific questions about the barriers caused by the legislation in force, understanding of the Energy service contracting among the decision makers in the municipalities, trustworthiness of the Energy service contracting providers, costs of Energy service contracting, acquaintance with the technical and economical potentials within municipalities, fear of necessity of reducing the number of jobs due to outsourcing, and asked them to explain if they find any other impediments that are not listed more relevant. I have also asked whether they would have had more Energy service contracting investments in their municipality if the acknowledged barriers were removed. I have given few options of the barriers and asked to add others if they find them more important. I have received 19 relevant answers with 33 identifications of the 12 most important barriers (the answers were not related to the barriers were left of out the analysis and are not included among the 19 answers presented). The low response could be, besides the regular reluctance to answer surveys, explained with a low interest in energy efficiency measures. Some municipalities are very small and have no staff employed that could answer the environment related matters. The results of the survey are presented in the figure 5-1.

Among the actors that represent larger projects or larger (in size or number) municipalities and have responded to the survey are: Mr. Marko Hocevar is the Head of the Department of Public Utilities in municipality Kranj, where most of the Energy service contracting projects in the public sector in Slovenia have been realized; Mr. Bostjan Krajnc, who is a director of Regional Energy Agency of Kssena (Kssena is responsible for three regions, Savinjska, Saleska and Koroska Region); Mr. Marko Krajnc, who is a director of a public utility company in

municipality Vransko. Mr. Janez Petek, who is a director of the Regional Energy Agency LEA Spodnje Podravje, which is responsible for region with 30 municipalities provided answers to the survey and was in addition available for the interview. The answers provided in the interview are included in the analysis like other answers from interviews. All the answers from the survey are included in the graph that shows the biggest barriers identified by the municipalities. Besides, their answers are described in more detail. Other local energy agencies in Slovenia have not provided the answers to the survey. They are: Local energy agency Dolenjska - Posavje - Bela krajina (LEAD), Local energy agency of Pomurje (LEA Pomurje), Goriska Local energy agency (GOLEA) and Local energy agency of Podravje (EnergaP).

Interviews. In addition to the survey, I have conducted several *interviews* with the relevant actors on the Energy service contracting market. The interviews with the actors on the Slovenian market were focused on finding what are the barriers on the Slovenian Energy service contracting market that they find particularly relevant for a slow development of Energy service contracting investments in Slovenia. The interview with Ms. Bunse, an expert on Energy service contracting at the Wuppertal institute in Germany, who is also one of the supervisors of the Change Best Programme (see sub-chapter 1.1.4) was focused on finding the answers to what are the barriers and especially the drivers that are in her opinion the most relevant for the relatively quick development of Energy service contracting on the German market. The following is the list of the interviewees:

1. Mr. Janez Petek, the director of the LEA Spodnje Podravje, which is one of the energy agencies established under the European Union Executive Agency for Competitiveness and Innovation (EACI). LEA Spodnje Podravje is promoting the sustainable energy development in the East Stajerska region in Slovenia. It helps 30 municipalities with approximately 180.000 inhabitants to develop energy projects, to find the financial sources for these projects etc.;
2. Mr. Stane Merse, Energy Efficiency Centre Head at the Jozef Stefan Institute, the leading Slovenian scientific research institute;
3. Mrs. Blazenka Pospis Perpar, the project officer at the only 'pure' ESCO in Slovenia, El-Tec Mulej d.o.o.;
4. Mr. Miha Valentincic, the director of the energy sector in the largest energy company in Slovenia, Petrol d.d.
5. Ms. Maike Bunse, a research Fellow at Research Group Energy, Transport and Climate Policy at the Wuppertal Institute for Climate, Environment, Energy

1.5.2 Methods for data analysis

Qualitative methods are used in this research for data analysis.

Analysis of the data collected from the survey. I have received 19 answers, 2 of them are provided by the local energy agencies that are responsible for energy related issues in more then one municipality (each of these local energy agencies cover around 30 municipalities). When presenting the barriers identified in a survey, I do not use different weights to indicate the number of municipalities included in one answer. The graph simply shows the identified barriers and the number of indications of these barriers by the actors that responded to the survey. An approach without weighting the number of answers is chosen because there is no single variable that could explain the importance of the answers. The importance depends on the size of the municipalities that vary, the activity of certain municipality in energy efficiency projects, the interest of the municipality in Energy service contracting etc.

Analysis of all the data collected in the research. The data collected is qualitatively analysed using the analytical framework of transaction costs economic (The concept of transaction costs economics is discussed in the chapter 3). Such framework provides a powerful analytic tool, which can be used in different social contexts to understand broad range of principals-agent relations (Gomez-Mejia & Wiseman, 2007). It provides a descriptive overall assessment of the barriers and drivers on the Energy service contracting market. An assessment that provides a clear picture of the importance and underlying causes of barriers and drivers can be used by the policy makers to use the appropriate policy measures.

1.6 Disposition of the thesis

The paper is divided into six chapters. Within the introduction, the background of the thesis, problem definition, objective of the research and the research questions, scope and limitations, methodology and the thesis outline are provided. The second part describes the conceptual framework of the research and gives an illustration of what the Energy service contracting means, also in terms of business models, types of providers, savings structures and types of financing. The third part explains the theoretical framework used to identify the important barriers and drivers for Energy service contracting development in Slovenia. The fifth part is the body of the thesis and it first looks into barriers that have been already identified in the existing literature and surveys on energy service companies (ESCO) in Germany and Slovenia. Afterwards the results of the survey conducted among the larger actors on the Energy service contracting market in Germany and Slovenia are presented. According to these results, the additional barriers and drivers are identified. The next step provides the analysis of identified barriers and drivers for Energy service contracting in Germany and in Slovenia according to the analytical framework used (transaction cost economics) to mark out the most important barriers that hinder Energy service contracting development in Slovenia. The sixth part is the conclusion that summarizes the findings.

2 Conceptual and theoretical framework

This chapter aims to provide the conceptual considerations of Energy service contracting regarding its business models, its providers, and its saving and financial structures. The chapter also explains the theoretical framework of the research.

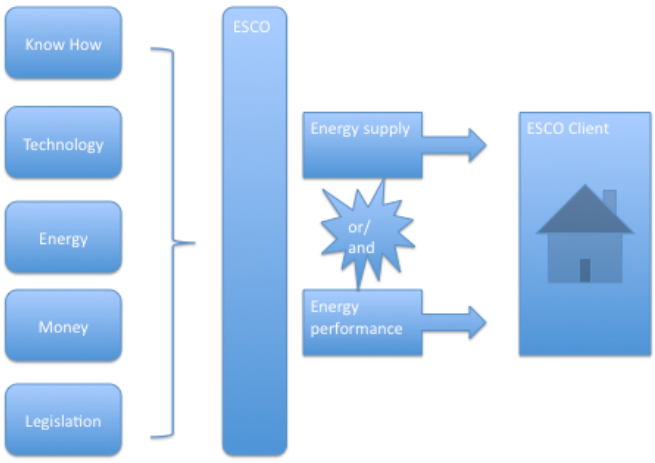
2.1 Definition of Energy service contracting

A variety of the conceptual considerations related to the Energy service contracting is explained in this subchapter. There are many different forms of contractors and contract forms that that can be used in Energy service contracting. The different contract forms include different scope of services offered by the contractors, different ways to split the savings between a contractor and a client, different ways of financing the project. All are described below.

2.1.1 Business models of Energy service contracting

There is no common definition of Energy service contracting. In its most basic form it is a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy service. Androschin & Ungerböc (2009) in the Discussion Paper: "What is Energy Contracting? Concept, Definition, Two Basic Business Models", describe energy contracting as "a flexible and modular "efficiency tool" to execute energy efficiency projects, according to the goals of the facility owner" As Figure 2-1 shows, "flexible and modular" refers to combining the two basic energy contracting models in a way that fits best to the client. The two main models of energy contracting are Energy supply contracting (ESC) and Energy performance contracting (EPC). In Energy supply contracting the subject of the contract is an efficient supply of energy service while at Energy performance contracting the subject of the contract is the energy performance of the installations or energy savings (Androschin & Ungerböc, 2009).

Figure 2-1: What is energy service contracting?



Source: after After Bleyl, 2009

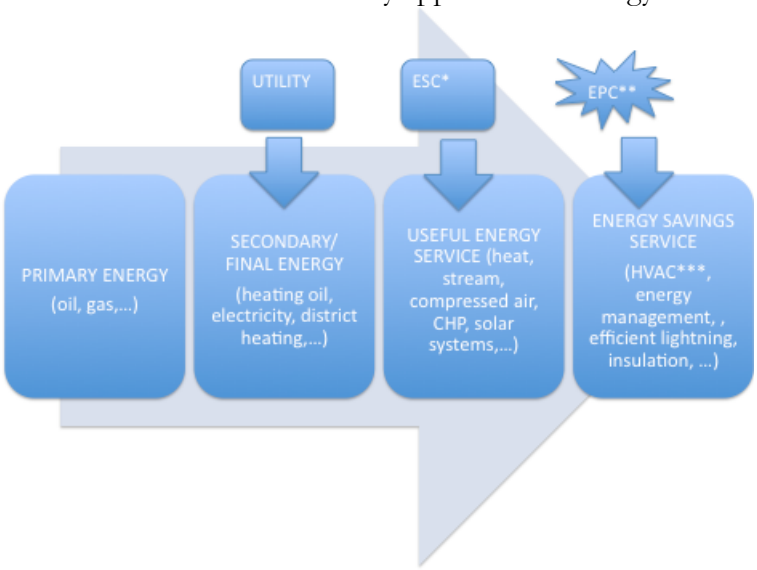
The International Energy Agency (IEA, 2003) puts the definition of Energy service contracting in the functional sales perspective, meaning that under Energy service contracting,

the client pays for performance, air-conditioned or heated spaces and not for the energy equipment. The way the functions are delivered and maintained depends on the ESCO. Energy contracting can be applied in residential and industrial buildings, hospitals, schools (it has been applied in these premises mostly in public sector), public lightning, offices etc. Clients are very often municipalities, companies that have large properties (buildings), apartment owners etc. (IEA, 2003)

2.1.2 Providers of Energy service contracting

Definitions for ESCOs also vary, but the common understanding is that they are usually differentiated from other energy companies in mainly three ways: ESCO guarantees energy savings, their payment is related to the level of energy savings and they usually provide financing for the project (Bertoldi et al., 2006). According to Bertoldi (2006), who is one of the most cited authors in the area of ESCO in Europe, the pure ESCOs are the ones using the Energy performance contracting concept and either third-party financing or ESCO-financing. According to The Directive 2005/32/EC on energy end-use efficiency and energy services, ESCO is "a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria;"(Art. 3i). The Directive definition refers to ESCOs that are either energy companies providing energy efficiency services as a part of their business or 'pure' ESCOs.

Figure 2-2: Business models as they appear in the energy service value chain



Source: After Bleyl-Androschin & Ungerböck, 2009

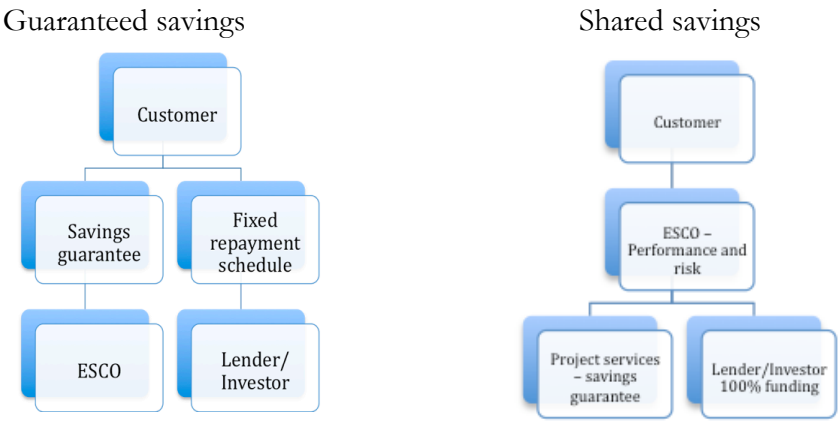
*ESC is Energy service contracting
** EPC is Energy performance contracting
*** HVAC stands for the closely related functions of heating, ventilating, and air conditioning

2.1.3 Saving structures of Energy performance contracting

Energy performance contracting has many different forms. They are usually classified in two different primary savings structures: guaranteed savings and shared savings, according to the savings structures (ICF International, 2007).

If an ESCO guarantees a certain level of energy savings and takes the entire performance risk, the concept is called *guaranteed savings*. Under this scheme, the ESCO is unlikely to assume credit risk in addition to performance risk; therefore third-party financing is rarely used in guaranteed savings contract. Usually the client borrows the capital needed (ICF International, 2007). Therefore, there must be a thorough understanding of the Energy performance contracting concept among major actors (commercial banks, clients and energy companies) if the guaranteed savings concept is to function properly (Bertoldi et al., 2006)
The other, more common concept is called *shared savings contract*, where the client takes over some performance risk (in the contract the performance risk is split between ESCO and a client). In this concept, financing is usually provided by the third party or the ESCO (CTI, 2003). The credit risk stays with the ESCO (Bertoldi et al., 2006).

Figure 2-3 : Primary savings structures



Source: after Dreessen, 2003

This classification is made according to the split of savings resulting from Energy performance contracting investment. The financing of the investment can be either provided by the ESCO, third party or a client. Client financing usually means that the client provides financing from internal capital, which is ensured by the ESCO savings guarantee, but this kind of financing is rare in practice. Also the case where client takes a loan, which is guaranteed by the ESCO energy savings (CTI, 2003) is not usual, because the savings are usually not accepted as collateral. Another way of differentiating the Energy performance contracting models is by who is entitled to energy costs savings. The two different models exist: the *duration model* and the *participation model*. In the duration model, the ESCO is entitled to all savings during it's perform obligation and the client is entitled to them after the contracting period. In the participation model, the client is entitled to part of the energy cost savings during the contract period and the client part is usually no less than 10% of the savings achieved during the time of the contract. In the duration model, the contracting time period is usually shorter than in the case of participation model (Berger & Schafer, 2009). According to one of the interviewees, the combination of any of these different models can be used. The combination depends on the client and a project and there is no single model that a certain ESCO would use.

2.1.4 Financing structures of Energy service Contracting

The aim of Energy service contracting and in particular Energy performance contracting is the return of investment for the ESCO through energy cost savings. These savings potentials are

realised on the ESCOs risk in a certain period of time. The contracting rate is therefore determined by the expected energy cost savings. The European Commission has identified promotion of innovative financial mechanisms as an important step towards energy efficiency projects implementation. In particular, it has pointed to two financial mechanisms: third-party financing and energy efficiency certificates (White Certificates) (Ferrari, 2008).

Many times energy efficiency projects are not implemented, because these investments usually require a relatively high initial capital and have a relatively long pay back period. A pay back period is still widely used among managers when making investment decisions. Besides, managers are not keen on investing in 'marginal' issues such as energy efficiency (Sorrell, 2007). Another difficulty with financing Energy service contracting projects is that they cannot provide collateral for the commercial banks. Commercial banks usually require a collateral to back up the loans and usually need information on the risks exposures of such projects. Both necessary conditions are lacking with Energy service contracting projects (Jackson, 2010) Therefore, the European Commission have decided to promote third-party financing. The Directive 2006/32/EC acknowledges third-party financing as an innovative practice that should be stimulated (Preamble 22) and explains that the purpose is to take the initial investment burden from the shoulders of beneficiary and use the savings from the third party's investment to repay its investment and interest costs. The third party can therefore be the ESCO or there may be another subject in the business model besides the energy supplier and the ESCO that provides financing (Art. 3 k). White certificates are not used in Germany or in Slovenia. The Directive 2006/32/EC defines White Certificates as "certificates issued by independent certifying bodies confirming the energy savings claims of market actors as a consequence of energy efficiency improvement measures" (Art. 3 k). They are widely used in Italy, but not very common in other parts of Europe and are therefore left out from further analysis in this paper.

2.1.4.1 Leasing versus Energy performance contracting

There are some financing mechanisms that are very similar to a leasing used in Energy service contracting. However, they should not be confused with leasing. These commonly used financing mechanisms are a chauffage contract, the first-out contract and the Build-Own-Operate-Transfer (BOOT) contract. In the chauffage contract, the client is usually 'outsourcing' all energy services and the clients' payments amount to the certain percentage of savings. Under the 'first-out' the ESCO is paid 100 % of the energy savings until the costs of investments and a profit margin for the ESCO are covered. A Build-Own-Operate-Transfer contract means that the ESCO takes care of the energy services and energy installations that are at the end of the contracting period transferred to the client. It is a long-term supply contract where the client pays for the service delivered, including capital and operating costs.
Leasing however, differs from the described models. It is a form of borrowing, which is not true for the Energy service contracting financing mechanisms described above. The client's (lessee) payments consist of principal and interest. In capital lease the client owns and depreciates the installed equipment, which impacts its balance sheet. In operating lease the ESCO only rents installed equipment for a fixed monthly fee, which does not affect the client balance sheet. The non-appropriation clause applies (such financing can not be perceived as debt) (Bertoldi & Rezessy, 2005).

3 Theoretical framework

In this chapter I present different frameworks that could be used to address the barriers to Energy service contracting and to explain the obvious hesitation of companies to invest in energy efficient technologies. I discuss the choice of transaction cost economics as an analytical framework for this research.

3.1 Different theoretical frameworks addressing lack of investments in energy efficiency

Energy efficiency gap is the gap between potential, cost effective investments in energy efficiency and investments that are realized. It means that there is unrealized energy efficiency potential. There is a lot of literature evaluating the gap, showing that it amounts to around 25% of current energy demands (Gardner & Stern 2008, Ehrhardt-Martinez & Laitner, 2009, Ferrari, 2008, Greenpeace & EREC, 2007).

Why does the efficiency gap exist? Mills et al., 2006 argue that energy-efficiency investments are overlooked because *risk and volatility information are not provided*. This view is supported by Jackson, 2010 who claims that current capital budgeting practices have negative impact on energy efficiency investments. The problem with the capital asset pricing model (CAPM), that in theory determines the discount factor, is that it does not consider the fact that energy efficiency investments are usually specific and cannot be easily resold (Golove & Eto, 1996). There is no single methodology to determine the appropriate risk-adjusted discount rate (Keat & Young, 2006) and the payback rules-of-thumb that use conservative assumptions to protect against "bad" investments are usually used. He proposes the use of financial VaR (Value-at-Risk), a measure of the risk of loss per certain portfolio and applies it to analysis of risk and returns of energy efficiency investments. VaR provides a single, decision variable that directly measures risk.

Evolutionary economics is another alternative economic framework used to explain the energy efficiency gap or efficiency paradox. The evolutionary framework proposes two factors, one at the individual level, which is 'habits', and the other one at the level of socio-technical systems that resist against change and therefore reduce the efficiency of traditional instruments (Nelson & Winter, 1982).

The existence of the energy efficiency gap is often explained by 'market failures' and 'market barriers' to energy efficiency (OECD/IEA, 2007). This is the third, widely accepted explanation that comes from *transaction cost economics*. I discuss this framework in the next section (3.2).

3.2 Transaction cost economics

Arrow (1969, p.48) wrote: "market failure is not absolute, it is better to consider a broader category, that of transaction costs, which in general impede and in particular cases completely block the formation of markets". Also Williamson (1985), who is a founder of transaction cost economics, in his book The Economic Institutions of Capitalism, argues that transaction costs cause departure from the market equilibrium.

Transaction costs are the costs of arranging the contract (costs of carrying out a transaction) and later enforcing and monitoring it (Matthews, 1986; Milgrom & Roberts, 1992). This research looks into transaction costs related to Energy service contracting, which are

transaction costs of potential clients (e.g. searching for the right contractor, determining the scope, duration and other features of the contract) and the transaction costs of contractors (e.g. evaluating the client, searching for different providers with different technical knowledge (outsourced knowledge), looking for the equipment providers, negotiating the contract and later provide measurements, costs of contract enforcement if necessary).

3.2.1 Transactions are often based on imperfect information

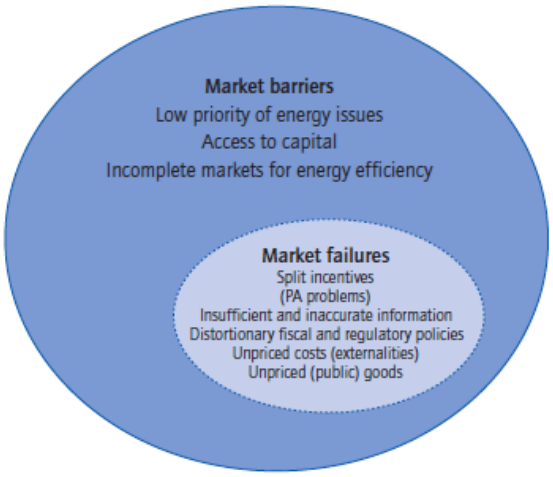
Institutional frameworks influence the behaviors of the actors on the market and these actors often make transactions based on imperfect information (Menard, 2004).

In this section I present the concept of transaction cost economics, which has been supported by the New Institutional Economics. The transaction cost economics suggest that market barriers and market failures lead to *split incentives* and in particular to *asymmetric information* that consequently result in a principal/agent problem that hinders investments into emery efficiency improvements.

3.2.1.1 Market barriers and market failures

Markets for energy efficiency experience 'barriers' like every other market for goods and services. In the context of energy efficiency, the term market barrier refers to any market-related factor that inhibits energy efficiency improvements (Intergovernmental Panel on Climate Change, 2001). There are many barriers identified in the energy-efficiency market (i.e. DeCanio, 1993; Ingham, Maw & Ulph, 1991; Sorrell, 2007; Sathaye & Murtishaw 2004) and also market failures as a subgroup of market barriers. According to neoclassical economics, only market failures cause inefficient allocation of resources or Pareto inefficiency and national policies should seek to intervene where the inefficiencies exist (OECD/IEA, 2007). There may also be interventions to overcome market barriers, but these interventions are targeted to specific policy goals (e.g. energy security and environmental sustainability) and not towards establishing equilibrium on the market. OECD/IEA (2007) give an illustration of possible categorization of market barriers and failures on energy-efficiency market (figure 3-1).

Figure 3-1: Market barriers and market failures inhibiting energy efficiency improvements



Source: (OECD/ IEA, 2007)

According to OECD/IEA (2007) classification of *market barriers* to energy efficiency, market barriers can occur in three circumstances. First, when energy costs have a relatively low share in all (production) costs. In that case the perceived benefits from energy efficiency investment

are small comparing to perceived transaction costs from individuals perspective. Second, they can occur when there is a limited access to capital for investments in energy-efficient measures. In energy contracting, financing of the projects is usually not based on the investment project (project financing), but rather on a rating of the borrower. According to that, individuals and small ESCOs may face higher costs for investments in energy efficient improvements than bigger companies that are well established with the banks. Also, according to DeCanio (1993) companies usually require higher returns for energy efficiency investments then are their cost of capital. The third circumstance when barriers occur is when there are incomplete markets for energy-efficiency, which means that energy efficiency is not a separate option, but it comes together with a product package (OECD/IEA, 2007).

Market failures on the other hand, according to the neoclassical economics occur when some companies believe that they can have an impact on a price on the market, which means that there is not enough companies competing on the market; when there are some limits to information; when there are entry or exit barriers to the market; when firms are not rational profit maximisers or/and when there are transaction costs. All these failures lead to *split incentives* and in particular to *asymmetric information* that are causing the principle-agent problem. The principal-agent problem very much affects the end-use energy and projects to improve energy en-use (OECD/IEA, 2007)

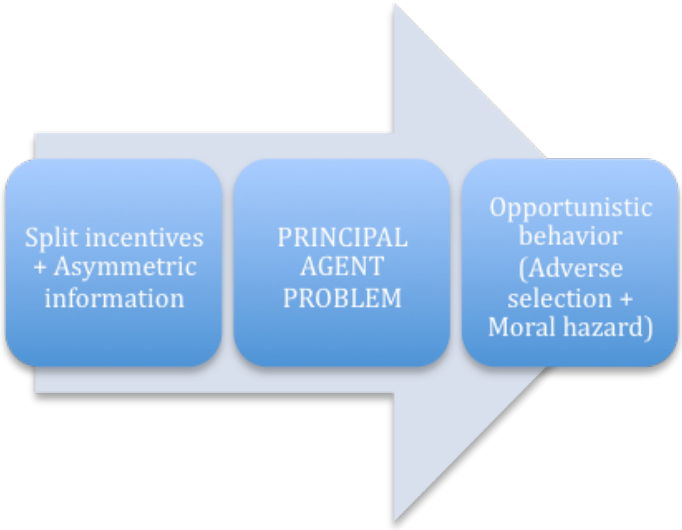
3.2.1.2 Insufficient and inaccurate information

Split incentives mean that the economic actors in the exchange have different goals. The 'landlord-tenant problem' is a school-book example of split incentives, where the tenant is paying the energy bills. There is a split incentive between the actors, because if acting rationally, the landlord minimises the capital cost of the energy investments and the tenant wants to maximise the energy efficiency of the appliance to save on energy costs. In such case there are suboptimal (to little) investments in energy efficiency. Also when the same company is in charge of energy supply and energy efficiency improvements, there are split incentives present, especially where there is a limited competition on the market and the contractors are not primarily concerned with a 'fight for customers' by offering quality service.

Insufficient and inaccurate information (asymmetric information) about the market can lead to paying a price, which is too high for certain good or service or can lead to higher costs caused by search for the information about other suppliers. Sometimes economic actors take decisions on the basis of imperfect information (Richter & Furubotn, 1999), because acquiring additional information would involve to high transaction costs. The concept 'bounded rationality' means that economic actors intend to act rationally, but are bounded by their own capacities of thinking. Williamson (1989), who was primarily interested in commercial contracting, observes that bounded rationality (caused by imperfect information) is the enabler of the opportunistic behaviour, which is often present in Energy service contracting and many times reported by interviewees.

The split incentives and asymmetric information lead to adverse selection and moral hazard as (figure 3-2.) according to the Agency theory (Lipsey, 1983; Eisenhardt, 1989; Wright et al., 2001; Lange, 2005; OECD/IEA, 2007). Adverse selection is an ex-ante (entering the contract) opportunistic behaviour and moral hazard is an ex-post (signing the contract) opportunistic behaviour. The Agency theory has and explanatory power, however we must be aware of it's weaknesses. The table 3-1 summarizes some of the important strengths and weaknesses of the theory.

Figure 3-2: Agency Theory and Principal – Agent problems



Source: Based on OECD/IEA, 2007

Table 3-1: Strengths and weaknesses of Agency Theory

Strengths	Weaknesses
Broad applicability Principal-agent can be found in any kind of organization (Sorrell et al., 2004); it provides an adaptable base for developing models to explain the conflict of interests (Gomez-Mejia & Wiseman, 2007)	Jensen and Meckling's (1976) model* is *unable to adequately portray real-world situations* because of unrealistic assumptions about individuals, organizations, and market behaviour (Lubatkin, 2005).
A powerful analytic tool It can be used in different social contexts to understand broad range of principals-agent relations (Gomez-Mejia & Wiseman, 2007)	*Overly simplistic assumptions* (Gomez-Mejia & Wiseman, 2007; Sharma, 1997) when considering specific applications of a theory

Source: OECD/IEA (2007); Gomez-Mejia & Wiseman (2007); Lubatkin (2005); Sharma (1997)

**Jensen and Meckling's (1976) applied agency theory to develop their Theory of the Firm.*

3.3 Application of Transaction cost economics and Principal-Agent problem to energy contracting

The New Institutional Economics focuses on how institutional frameworks shape the behaviour of the actors on the market and how decisions are taken based on the imperfect information on the market (Menard, 2004). According to this, Sorrell (2007) proposes the institutional framework as one of the determinants of the transaction costs that appear in the Energy service contracting. According to Sorrell (2007), the total savings in production costs must be grater then the increase in transaction costs if the Energy service contracting is to prove economically viable. Below the determinants of the production and transaction costs are discussed.

The main determinants of production costs are the technical potential for improved conversion and efficiency of distribution, which is itself determined by operation, maintenance and control. ESCOs may be able to deliver such savings to clients because of potential economies of scales and market incentives (Globerman & Vining, 1996). Economies of scale are usually the case when the ESCO is relatively bigger then its client (the ESCO substitutes a relatively inefficient in-house management of the client or/and the ESCO negotiates relatively lower prices from energy suppliers). Market incentives, on the other hand, come from an opportunity for the competitive biding for energy services, and they depend on the competitiveness of the energy service market (Sorrell, 2007).

Transaction costs are more difficult to estimate, but the determinants are well discussed in the literature dealing with the viability of the energy contracting projects (Yang et al., 2008; Bertoldi et al, 2006; Langniss et al., 2006; Sorrell, 2007). Split incentives and asymmetric information are causing higher transaction costs before, during and after the contract negotiation process and are therefore uncertain (Masten, 1993). They also vary with the scope, depth and method of finance of the contract (Sorrell, 2007) and other external factors. According to Williamson (1985), who was especially concerned with contracting, transaction costs can be determined by investment frequency, specificity, uncertainty, limited rationality, and opportunistic behaviour.

Sorrell (2007) uses this framework and sets the *determinants of the transaction costs* in energy service contracting in four groups, namely asset specificity, task complexity, competitiveness of the energy service market and the institutional context. The term 'task complexity' is used to summarize the behavioural uncertainty and environmental uncertainty into a single variable. This approach derives from Globerman & Vining (1996). Asset specificity, task complexity, limited competition on the market and unfavourable institutional context are giving room to asymmetric information and split incentives and consequently raising the transaction costs of contracting.

Asset specificity is an important concept of transaction cost economics. If investments are specific, they are not easily transferable, which means that certain efficiency improvements will only occur in specific applications. However, according to transaction cost economics, they will in these applications provide grater gains then it would be the case if investments were more generic or easily transferable to another application. Specific investments therefore mean more efficient production, but also greater sunk costs (Williamson, 1989). For example, the costs of energy efficiency improvements in one building (sunk costs) can only be recovered through payments of the tenant. If however, money is invested in more generic investments, it can be much easier recovered by simply transferring the investment to another application (e.g. package boilers). If investments are specific there is more space for opportunistic behaviour, i.e., the tenant does not pay for the services provided through the investment in energy efficiency improvements. Therefore, there must be certain government structures in place to prevent the opportunistic behaviour in case of more specific, but also more efficient investments (Williamson, 1989). According to Sorrell (2007) there are three types of asset specificity that influence transaction costs of Energy service contracting: Site specificity of investment, which determines how easily is an application transferable from one site to another, physical asset specificity which determines the costs of the energy investment audit, human asset specificity that determines the costs of specific knowledge needed. The more specific these three assets are, the more transaction costs are involved.

Task complexity, according to Globerman and Vining (1996) refers to how costly it is to define the terms and conditions of the contract and then verify and monitor the performance defined in the contract. If conditions are poorly defined, there is a space for opportunistic behaviour,

which increases the transaction costs. There are two important issues that need to be addressed at energy contracting: what is the baseline for energy efficiency improvement and how to meter the savings (Langniss, 2006). The more complex the task is, the more information is needed, which increases the principal agency problem.

Higher transaction costs can occur also because of lack of *competition* among ESCOs. In the environment of limited competition, especially where there are high costs of entry to the market, there is a higher probability that ESCOs act opportunistically (Globerman & Vining, 1996).

The institutional context (political, economic, legal and financial context) is very important for development of ESCOs and Energy service contracting market and has been addressed by the EU Commission. An especially unfavourable regulatory context cannot only cause higher transaction costs, but can also mean an excluding factor in certain projects. According to Sorrell (2007), better information and demonstration schemes, standardised procurement procedures, accreditation and certification of ESCOs, Standardised protocols for monitoring and verification, standardised contracts and expert assistance with contracting could all reduce transaction costs of Energy service contracting and could be supported by the government (Bertoldi et al., 2003).

In sum, favourable conditions for the Energy service contracting market development are on a side of production costs high technical potential for energy efficiency improvements and relatively low aggregate production costs of the client for energy services in all production costs. On the side of transaction costs, the favourable conditions for the Energy service contracting market development consist of low asset specificity and task complexity (low Principal-Agent problem with less incentives for opportunistic behaviour), high level of competitiveness among ESCOs and favourable institutional context.

4 Barriers and incentives for the Energy service contracting previously identified in the existing literature

In this chapter I delineate the general barriers and incentives that affect the Energy service contracting market in Europe and have been previously identified in the existing literature. Afterwards I delineate the previously identified barriers and incentives for Energy service contracting market for Germany and in Slovenia separately.

4.1 General barriers and incentives for the Energy service contracting

There have been barriers and incentives for Energy service contracting in Europe identified in surveys on ESCO in Europe (e.g. Vine (2005), which is an international ESCO study and Bertoldi et al. (2006), which is a study of the European market. These surveys outline the barriers that are very common on the Energy service contracting market and also identify some specific country related barriers and drivers. Recent studies assigned by the European commission, the European Energy Service Initiative and a Change Best program provide an overlook of the barriers and drivers on the European market. A summary of the identified barriers and drivers for supply and demand side separately is provided in this section.

4.1.1 General barriers and incentives for the supply-side

This subchapter delineates the general barriers and incentives to Energy service contracting that energy contractors (ESCOs) are facing. First I outline the barriers and then the incentives. The incentives are not completely the same for the energy service companies that offer only Energy performance contracting and for those that offer Energy service contracting (Energy supply contracting in addition to Energy performance contracting) and are therefore outlined separately.

Sources come from the Wuppertal Institute publications, Berliner Energieagentur publications, and international surveys on ESCO: Vine (2005), Bertoldi et al (2006), Bertoldi & Rezessy (2005).

4.1.1.1 General barriers for the supply side

- Small project size and limited opportunities to bundle projects together;
- Due to a relatively long time-period of a contract, the probability of clients' default is higher. Therefore the business risk is higher;
- Relatively high performance risk and in case of financing through the ESCO also credit risk;
- Non-supportive legal and regulatory frameworks, procurement rules, public budgeting rules – incompatible with energy efficiency investments;
- Complicated procedures in the public sector due to regulations that do not support Energy service contracting;
- Despite the recognition of the importance of the instrument, there is still a lack of support from the government level;
- In the public sector also administrative hurdles and tenders that are due to the lack of knowledge of the personnel in the public sector prepared in an non-understandable way, usually unfavourable to Energy service contracting (interviewee Pospis - Perpar , 2010);

- Limited financial resources (i.e. related to the financial crisis), but also due to high-perceived risks of energy efficiency projects (competing for scarce capital with more traditional investments. There is a problem of payback calculating methods and lack of information on true risk and volatility of Energy service contracting);
- Utilities and other energy companies that are energy suppliers and have knowledge on EE issues are reluctant to partly act as the ESCO, because it may diminish their revenues. They are only interested in such projects if competition forces them to (to have a broader offer for consumers);
- Liberalization of the energy market in EU has a positive and a negative impact on the ESCO. Competition has pushed energy prices down (electricity in particular) which means caeteris paribus[2] a move down the demand curve or in other words reduced incentive to save energy. However, liberalization also increased competition on the market, which means a competition for customers and consequently higher demand because of lower perceived risks on the customers' side and a higher probability of a good service received;
- Lack of tools to evaluate value, risk and volatility of the energy efficiency investments (Mills et al., 2006).

4.1.1.2 General incentives for the supply-side

- Potential for product differentiation and value added, which are both opportunities for a profit increase;
- Opportunity for an improved reputation through improved social responsibility;
- Opportunity to establish or maintain good relations with customers and sustain their loyalty;
- In case of Energy service contracting that includes Energy supply contracting, the risk of energy delivery errors is reduced;
- Regulatory targets regarding emissions and other environmental issues are easier achieved.

General incentives for supply side that refer to Energy service contracting that includes Energy supply contracting in addition to Energy performance contracting

There are some additional incentives for those energy companies that offer Energy service contracting (Energy supply contracting in addition to Energy performance contracting) and not only energy performance contracting. They come in a form of avoided costs, additional revenue and cost recovery and are outlined separately below

- Avoided costs:
    - Lower amount of purchased power from the wholesale market is needed, costs of expanding distribution capacity can be avoided in some cases, lower distribution losses due to reduced generation requirements, increased system reliability;
    - In case of savings requirements, companies can avoid penalties with energy efficiency investments (e.g. White certificates);
- Additional revenue:
    - Caeteris paribus additional revenue due to extended service offer;
    - Additional revenue due to long term contracts and new customers because of extended service offer.

[2] "caeteris paribus" means "all things being equal"

- Cost recovery - Energy savings that mean lost revenue for Energy supply companies (caeteris paribus) due to reduced energy sales can be recovered through:
    - Distribution tariffs (if they are not regulated by authorities or if authorities allow the rise in distribution tariff, to enable energy supply companies to get a share in net cost savings to society caused by the implemented energy efficiency investments);
    - Supply prices. Such practices are more likely on the market where competition among energy supply companies is low;
    - Government funds (public benefit charge).

Although energy companies and pure ESCOs both operate in the Energy service contracting, their barriers and incentives to provide it differ slightly. In table 4-1 there are some competitive advantages (+) and disadvantages (-) comparing them among each other regarding the provision of Energy service contracting, depending on the provider

Table 4-1: competitive advantages (+) and disadvantages (-) regarding the provision of Energy service contracting for energy (supply) companies and ESCOs

	Energy companies	ESCOs
Customer contacts and infrastructure facilities	+	-
Marketing synergies to energy retailing	+	-
Financial basis	+	-
Technical knowledge and capacities for EES	-	+
Competences for EES	+	+
Relevance of lost revenues	-	+
Strategic partnerships	+	+

Source: Suerkemper (2010)

4.1.2 General barriers and incentives for the demand-side

Sources come from the Wuppertal Institute publications, Berliner Energieagentur publications, and international surveys on ESCO: Vine (2005), Bertoldi et al (2006), Bertoldi & Rezessy (2005).

This section delineates the general barriers and incentives to Energy service contracting that the demand side (potential clients) is facing. First I outline the barriers and then the incentives.

4.1.2.1 General barriers for the demand side

- Lack of information and/or trust (especially where the market competition among ESCOs is low);
- Lack of awareness and understanding of energy efficiency measures, concept or Energy service contracting and third-party financing;
- Budgeting rules more often provide no incentives for (energy) savings in municipalities or states, because the savings in a current year may mean less financial sources allocated from the public budget in the following year (anti incentive);
- Non-supportive legal and regulatory frameworks, procurement rules, public budgeting rules – incompatible with energy efficiency investments (also barrier on the supply-side);
- Complicated procedures in the public sector due to regulations that do not support Energy service contracting (also barrier on the supply-side);
- Aversion to outsource energy management and aversion towards displaying the

production procedures (that may involve companies' secrets) to the third party
- Lack of interest in the instrument because of low share of energy costs in the total production costs;
- In the public sector also administrative hurdles and very poor tenders due to the lack of knowledge of the personnel in the public sector (also barrier on the supply-side).
- Unfamiliarity with the Energy service contracting concept and risks involved;
- Due to a relatively long time-period of a contract, the probability of the ESCO's default is higher. Therefore the business risk is higher.

4.1.2.2 General incentives for the demand-side

- Expectations of energy price rises in the future (EIA, 2010);
- Financial support (subsidies, soft loans…);
- Relatively high knowledge on energy related issues on the side of ESCOs comparing to the average client;
- Pressure by regulations (from regulators);
- Government exemplary role by implementing Energy service contracting projects and developing best practice examples;
- Increasing public awareness of energy efficiency benefits;
- Information dissemination by governments, agencies, others;
- Concentration on a core business – an incentive for outsourcing.

4.2 Barriers and incentives for Energy service contracting previously identified for Germany and Slovenia

In this chapter I delineate a group of the barriers and incentives that are in the Wuppertal Institute publications, Berliner Energieagentur publications, and international surveys on ESCO: Bertoldi et al (2006), Vine (2005), Bertoldi & Rezessy (2005) and in German and Slovenian national reports (EESI reports, Change Best reports, NEEAPs) identified as important for the Energy service contracting market in the country.

Under the European Energy Service Initiative – EESI project, the participating countries have prepared the national reports on the 'Framework Conditions for Energy Performance Contracting' and have identified the bottlenecks, challenges and opportunities for the Energy Performance Contracting development. Germany and Slovenia have both prepared national reports. The scope of this research however is not only Energy performance contracting, but also Energy supply contracting as another part of the Energy service contracting, because energy companies often provide Energy performance contracting only in combination with Energy supply contracting (Energy performance contracting is 10% of the Energy service contracting measuring in numbers of projects). Although reports refer to Energy performance contracting only, the findings can be applied to both elements of Energy service contracting. Such scope is possible, because the reports consider not only 'pure' ESCOs, but also energy companies that provide both, Energy supply contracting and Energy performance contracting. The summary of the findings is provided in this section, together with the findings from the Change Best reports on Energy Efficiency Services in European Union and other reports on ESCO in Europe (such reports are Vine, 2005; Bertoldi et al., 2007).

4.2.1 Germany

Both primary types of Energy service contracting, Energy performance contracting and Energy supply contracting have reached a high level of development in Germany. There are more than 500 companies that offer Energy service contracting services; about 75% of them are ESCOs and utilities. There are the biggest investment potentials for Energy service contracting in the public sector (public buildings).

4.2.1.1 The main barriers to Energy service contracting further development in Germany

- Lack of information: the potential clients are not familiar with the concept and the transaction costs involved in the contracting;
- Long project duration: projects that have longer durations also carry more risks, besides managers give priorities to the projects with a shorter payback period;
- Financial focus: the public sector mainly perceives Energy performance contracting only as a financial instrument. The measures of the instrument however exceed the financing role – very important is energy saving guarantee;
- Refurbishment measures: Investments in thermal insulation are practically excluded from the classical Energy performance contracting model, because they have very high investment costs and therefore for majority of the potential customers unacceptably long payback periods. The buildings that need a refurbishment are many times excluded from Energy performance contracting;
- The Tenant Law: building owner can not pass the contracting fee to tenants if all tenants don't agree (under discussion) + landlord/tenant dilemma;
- Energy service contracting providers are unequally treated comparing to the energy efficiency providers that are producing energy themselves (if not produced themselves, a fee for renewable sources has to be paid);
- Municipalities are unwilling to outsource and energy managers are reluctant to inform companies' managers about the energy service outsourcing possibilities. Municipalities because it is difficult to reduce the number of jobs n case they become redundant because of the outsourcing. In the companies because the energy managers are afraid to loose a job for the same reason;
- Fears of becoming dependent on the contractor (problem in industry).

Public sector

- Low quality of public tenders; no life cycle assessments;
- Accounting of remuneration from savings within the municipal budget;
- Complicated administrative procedures.

4.2.1.2 The main drivers for Energy service contracting development in Germany

- Expectations of energy price rises in the future (EIA, 2010);
- Good-practice examples raised the attention and interest of the potential clients, which gives ESCOs a better starting point in gaining new business/clients;
- Dissemination of information and capacity building by the government, energy agencies, others (Increasing awareness of energy and consequently economic saving potentials);
- EU Directive 2006/32/EC on energy end-use efficiency and energy services that promotes the use of Energy service contracting (Energy performance contracting) especially as a financial instrument in the public sector;
- Financial support by governments and other;
- Shortage of funds and knowledge on energy related issues of the clients;
- Law requirements for refurbishment;
- Market development strategies on a regional level;
- Outsourcing of energy services because of the need to concentrate on core business.
-

Further steps necessary for Energy service contracting development identified are:

- Further development of contracting models that would include projects that require relatively high amount of initial investment (thermal insulation in building retrofitting)

or modular system contracting (to increase adaptation of customer needs);
- Further development of standard contracts;
- Further simplification of the contracting procedures.

Best practice examples
The "Berlin Energy Saving Partnership" that was established by The City of Berlin and Berlin Energy Agency (BEA) offers a building renovations through Energy performance contracting in order to improve buildings' energy performance to the public and private sector. An accredited ESCO chosen through the tender offer takes over financing and performance risk. Prior to investments, it defines energy savings. The saving model used is the participation model, so the clients benefit from energy cost reductions from start of the repayment period. Such model is advised to use in the public sector, because it is positive for the public budgets (Berger & Schäfer, 2009).

4.2.2 Slovenia

The Slovenian economy is small and so is the market for Energy service contracting. There is only one 'pure' ESCO on the market and few bigger energy companies.

4.2.2.1 The main barriers to Energy service contracting further development in Slovenia

- Lack of information: the potential clients are not familiar with the concept and the transaction costs involved in the contracting;
- Limited competition among ESCOs on the market;
- The ESCO is small with limited knowledge and expertise;
- Energy performance contracting has not been addressed in legislation;
- Projects are usually of very small size, no economies of scale;
- Poor energy data available (about to change with a new law on energy book-keeping in public sector);
- Unsupportive legislation, public procurement and accounting rules;
- Financial sector is reluctant to finance projects;
- Lack of knowledge and expertise;
- Lack of best practice examples;

4.2.2.2 The main drivers for Energy service contracting development in Slovenia

- Increasing energy prices;
- New regulation to be adopted: New regulation about street lighting, New building code, new law on energy book-keeping;
- Establishment of a qualified energy services provider scheme is planned in NEEAP;
- EU Directive 2006/32/EC on energy end-use efficiency and energy services;
- Directive 2002/91/EC on the energy performance of buildings.

Further steps necessary for Energy service contracting development identified are:
- Improve information campaigns, procurement procedures, savings measurements and verification protocols;
- Development of innovative financing schemes to help small ESCOs;
- Improved standardized contracts and the legislation that would enable their use;
- Introduce programs for technical assistance, improve them in energy audits;
- ESCO certification.

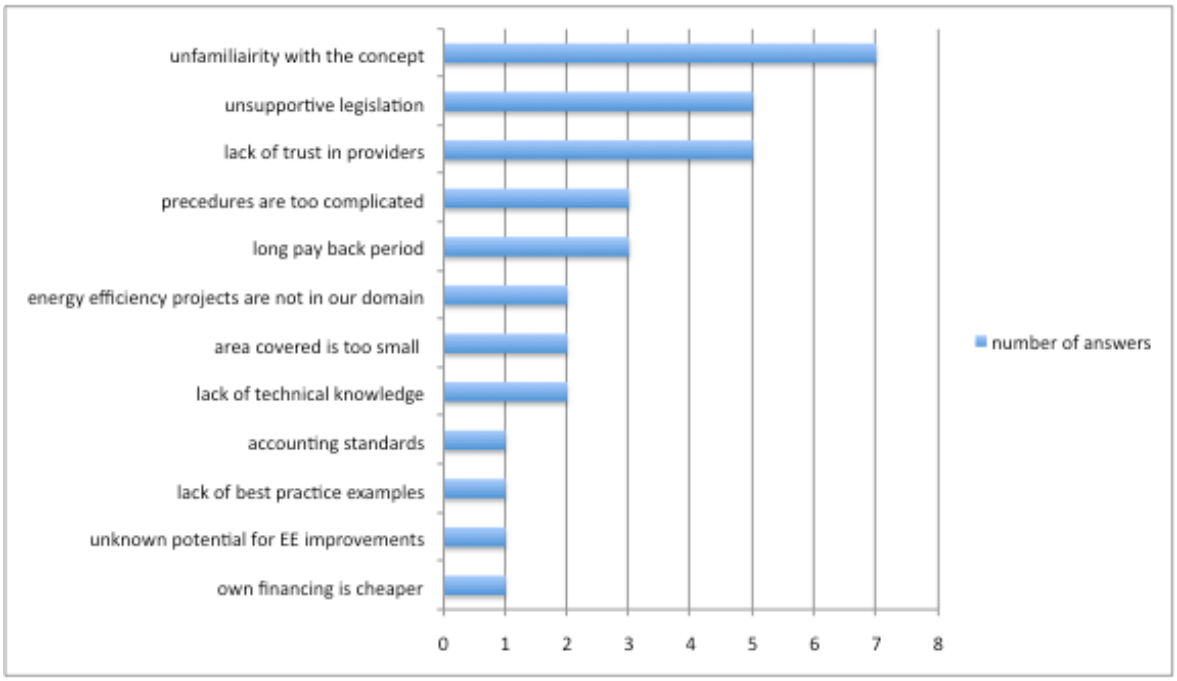
5 Barriers and incentives for Energy service contracting that are perceived as important by different market actors

In addition to already identified barriers and drivers for Energy efficiency contracting, the survey among Slovenian municipalities has been performed to determine the subgroup of the barriers and drivers that are perceived as important by the main potential clients. The survey also aimed at discovering other barriers and drivers that are also perceived as important by the main actors, but have not been identified before. On the supply side, the interviews with the two main providers of Energy service contracting have been conducted. The aim of the interviews was the same as that of the survey; they are only focused on the supply side, not on the demand side of the Energy service contracting.

5.1 Barriers and incentives for Energy service contracting as perceived by the public sector in Slovenia identified in own survey

The results of the survey conducted among Slovenian municipalities reveal how important are certain barriers on the energy service contracting market in the eyes of the main potential clients. The results are presented in the figure below.

Figure 5-1: Barriers to Energy service contracting as perceived by Slovenian municipalities



Source: Own survey, July 2010

The survey in the public sector reveals that the most significant barrier is unfamiliarity with the concept or the instrument. Almost as significant barriers are the unsupportive legislation and the lack of trust in the Energy service contracting providers. Also important are the complicated administrative procedures and long pay back periods of Energy service contracting investments.

Marko Hocevar, Kranj. Mr. Hocevar is the Head of the Department of Public Utilities in municipality Kranj, where most of the Energy service contracting projects have been realized.

Most of role models in public sector come from Kranj. Mr. Hocevar sees the biggest barriers in the current legislation. Every Energy service contracting project in the public sector has to be previously approved by the Ministry of Finance, since the provision about excluding Energy service contracting from debt has been taken out of the legislation. The project also needs a supporting study prepared by an independent expert about its economic viability. The Ministry of the Economy has received many proposals and initiatives from different actors on the market to improve the regulatory framework for the Energy service contracting.

Bostjan Krajnc, Kssena Velenje. Mr. Krajnc is a director of Regional Energy Agency of Kssena. Kssena is responsible for three regions, Savinjska, Saleska and Koroska Region. It's mission is to accelerate promotion and implementation of measures in fields of renewable energy sources, energy efficiency and sustainable city transport in of Savinjska, Saleska and Koroska Region. Mr. Krajnc sees the biggest barriers in a poor knowledge about the Energy service contracting among technical staff in the public sector and complicated procedures to realize public contracts. Energy service contracting has to be done according to both, the Public-Private Partnerhip Law and the Public Procurment Law. These two pieces of legislation are however in a case of contracting self-excluding. The biggest drivers, in his opinion, come from the best practice examples and municipalities should be a role model in this case.

Marko Krajnc, Energetika Vransko. Mr. Krajnc is a director of a public utility company in municipality Vransko. He also puts a lack of knowledge among technical staff, complicated procedures and unsupportive legislation (tender requirements for which there is no knowledge in the public sector) and a lack of best practice examples among the biggest barriers to Energy service contracting. He also stresses bad experiences with private companies that often do not deliver what they promise. The drivers could be in larger share of incentives (subsidies) and simplified tender procedures.

Janez Petek, LEA Spodnje Podravje. Mr. Petek is a director of the Regional Energy Agency LEA Spodnje Podravje, which is responsible for region with 30 municipalities. Mr. Petek sees the biggest barriers in poor offers and performance by companies that offer Energy service contracting, in poor data about the technical end economical potential for energy efficiency improvements in public sector buildings, the unacceptably long pay back periods (20 years) of the projects that would be most necessary (thermal insulation of buildings).

Other local energy agencies in Slovenia have not provided the answers to the survey. They are: Local energy agency Dolenjska - Posavje - Bela krajina (LEAD), Local energy agency of Pomurje (LEA Pomurje), Goriška Local energy agency (GOLEA), Local energy agency of Podravje (EnergaP).

5.2 Barriers and incentives for Energy service contracting as perceived by the Energy service contracting providers in Slovenia

I have conducted interviews with Mrs. Blazenka Pospis Perpar, the project officer at the only 'pure' ESCO in Slovenia, El-Tec Mulej d.o.o. and Mr. Miha Valentincic, the director of the energy sector in the largest energy company in Slovenia, Petrol d.d.. These two companies cover almost all Energy service contracting projects in Slovenia and are therefore representative for the supply side.
Mrs. Pospis - Perpar sees the biggest barriers in unsupportive legislation, moreover in the interpretation of the legislation by the Ministry of Finance. Since the Energy performance contracting is not addressed in the legislation any longer (see the Legal framework comparison

in the next chapter), the Ministry of Finance decides on a case by case basis whether certain Energy service contracting project in the public sector should be included in a debt quota or not. According to interviewee, the Ministry of Finance treats Energy performance contracting as leasing and therefore usually decides not to allow Energy performance contracting if the public sector if the municipality's contracted debt (in which Energy performance contracting is included in this case) doesn't meet the provision of the Municipality budget Law (Article 10) "…the repayment of the principal and interest in a particular year of repayment does not exceed 5% of realized revenues without donations and investment transfers from the state budget in the year prior to the year of contracting of debt…" (see 6.1.4). The difference between leasing and similar forms of Energy performance contracting to leasing is described in the first part of the research (see Financing structures of Energy service Contracting)

Mr. Valentincic sees the biggest barriers in administrative procedures in the public sector, unwillingness of majors to undertake projects that are not very explicit to the public or have a longer pay back period than is their mandate even if the projects are among the most economically viable projects available to them. In addition Mr. Valentincic explains the unwillingness of the public sector to pursue Energy performance contracting by its unwillingness to outsource and therefore possibly lose some jobs.

Both interviewees see the solution to these biggest barriers in the legislation that would explicitly address and encourage Energy performance contracting.

Table 5-1: Comparison of Barriers and incentives for Energy service contracting previously identified in surveys and national reports for Germany and Slovenia with added results from own survey and interviews. Barriers that are perceived as important by the public sector are marked with a star (*)

Common barriers (previously identified)	Common drivers (previously identified)	Non-common drivers in Germany (previously identified)	Non-common barriers in Slovenia (previously identified)
Lack of information*	Increasing energy prices	Information, communication, consulting activities + supportive policy measures within the German NEEAP and German Integrated Energy and Climate Plan	Limited competition
Long project duration (log pay-back period)*	EU Directive 2006/32/EC	Energy Saving Partnership	**Small ESCOs- Lack of knowledge and expertise, inability to take over larger projects***
Poor tenders*	Some favorable legislation that has indirectly a positive impact on energy service market development	Best practice examples	**Little opportunities for economies of scale***
Refurbishment measures – too long pay back period	Legislation addressing refurbishment of buildings (Directive 2002/91/EC on the energy performance of buildings)	Financial support for energy efficiency projects in many different forms	**Poor data available on technical potentials***
Housing sector: all tenants agreement		Market development strategies on a regional level	Poor availability of project financing
Unfavorable legislation*			**Lack of best practice examples***

Source: Change Best reports (2010), EESI reports (2010), own survey.

Additional barriers revealed by the survey that have not been previously identified in existing surveys:

- Lack of trust in providers. The barrier can be attributed to limited competition that was previously identified as a barrier on Slovenian market;
- Lack of technical knowledge in the public sector, which also demonstrates in poor tender offers;
- Complicated procedures;
- Limited potential for energy service contracting implementation because of the small size of the average municipality (limited area of domain) – can be attributed to the little opportunities for economies of scale, which was previously identified as a barrier on Slovenian market;
- Municipality does not consider energy related issues;
- Unsupportive accounting standards;
- The conditions offered by the contractors are relatively expensive to the own financing if the potential client has financing available;
- Self-interests of the decision makers in the public sector overrule the interests in economical viable projects.

6 Comparison of transaction costs determinants between Germany and Slovenia

The New Institutional Economics focuses on imperfect information and institutional framework that both influence the decisions of the market actors (Menard, 2004). Also Sorrell (2007) proposes the assessment of the institutional framework on certain markets, because it is one of the important determinants of the transaction costs and consequently determinants of the economic viability of the transactions. According to Sorrell, institutional framework is beside the competition on the market one of the two determinants of transaction costs that are common to all Energy service contracting projects. The ones that are project specific are the asset specificity and task complexity. To be able to access the economic viability of the Energy service contracting, also determinants of the production costs need to be accessed (as discussed in the chapter 3.3). Therefore the determinants of the transaction costs and production costs that are outlined by Sorrell (2007) are assessed for Germany and Slovenia in this chapter. The comparison between the countries is made to be able to find the determinants of the relatively important barriers and drivers for Energy service development in Slovenia.

6.1 Institutional framework and competition on the Energy service market between Germany and Slovenia

According to Sorrell (2007), the two determinants of transaction costs are common to all Energy service contracting projects and are not project specific. These are the *institutional environment* in which contracting is performed and the *competitiveness* of the Energy service contracting market. The two variables that are project specific are asset specificity and task complexity. Since this research looks for the barriers and drivers that are common to most Energy service contracting projects on a certain market, I compare the institutional framework and market competitiveness for Germany and Slovenia. These variables of transaction costs are looked into to find out what causes the identified barriers and to look into possibilities to overcome them. By comparing the two markets, the relative importance of certain barriers may also be revealed.

The data is collected from German and Slovenian national legislation, relevant national action plans and green papers, surveys and interviews.

6.1.1 Political framework

The policy mix in Germany is identified in many reports as the most important element for the German energy efficiency service market development. The measures of German National Energy Efficiency Action Plan (NEEAP) as well as of the German Integrated Energy and Climate Plan are encouraging for energy efficiency projects. In Slovenia, energy efficiency has not been addressed in national action plans until recently with partly implemented Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings and Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services in its NEEAP and legislation. Also in Germany the two directives are not completely implemented yet, however, there is Energy Efficiency Act ("Energieeffizienzgesetz – EnEfG") in preparation, which will fully implement the 2006/32/EC Directive. Energy performance contracting is identified in Slovenian and German NEEAP as an efficient tool to boost energy efficiency investments.

The main national energy acts in Germany are the NEEAP and German Integrated Energy and Climate Plan (Agreed on August 2007), which contain all energy savings measures. The Integrated Energy and Climate Plan consists of Energy Saving Order (Energieeinsparverordnung EnEV) that combines all measures to boost energy efficiency of buildings; the Renewable Heat Act (Erneuerbare Wärme Gesetz EEWärmeG) and the Combined Heat and Power Law (Kraft-Wärme-Kopplungs-Gesetz KWKG). All these three acts indirectly promote energy service contracting, however the Combined Heat and Power Law and the Renewable Heat Act also contain provisions that discourage Energy service contracting. These provisions favour production of energy on site (Bunse, 2010) and therefore discourage contracting (if energy is not produced on site, a renewable sources fee has to be paid). The NEEAP that was issued in 2007 includes the cumulative energy savings target, which is 232 TWh from 2008 till 2016. NEEAP also includes a plan to double energy productivity by 2020 from the 1990 levels and states that there will be public funds available to achieve these targets.

In Slovenia, the main national energy acts are the NEEAP that was issued in 2008 under the requirement of the Directive 2006/32/EC and the Green Paper on New National Energy Program that was issued in 2009. In the Green paper, energy efficiency is identified as one of the primary energy policy concerns (Zelena knjiga za Nacionalni energetski program Slovenije, 2009). The New National Energy Program should be prepared by fall 2010. The NEEAP includes the target of cumulative energy savings between 2008 and 2016, which is 4261 GWh (9.5% or the cumulative energy consumption). Overall target set in NEEAP is 20% cut in primary energy consumption by 2030 from 2008 level. The operational targets include a limitation of electricity use to 12% growth until 2030 from the levels reached in 2008 and increase the share of Zero-energy new buildings to 100% by 2020 (NEEAP Slovenia, 2008). The public funds available to achieve these goals are limited to EUR 380 million in the period until 2016. With the new National Energy Program, Slovenia will develop a more favourable energy policy for energy efficient projects, which is at present relatively poor comparing to German Integrated Energy and Climate Plan.

Although there are no measures to directly stimulate development of Energy service contracting in either of the two countries, the German comprehensive national energy action plans and a favourable policy mix for Energy efficiency market development indirectly promote the development of Energy service contracting. In Slovenia such support is much weaker. The German government support program consists of many support instruments, among most important ones are: Feed-in-tariffs based on Renewable Energy Law, research and development programs, loan/funding schemes, incentive programs for renewable energy, energy efficiency initiative of the German Energy Agency. In addition to governmental, there are non-governmental programs such as credit programs by eco-banks (e.g. kWf) or boiler replacement by utilities, which complement ESCOs work in the residential sector (Geissler, Brand & Bertoldi, 2003; NEEAP Germany, 2007). In Slovenia, the national program consists of redesigned feed-in-tariff, which includes guaranteed purchase price or financial aid for RES and high efficiency cogeneration; Excise duty on Energy products and Electricity (e.g. biofuels are exempted); Supplementary energy efficiency fee on electricity, heat and fossil fuels. The program will also include a new CO2 tax, which is in preparation. As good practice examples, the EU Commission Synthesis (2009) reports Germany's long-term, low-interest loans for refurbishing existing buildings, CO2 Building Retrofit Programme, information campaign with the building. The only reported good practice example in Slovenia is voluntary agreements as a good practice in Slovenia (EU Commission Synthesis, 2009).
In addition to the much richer energy policy, the NEEAP of Germany identifies Energy performance contracting as a concrete measure for energy efficiency refurbishment in state buildings, compressed air, lightning, heating, modernization of street and traffic lights,

whereas NEEAP of Slovenia places Energy performance contracting in a group of 29 instruments that will be promoted to achieve energy savings. Energy service contracting, however has not been promoted directly, there are no guarantee schemes for ESCOs in any of the two countries under observation.

6.1.1.1 The public sector as a role model

In both NEEAPs, Energy performance contracting is described as an instrument that is particularly suitable to the public sector, because of the large technical and economical potential in public buildings and because the public sector is a relatively low-risk customer for ESCOs in both countries (Standard & Poor's rating of German long-term sovereign debt is AAA and Slovenian AA (Bloomberg, 2010). In the German NEEAP, the focus is on the refurbishment of existing buildings, while in Slovenian NEEAP, the focus is on the thermal envelope and building equipment. According to the NEEAPs, the Federal German Government is obliged to reduce the CO2 emissions in its area of responsibility by 30% in the period between 2008 and 2012, compared with 1990 levels. The aim is to set an exemplary role of the states (Länder) and municipalities, mainly by improving the energy efficiency of public buildings (the basis for improving energy efficiency in the building sector is the Energy Saving Order). Slovenian NEEAP states that public sector will fulfil the exemplary role with 496 GWh saved energy between 2008-2016. The Federal German Government has already introduced a pilot project (financed by third parties) to optimise many Federal Government properties with a large energy efficiency improvement potential. The aim is to use Energy service contracting, to exploit the existing potential for energy savings, to reduce CO2 emissions and lower the costs.

Germany developed a long list of instruments (in place or planned) to improve energy performance of all sectors, the public sector in particular. Support on government, state and local level is expressed through loans, subsidies, activities to spread information on energy efficiency by municipalities, energy agencies, local energy suppliers, consulting companies and NGOs. All these actors have a role in development of German energy efficiency service market (Hansen 2009). They lower the production costs and transaction costs of the energy efficiency projects. Bunse, Irrek, Siraki & Renner (2010) in the Change Best report for Germany suggest that information campaigns on energy efficiency, financial support programmes for energy audits and regulations on buildings and heating systems have been together very effective, however the effects of single measures have not been evaluated (Bunse, Irrek, Siraki & Renner, 2010. In Slovenia, there have been relatively few similar activities. In addition, in the German market, the European Commission projects like Eurocontract and Clearcontract[3] have been beneficial in providing standard forms of contracts and therefore minimizing transaction costs of contracts with standardization. In the Slovenian market these standard contracts have only been used in few cases. Recently, the Slovenian Ministry of Finance gave a negative opinion about the standard contracts developed under the projects Euroconctract and Clearconctract use in public-private partnership projects. They have recognized Energy performance contracting as a form of leasing and therefore all the regulations are applied according to this definition (interviewee Pospis - Perpar , 2010). In Germany, however, there is a tendency towards higher standardisation and there have also been contracting guidelines created by some federal states (Hansen 2009).

[3] Eurocontract and Clearcontract are projects supported by the European Commission that aims to develop standards, model documents, and local capacity building for Energy Performance Contracting

6.1.2 Economic framework

Energy dependency is an incentive for the governments to promote projects that diminish energy consumption. Both, Germany and Slovenia are very much dependant on the foreign enery sources, which s an incentive to promote energy efficiency projects among others. Germany's dependency in 2008 was 60,9% and Slovenia's 55,0% (European Union 25 average was 55,4%). Another economic determinant that has an impact on energy efficiency projects is the price of energy. The higher the cost of energy, the bigger is the incentive for energy efficiency projects. Electricity prices consist of generation costs plus a profit margin, costs of transport (net price) and public dues that take a relatively large portion of the price. Public dues can be in form of value-added and electricity tax, non-renewable energy charge, municipal charge (Cronenberg 2006). Table 6-1 presents major energy price statistics for both countries.

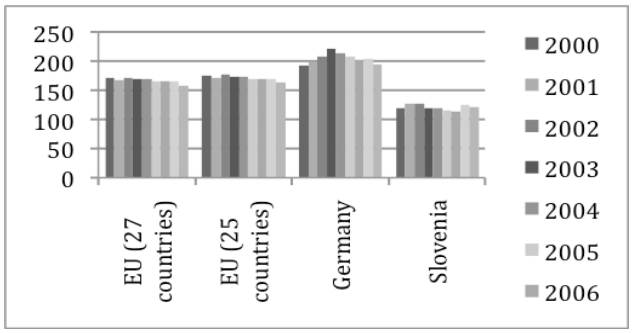
Table 6-1: Energy prices in Germany and in Slovenia in 2009 expressed in EUR/kWh

Energy prices		Germany	Slovenia
Electricity Prices in EUR	Household consumers (EU27 average = 0.1227)	0.1401	0.107
	Industrial consumers (EU27 average = 0.0952)	0.0975	0.1063
Gas prices in EUR	Household consumers (EU27 average = 0.1227)	13.48	14.44
	Industrial consumers (EU27 average = 0.0952)	10.86	11.34
Implicit tax rate on energy in 2008 as ratio of energy tax revenues to final energy consumption, deflated. EU 25 average = 162.5%		193.8%	121.7% Energy taxes are defined through the fiscal policy. Treated as a national budget income

Source: Geissler et al. (2006), Berliner Energieagentur GmbH (2006) and Eurostat (2010)

Implicit tax rate on energy has been relatively high in Germany comparing to EU average and relatively low in Slovenia, where implicit tax rate has been substantially lower then the EU average (see figure 6-1f) In Germany, according to the Bunse et al. (2010) and Hansen (2009), many ESCOs argue, that energy taxes are one of the most effective policy instruments for energy efficiency. One of the very important factors for energy efficiency service market development in Germany has been German energy and electricity tax law. This law that is now under revision gives tax allowances to industries where energy consumption is high. Companies or organisations in other sectors can also apply for a tax allowance if the energy efficiency service company supplies energy for them. By contracting the energy supply to the company in the industrial sector, the 'producing' company can get the tax allowances for the 'nonproducing' company. Therefore the higher taxes are beneficial for energy efficiency supply companies (ESCOs).

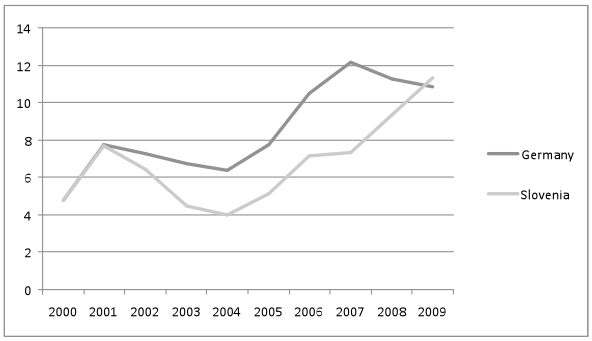
Figure 6-1: Implicit tax rate on energy for EU (27) average, EU (25) average, Germany and Slovenia. Ratio of energy tax revenues to final energy consumption, deflated, between 2000 and 2008.



Source: Eurostat, 2010

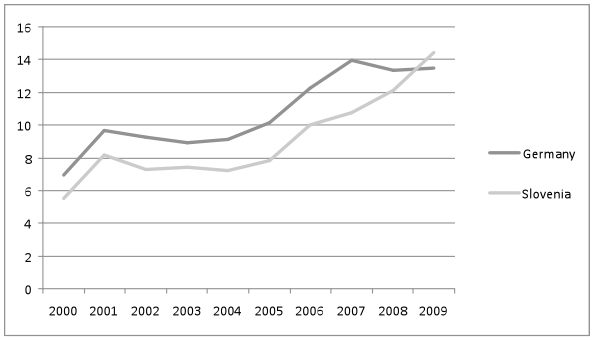
Also energy prices have a substantial impact on energy efficiency services market development. In recent years, the world energy prices have been fluctuating, however they are estimated to rise in the near future (Energy Information Administration, 2010), which is a positive factor for energy efficiency services market development. Except for electricity prices for household consumers, energy prices have increased relatively more in Slovenia in recent years than in Germany. However, the level of gas and electricity prices has been higher in Germany in the past few years. In 2009, gas prices for households and industry, as well as electricity prices for industrial consumers are slightly higher in Slovenia than in Germany, but the electricity prices for household consumers are still much higher in Germany. Higher absolute levels of energy prices in the past few years in Germany imply relatively better conditions for Energy performance contracting development (higher energy prices give incentives to consumers to lower energy consumption). However, there has been a higher growth in electricity prices for households in the last two years in Slovenia, which could be an incentive for a higher growth of Energy performance contracting in Slovenia.

Figure 6-2: Gas prices for industrial consumers from 2000 till 2009 in EUR/Gigajoule



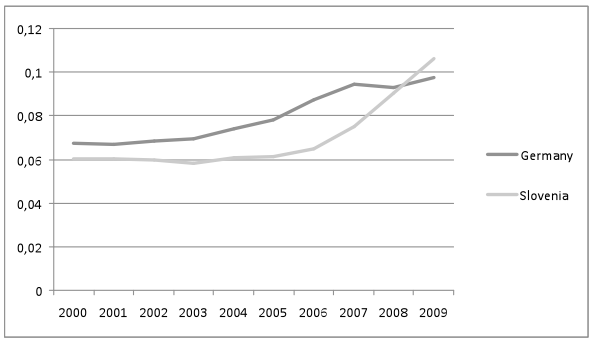
Source: Eurostat, 2010

Figure 6-3: Gas prices for household consumers from 2000 till 2009 in EUR/Gigajoule



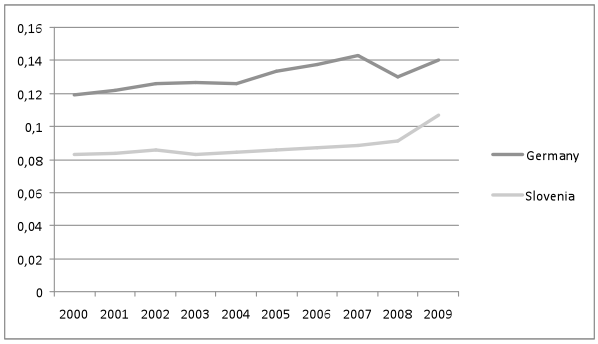
Source: Eurostat, 2010

Figure 6-4: Electricity prices for industrial consumers from 2000 till 2009 in EUR/kWh



Source: Eurostat, 2010

Figure 6-5 : Electricity prices for household consumers from 2000 till 2009 in EUR/kWh



Source: Eurostat, 2010

6.1.3 Energy market structure and competition on the market

The economic framework has a great impact on the market structure and number of players on the market, which are an important determinant of transaction costs on energy efficiency market. The table 6-2 shows that the energy efficiency service market in Germany is relatively competitive comparing to the Slovenian market, even if we take the relative sizes of the economies into consideration (German economy is approximately 40 times bigger then Slovenian if we take the number of citizens into account and approximately 67 times bigger if

we consider nominal GDP of the countries (Wikipedia, 2010))[4]. According to a survey from Bundesamt für Bauwesen und Raumordnung (2009), there are around 500 companies offering energy efficiency services in Germany, half of them offer energy contracting, mostly energy supply contracting. Energy performance contracting is usually not a core product, but rather an addition to existing service offers. Only 15 ESCOs offer only Energy performance contracting ('pure' ESCOs) in Germany (Berliner Energieagentur, 2009). In Slovenia, there are only few companies offering energy efficiency services, only three offer energy service contracting and only one of them is a 'pure' ESCO offering Energy performance contracting.
The share of the biggest energy companies that offer energy efficiency services influences the negotiating power of the actors. Both the German and Slovenian energy markets have an oligopolistic structure. On the German market, there are four energy supply companies (E.on, Vattenfall, EnBW, RWE) that are also biggest energy service companies offering Energy performance contracting. They are also the biggest actors in electricity distribution market, which determines electricity prices in the wholesale trade (Nagel 2006). Since 2008, there is a net price regulation of electricity, based on incentive regulation. On the Slovenian market, the biggest energy supply company is Petrol, which controls around 60% of the energy supply market (Petrol annual report, 2009). It also has the biggest market share in Energy contracting projects. The other bigger oil company is OMV Slovenia (the former Istrabenz). Both companies are state owned. Electricity market is also dominated by two state owned companies, Holding Slovenske Elektrarne (HSE) and Elektro-Slovenija (ELES). Electricity prices are regulated on the government level. The gas distribution market is 30% controlled by Geoplin, which is also state owned company (Enercee.net, 2010). Both, Germany and Slovenia have adopted the Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, under which the electricity market has been opened up, which means that all the customers can freely choose their electricity suppliers.
Although there are very few companies on both markets dominating the energy market, there is apparently much higher level of competition among these actors in Germany than in Slovenia. According to the interviewee Bunse (2010), who is an expert on Energy service contracting at the Wuppertal institute in Germany, energy supply companies on the German market are trying to gain customers' loyalty mostly by differentiating their services in quality and range. In Slovenia, there is a lack of competition in energy distribution and energy service market, which reflects in the prices of energy companies' services. The answers of the survey that was conducted among all Slovenian municipalities reveal that one of the major reasons why the municipalities are avoiding Energy performance contracting are the unappealing conditions offered by energy service companies.

The transaction costs also depend on the relationships of the actors on the market and not only on their number and market share. If there is co-operation between energy companies/ ESCOs, architects, equipment providers, installers, energy consultants etc., customers can expect a better quality of the energy efficiency installations than in the case where every actor considers strictly its own part in the investment offer. The transaction costs for the clients are minimized if all relevant actors make a single investment offer together, however the cooperation among actors should not result in the higher price for the offer. Such cooperation of actors is found in Germany, resulting in offers of complex system solutions and competition among smaller and larger energy service companies. In Slovenia, however it only

[4] Slovenian population is approximately 2 million and GDP per capita in 2009 was approximately 19,200 EUR. German population is approximately 82 million and GDP per capita in 2009 was approximately 32,100 EUR (Wikipedia, 2010)

appears in a form of outsourcing by the energy service company or the ESCO, which usually reflects in higher prices of the offer (interviewee Pospis - Perpar , 2010). In Germany, however, there is cooperation among actors and the energy service market is generally characterized by high competition pressure (Bunse et al., 2010).

Table 6-2: Number and types of energy efficiency service providers in the countries considered

Energy efficiency service provider typologies	Germany	Slovenia
ESCOs	About 500 (10-15 Energy performance contracting)	1
Retail energy sale companies	>800	Few (2 larger energy companies)
Energy/governmental agencies and NGOs (e.g. publicly financed advice centres)	Several	Energy Efficiency centre (Institut Jozef Stefan)
Associations of Energy efficiency service providers	2	0
Manufacturers of energy efficient technology	Several	0
Consulting engineering, installation companies, facility management and operation companies or other technical organisations	About 1 000 000	45 energy auditors

Source: Labanca, 2010

Beside the number and cooperation between different actors on Energy service-contracting market, the government and regional support in terms of information dissemination or funds provided lowers the transaction costs of Energy service contracting. In Germany, there are two associations helping the ESCO sector via range of activities. ESCO Forum ZVEI is an association of large ESCOs (www.zvei.de) and Verband fur Wärmelieferung (VfW) is an association of small heat delivery services (www.vfw.de). No such associations exist in Slovenia. In addition, Germany has introduced government schemes to promote Energy performance contracting. The Energy Saving Partnership scheme was established in Berlin in 1995 and is considered to be an important step in establishing the energy efficiency market in the public sector in Germany (Geissler et al. 2003). Under the Energy Saving Partnership scheme buildings are bundled into pools in order to decrease transaction costs. The scheme has been extended with Energy Saving Partnership Plus scheme for building and construction measures (e.g. heat insulation, window replacement) (Berliner Energieagentur GmbH 2006). Such schemes are used to reduce transaction costs and production costs of energy performance contracting through economies of scale.

6.1.4 Legal framework

Energy performance contracting is not directly regulated by the legislation in force in either of the two countries under observation. All energy laws are rooted in EU energy policy. Directive 2006/32/EC on energy end use efficiency and energy services, together with Directive 2002/91/EC on the energy performance of buildings are not yet completely implemented in the national legislation in Germany and in Slovenia.

In Germany, the legislation that mostly positively affects energy efficiency projects in industrial and residential sector is captured in Renewable Energy Heat Law that came into force on January 1st 2009, Energy Law and Law on Energy Savings. Energy Efficiency Law is in preparation, but it will not directly address the Energy performance contracting, however it will address energy audit (interviewee Bunse, 2010). There are also some articles in the Renewable Energy Heat Law that negatively affect Energy service contracting, e.g. all clients

that are provided with electricity by the contractor have to take renewable energy and therefore pay contribution, however the act does not affect the users that are producing electricity themselves. Also, the producers of Energy using Combined Heat and Power Plant that use contracting cannot apply for financial support.
In Slovenia, the Energy Law and the Building Construction Law that partly implemented the Directive 2006/32/EC on energy end use efficiency and energy services and Directive 2002/91/EC on the energy performance of buildings are the two pieces of legislation that positively affect energy efficiency projects in industrial and residential sector. The Energy Law is currently under Revision and should be adopted in 2010. According to the interviewee Pospis - Perpar (2010), there is a need for legislation in Slovenia that would address energy audits, because Energy performance contracting cannot be placed into current accounting rules. This is one of the reasons why Energy performance contracting projects are perceived as complicated, particularly in the public sector.
In Germany, favourable legislation on energy efficiency is more extensive then in Slovenia. In addition, the legislation that addressed energy audit is going to further lower the transaction costs of Energy service contracting.

In the public sector, the laws that mostly affect energy efficiency projects in Germany and in Slovenia are the respective Public-Private Partnership Law, Communal (Municipal) Budget Law and Law on Public Procurement. This legislation imposes many barriers to Energy service contracting projects and increases their transaction costs.
In Germany, public sector (Federal, State (Länder) and local authorities) must follow the principles of the Budget Law, among others the principle of total budget coverage (incomes cover expenses), the principle of minimization (reduce expenses to minimum) and the principles of economic efficiency and prudence. Because of the first two principles, cost intensive energy efficiency projects are rarely implemented. Another obstacle for Energy service-contracting coming from the German Budget Law are separated local authority budgets. Unlike the Federal and State budgets, local authority budgets are divided into an administrative budgets and capital budgets. The capital budget includes investment expenditures, loans and excess revenues in the administrative budget; other financial flows are included in the administrative budget. There is no clear understanding of the accounting of the remunerations from Energy service contracting savings (Bundesministerium der Finanzen, 2008) Another impediment to Energy service contracting in public sector in Germany is the requirement that a comparison with self-financing has to be done for energy contracting projects. Many States have such a rule and no consistent standards for projects evaluation. Energy service contracting is also a subject to prior approval of state or local authorities (Bunse et al., 2010). The legislation that is expected to positively influence the Energy service contracting in the public sector is the new Regulation on Green Public procurement that is under way (Bunse et al., 2010). Currently, energy efficiency related public contracts are usually awarded to the cheapest offer considering only the upfront investment, whereas energy saving (lifecycle costs) are not considered.

There are some similar impediments to Energy service contracting development in the public sector in Slovenia. Currently, also in Slovenia energy efficiency related public contracts are usually awarded to the cheapest offer, although the Public-Private Partnership Law states that the contract is given on a basis of ex ante published conditions that determine the economically most favourable offer. The new Decree on Green Public Procurement that is expected to come into force in 2010 is expected to promote valuations on the life cycle assessment basis to the grater extent. Another obstacle deriving from the Public-Private Partnership Law is the Article 8, which requires that all (with certain exceptions) the contracts that exceed the amount of EUR 5.278 million are treated as a Public-Private Partnership and not as a public procurement. According to Mr. Gorse from Novo Mesto Municipality

(personal communication, July 27th, 2010) the Public-Private Partnership Law and the Public Procurement Law are self-excluding. Energy service contracting has to be treated as investment maintenance under the Public Procurement Law and also as a Public-Private Partnership, because it exceeds a certain amount of investment. Energy service contracting therefore cannot be done according to all the legislation that has to be followed. The more complicated procedures increase the transaction costs of the investment.
An even bigger barrier to Energy service contracting comes from the Municipal Budget Law. In the Article 10 it contains a provision on contracted debt: " a municipality's debt in the current fiscal year cannot, together with the existing debt exceed 20% of realized revenues in the year prior to the year of contracting of debt excluding donations and investment transfers from the state budget, provided that the repayment of the principal and interest in a particular year of repayment does not exceed 5% of realized revenues without donations and investment transfers from the state budget in the year prior to the year of contracting of debt" (the Municipal Budget Law, Art.10). This article is perceived one of the main barriers to Energy service development according to the interviewees. Until 2007 the Law on Execution of the State Budget explicitly defined the Energy performance contracting as contracts, which are not included in the debt quota, however later changes of the law excluded all provisions on Energy performance contracting. Since Energy performance contracting is not addressed in the legislation any longer, the Ministry of Finance decides on a case by case basis whether certain Energy service contracting project in the public sector should be included in a debt quota or not. According to interviewee Pospis - Perpar (2010), the Ministry of Finance treats Energy performance contracting as leasing. Such exclusion from the legislation and decision making of the regulatory body on the case-by-case basis imposes uncertainty, higher risks and consequently higher transaction costs to both, the contractors and clients (Stanicic, 2010).

Legislation barriers in the pubic sector imply very high transaction costs to the contractors and potential clients in Slovenia. The actors may go through the whole procedure of signing the Energy service contract and be not able to realize it at the end. The case by case interpretation of the Energy service contracting projects imposes high risks to the actors and makes the instrument seem complicated and time consuming. Improvements in the legislation seem a necessary condition for the higher uptake of the Energy service contracting in the public sector in Slovenia.

6.1.5 Financial framework

The government financial support for the energy efficiency projects seems to be stronger in Germany then in Slovenia. The German NEEAP states that all the programmes, measures and instruments proposed in the NEEAP, which presuppose financial expenditure by public authorities, are subject to such financing being provided. The Slovenian NEEAP gives the estimate of the funds needed and provided for its implementation. It states that EUR 380 million in public funds is needed, for the NEEAP implementation and that the estimated shortfall is around EUR 188 million, which will be provided from the state budget and the energy efficiency fee on heat and fossil fuels prices (Article 66b of the Energy Law). Lack of private funds is perceived as a major obstacle to Energy service contracting development in Slovenia (Stanicic, 2010). Besides, EBRD and other international financial institutions are not interested in Energy service contracting projects in Slovenia due to size of projects and absence of projects pipelines or bundled projects. Other government support for energy efficiency projects in Slovenia is available through Eco Fund. Eco Fund is the central financing institution for energy efficiency and environmental projects, providing soft loans and grants in accordance with national and EU priorities. European Investment Bank has given a framework loan to Eco Fund for small and mid size projects, also in energy efficiency.

In Germany, KfW, Gemany's leading environmental bank provides 'Special Funds' for Energy Efficiency for small and mid size enterprises. There is a Joint Initiative of the Federal Economic Ministry (BMWi) and KfW launched February 2008, providing grants for energy consulting and loans for investments in energy efficiency.
In Slovenia, the most important financial instruments to promote investments in energy efficiency named in NEEAP are: allocation of grants from the state budget or soft loans, favourable purchase prices for electricity produced from renewable energy or cogeneration, exemption from taxes on CO2 pollution in some measures and Energy performance contracting using third party financing (NEEAP Slovenia, 2010).

In the commercial sector, the banks of both countries are familiar with the Energy service-contracting concept (interviewees Valentincic, 2010; Bunse 2010), however in Slovenia the larger energy company Petrol reports that no favourable conditions are offered for such project financing (interviewee Valentincic, 2010). Petrol uses regular lines of credit and no project financing. Project financing is not widely used in Germany either, mostly because the International accounting guidelines and Basel II[5] regulations in general do not allow the equipment installed to be used as a collateral (The Bank for International Settlements, 2010). Also the savings generated are not always acknowledged as a cash-flow and therefore cannot be used as collateral either. The Basel II regulations negatively affect particularly small ESCOs that cannot receive a credit under the same conditions as large energy companies, because the creditworthiness of a customer instead of the project (cash-flow) is usually the base for a credit. In case of a project financing, the size of the project in Germany should be at least EUR 4 millions to receive favourable credit conditions (Bunse et al., 2010). In Slovenia, the only ESCO (El-Tec Mulej) uses project financing, however the credit conditions that it receives from the commercial banks are relatively poor comparing to the credit line offered to larger energy companies (interviewee Pospis - Perpar , 2010).

In Germany, Factoring (forfeiting)[6] is more commonly used, but that usually means that clients require higher percentage of the total savings guaranteed or be backed by a bank guarantee. It is a tool to avoid the "lack of cash-flow" problems (Bertoldi et al., 2007)

[5] Basel II is the second of the Basel Accords, which are international standards that regulators can use when setting the requirements about the capital that banks have to take as a collateral to protect themselves against the financial and operational risks (The Bank for International Settlements, 2010).

[6] Usually used in export finance, forfeiting is a method of financing, where the bank guarantees receivables.

7 Comparison of project specific transaction costs determinants

Asset specificity and task complexity are two determinants of the transaction costs that vary greatly by a project. Three types of asset specificity are determinants of transaction costs in Energy service contracting: Site specificity, physical asset specificity and human asset specificity.

Site specificity is a determinant of costs when transferring the instalations from one site to another.

Physical asset specificity is a determinant of how much has to be invested in auditing, finding technical experts and mitigating the risk that the client will opportunistically use the information provided by audit and ESCO experts (Singer, 2002). In Germany and in Slovenia there are government financial supports for energy audits in all sectors for energy efficiency projects (Bunse et al., 2010; Stanicic, 2010), which lower the transaction costs deriving from the physical asset specificity. However, such measures in Germany create a competition distortion, because these financial supports are only available to small and medium enterprises and not for energy consultants from energy companies. Also, in Germany and in Slovenia certain energy audits that are conducted by the energy agencies free of charge distort the competition because other energy consultants have to charge for their audits. On one hand, such practices are causing less transaction costs for both parties, because the transaction costs caused by the auditing are avoided. On the other hand, they cause additional transaction costs to ESCOs that have to take distorted competition into account and implement it in the calculations of their offers.

Human asset specificity is important when ESCOs or clients do not have a specific technical knowledge on a measure that needs to be implemented, In that case the transaction costs involve the costs of educating staff or costs of finding the right experts. In Slovenia such costs are expected to be relatively higher then in Germany, because of the number of actors and knowledge available on the energy service market. As the survey shows, the lack of technical knowledge is not only a problem of ESCOs, but also the biggest potential client – public sector, that doesn't have knowledge on the instrument nor technical knowledge to prepare tender offers of a reasonable quality. Poor tenders also increase the transaction costs of ESCOs that have to look for the missing information or take the risk of no information.

Also task complexity increases transaction costs. The more complex is the task, the harder it is to decide and monitor the terms or the contract. The survey among Slovenian municipalities reveals a lack of trust in providers, offering unacceptable conditions of the contract. To overcome the lack of trust and opportunistic behavior that a complex task offers, many details of the task could be specified. However such practice involves high transaction costs. A competitive market, such as German lowers these transaction costs because there is a greater chance that a competitor will make a better offer to the client.

8 Comparison of production costs determinants between Germany and Slovenia

According to Sorrell (2007), the total savings in production costs have to be greater then the rise in transaction costs caused by the contracting to make it viable. In other words, the total costs of energy supply and energy services need to be reduced. Therefore, to be able to make a framework for an analysis of economic viability of Energy performance contracting, the production cost variables need to be evaluated.

The production costs may be reduced through energy efficiency improvements and related reduced costs of operation and maintenance and also through a lower purchase price of the energy and cost of financing. These all depend very much on the relative size of the ESCO compared to its clients, and the two biggest production costs savings of a client can be achieved though the economies of scale and market incentives reached through Energy service contracting (Globerman and Vining, 1996).

Economies of scale

ESCOs can offer reduced costs comparing to the in-house provision resulting from their specialized knowledge in energy and bulk discounts that they receive for energy purchase that they distribute among many clients. In Germany, such savings are usually the case, however in Slovenia, the ESCO is many times smaller then the client and is therefore unable to provide savings on the economies of scale basis. Also in Germany, there is a The Energy Saving Partnership scheme, under which buildings are bundled together to achieve the economies of scale. Such partnerships don't exist in Slovenia. Besides, it is rarely possible to bundle public buildings together, because municipalities are very small and such practice would mean a single contract with many municipalities (to bundle buildings from many municipalities together), which is practically impossible due to administrative hurdles. Economies of scale play an important role in financing as well. An ESCO may be able to bundle projects together and receive a relatively cheaper financing because of the size of the project. In Germany, where project financing is common, this is often the case. In Slovenia, however, the biggest energy company doesn't use the project financing (interviewee Valentincic, 2010) and the 'pure' ESCO has not been able to bundle projects together (interviewee Pospis - Perpar , 2010).

Market incentives

Technical and Economic Potential for Energy performance contracting. Germany and Slovenia have made some estimations of their energy saving potentials. According to the Directive 2006/32/EC, they have determined possible savings, statically (i.e. without updating the quantity structures or market developments) over the period 2008-2016 in comparison with a reference year (2002). In Germany, the technical saving potential across all sectors is estimated to 1463 PJ [petajoules], which is 15.5% of the final energy consumption taken as a basis (9412 PJ) (NEEAP Germany, 2007).

In Slovenia, the technical potential across sectors is not provided. However, the estimated savings for the 2008–2016 period are given and they do not exceed the requirements of the Directive 2006/32/ES, which is 9% in the 2008–2016 period. The reference energy use is the 5 year average of final energy consumption before the implementation of the Directive for which official data exist). This amounts to 4261 GWh or 15,34 PJ of savings (NEEAP Slovenia, 2008).

In Germany, also the economical potential for energy savings and a potential that could be

achieved through Energy performance contracting has been evaluated and presented in the NEEAP. In Slovenia these two potentials have not been evaluated.

The economical potential in Germany as presented in German NEEAP (2007) is 1246 PJ across all sectors in the 2008–2016 period, i.e. 13.2% of the final energy consumption taken as a basis (9412 PJ). The energy savings that can be achieved per year through the Energy service contracting are estimated to EUR 3.853 million and 22% of these savings could be achieved through Energy performance contracting (Lamers & Berger, 2007). Most of the potential savings through Energy performance contracting are predicted in hospitals and public sector in general.

Other market incentives. Subsidies and other government support are discussed in section 6.1.5.

8.1 Summary of the barriers and drivers for Energy service contracting in Germany and in Slovenia by the transaction and production costs determinants

Summary of barriers and drivers for Energy service contracting in Germany and in Slovenia is presented in the table below by the transaction and production costs determinants. Barriers that are perceived as important by the public sector are again emphasized.

Table 8-1: Summary of barriers and drivers for Energy service contracting in Germany and in Slovenia by the transaction and production costs determinants. Barriers that are perceived as important by the public sector are marked with a star (*)

Cost determinant	Common barriers (previously identified)	Germany		Slovenia	
		Non-common drivers in Germany (previously identified)	Non-common drivers in Germany (Comparison of transaction and production costs drivers)	Non-common barriers in Slovenia (previously identified)	Non-common barriers in Slovenia (Comparison of transaction and production costs drivers)
Policy framework	Lack of information*	Information, communication, consulting activities + supportive policy measures within the German NEEAP and German Integrated Energy and Climate Plan; Best practice examples Market development strategies on a regional level	More ambitious energy efficiency targets in policy documents than Slovenia In addition to governmental, there are many non-governmental support programs, also information dissemination Concrete plans for exemplary role of the public sector + promoting standardized contracts	Lack of best practice examples	Standardized contracts (Euroconctract and Clearconctract) prohibited in public-private partnership projects
Competition	Poor tenders*	Best practice examples	Relatively large number of potential contractors Cooperation of the actors	Limited competition Small ESCOs - lack of knowledge and expertise, inability to take over larger projects*	No cooperation among actors

Economic framework			Higher energy prices (electricity, gas) except for the electricity prices for industrial consumers. Higher implicit tax rate on energy in Germany		
Financial framework		Financial support for energy efficiency projects in many different forms	Project financing is common; banks have a lot of role examples to base project financing on. All actions taken under NEEAP plan will be provided with funds needed		Banks offer unfavorable conditions for project financing (large energy companies use credit lines) Limited funds for NEEAP implementation
Legal framework	Unfavorable legislation*		More legislation that is indirectly favorable for Energy service contracting		Every Energy service contracting project in public sector is approved by the Ministry of Finance on a case by case basis Existing legislation does not allow (indirectly) Energy service contracting in the public sector
Asset specificity, task complexity	Poor tenders*		Germany has more best practice examples – simplified procedures on the next projects		
Determinants of production costs	Long project duration (long pay-back period)*	Energy Saving Partnership – economies of scale		Little opportunities for economies of scale*, Poor data available on technical potentials*	Very low possibilities to bundle projects together – no economies of scale

In this chapter I have provided information on the barriers and drivers to energy service contracting in Germany and particularly in Slovenia. Taking the differences in market sizes into consideration, I have compared the determinants of the production and transaction costs in Energy service contracting between Germany and Slovenia. The drivers for Energy service contracting in Germany seem to come particularly from the favorable political framework that contributes to the minimization of the transaction costs to a great extent. Also legal framework seems to be more supportive in a sense of transaction costs minimization, although there are some important legal barriers in Germany as well. In Slovenia, the legal framework is particularly restrictive in the public sector, because of few pieces of legislation that do not allow the necessary conditions for the Energy service contracting to develop. This may be a barrier that deters the Energy service contracting development to a point that the actors do not even consider gathering more information on an instrument, but simply refuse it from scratch. In such a case even more positive political framework have no role in Energy service contracting development. Also financial framework seems to be more positive for the

Energy service contracting project financing in Germany then in Slovenia. There is also more financial support in terms of government subsidies and funds provided for the actions taken under the German NEEAP. The economic framework does not offer substantially bigger drivers in Germany. The economies of scale and best practice examples are among the positive drivers that determine the German production costs and are not present to such extent in Slovenia.

9 Discussion

In the previous sections the important barriers to energy service contracting market development in Slovenia were identified using surveys and interviews. Then the Slovenian and German frameworks that determine the transaction costs and production costs on the energy service contracting market were compared in order to find the framework that determines the identified barriers and find a better alternative when looking into German framework. In this section the determinants (frameworks) of the biggest barriers on the Slovenian market are delineated and possible ways of improvements according to the German example outlined.

Limited information and limited competition seem to be the two most important market failures that drive the opportunistic behaviour and moral hazard on the Energy service contracting market.

The *lack of information about the instrument* is identified as one of the biggest barriers to Energy service contracting market development and causes transaction costs to potential clients that look for the information on energy service contracting possibilities. It can partly be attributed to the poor policy mix in Slovenia. In contrary, in Germany there are funds provided for auditing programs, for educational programs for managers and architects, energy agencies are very active in information dissemination. Information, communication, consulting activities and supportive policy measures within the German NEEAP and German Integrated Energy and Climate Plan make the instrument visible and understandable to potential clients. Policy can lower the transaction costs of contracting by promoting transparency, clear understanding of the instrument, and supportive framework in terms of standardization. Standardized forms of contracts, standardized verification procedures and measurements of energy savings add to clear understanding of the instrument.

Also best practice examples provide information on the instrument and therefore lower transaction costs of contracting. Not only clients, but also financial institutions could lower their transaction costs if they had more information on the instrument and be able to base their risk calculations on. Lack of best practice examples and information raises the transaction costs for commercial banks that are unwilling to offer cheap project financing, which consequently raises the production costs of contracting.
In the residential sector, which has one of the biggest technical potential for the energy efficiency improvements, information campaigns and regulations on agreement that would address the landlord/tenant dilemma could be beneficial for the instrument uptake.
It is important to increase the efficiency of organizational procedures and develop social processes to boost the learning mechanism procedure (Irrek, 2004). Promoting research and development (learning by searching) could also add to the instrument uptake (Weiss et al., 2007).

Lack of trust in providers is another barrier that is frequently mentioned. A large share of scope for opportunistic behaviour on the side of contractors comes from the limited competition on the market. A very limited number of bids means that it is harder for a client to perform a comparison between different offers and it is harder to find clauses that are a product of contractor's opportunistic behaviour. Limited number of actors on the energy efficiency market also means that the few ESCOs that exist on the Slovenian market do not have an easy access to technologies and a knowledge that they need to outsource for certain projects. A very limited cooperation among actors also adds to these costs.
According to the one of the interviewees, municipalities have no capacities (staff) to be able to compare potential savings from own investments with the contractor's offer. Also in Germany

there is no standard available to compare Energy performance contracting to own financing. According to interviewee Bunse (2010), such standard evaluation models could reduce transaction costs of potential clients. Energy audits performed by energy agencies reduce transaction costs of the client that tries to compare and evaluate different contractors bids. However, such audits may also mean a competition distortion as it is discussed in previous section. Subsidies for energy audit for any actor that can offer a comprehensive energy audit may be the right policy in the direction of reducing transaction costs of potential clients while not interfering into market competition. Among policy measures that could lower the transaction costs of clients looking for information on contractors are also ESCO certification and social marketing of energy efficiency investment actions (Bunse et al., 2010). The policy measures that increase the information available about the instrument is also beneficial to the financial sector when it comes to project financing. There is only one 'pure' ESCO in Slovenia, but it is very small and cannot receive the lines of credit the same conditions as larger energy service companies Petrol and OMV (interviewee Pospis - Perpar , 2010). Petrol has established lines of credit with commercial banks and does not use project financing, which would be more expensive (interviewee Valentincic, 2010). The ESCO however used the project financing. Best practice examples and better information available to the commercial banks would probably have a positive effect also on the financing terms offered for the project financing.

Lack of information about the instrument and lack of trust in providers point to the problem discussed by Mills et. al (2006) about the lack of understanding of financial and performance risks of energy savings projects. If the information about the risk and volatility is not provided, investors tend to avoid the projects.
Traditional investments are evaluated on a basis of value, risk and volatility. The risk and volatility data, however, is usually not available for the energy-efficiency projects, which keeps investors away. The fact that energy costs are usually marginal in overall costs of certain company or an institution only adds to the reasoning why such investments are overlooked. Risk management tools that would allow the analysis of the energy efficiency investments and therefore the exchange the important information on value, risk and volatility between energy efficiency experts (contractors) and investment decision makers (potential clients) could increase the uptake of the energy service contracting.
Establishing the risk and volatility assessment framework is important, first to avoid the misperception of the energy managers that investments in energy efficiency are a bare necessity and not an economic opportunity and second to stimulate investment into riskier and potentially more profitable projects. It would change the perception that any kind of risk needs to be avoided and that all the predicted savings should be discounted for the downside risks only, with no consideration of a potential upside. Risk management instead of risk avoidance is discussed by Mills et. al (2006), who proposes quantitative risk analysis for energy efficiency projects using techniques that come from supply side risk management and are commonly used in finance (e.g. Monte-Carlo simulation, coefficient of variation). His view is supported by Jackson (2010), who proposes the use of financial industry risk management tool Value-at-Risk in order to be able to choose the profitable efficiency investments and not be caught in the bias sure-bet investments. Both authors agree that the risk should not be avoided, but rather explained. Understanding of the risks gives the contractors incentives to undertake the potentially more profitable projects and to the clients understanding of the premium requested by the contractors. Also, explained risks would enable lenders to abandon the practice of increasing the costs of borrowing based on the perceived downside risks only. Such practices often increase the cost of borrowing to unreasonably high levels, which consequently (through more expensive financing) raises the production costs. Finally, they would also be beneficial to the policy makers to point the policy measures into direction of more complex, riskier, but potentially more rewarding energy efficiency investments (Mills et.

al, 2006).
The risk management should consist of a risk framework that would enable the actors on the energy service contracting market to understand and evaluate the project intrinsic (can be controlled within the facility) and extrinsic volatilities (can be hedged, but not controlled, because they are determined from the outside).
Jackson (2010) argues that the financial Value-at-Risk (VaR) that shows a probability of the greatest portfolio loss in a certain period of time can be used for energy efficiency project risk and return analysis. VaR is a single variable to measure risk and is therefore easy to use in risk management and it is easy to understand. This is one of the reasoning's by Jackson (2010) why such a measure should be used instead of others, more complicated quantitative risk management measures (e.g. Monte-Carlo that is proposed by Milles at al., 2006). VaR has become widely used in financial industry investment analysis, and according to Jackson can be applied to energy efficiency investments to enable decision makers to make more informed decisions. VaR basically translates a technical language of engineers into simple financial analysis better understandable to CEOs.
Knowing the risks and volatilities of the projects, investors could invest into a portfolio of projects to spread the risks of a single project and reach a desirable risk exposure. Also insurance products and other financial instruments (derivatives) to mitigate risks could be developed if risks were evaluated (Mills et. al, 2006). Securitization of the energy efficiency investments makes them more available to the broader investment community. VaR also adds to the transparency of the risk evaluation and promotes its wider acceptability and can be therefore appreciated as a sort of information dissemination tool.

Unsupportive legislation, complicated administrative procedures and non-compatible accounting rules are also among the most frequently mentioned regulatory barriers. The existing legislation in Slovenia imposes high transaction costs in the public sector, because every project must be approved by the government (Ministry of Finance) on a case-by-case basis. Such procedures delay the implementation of Energy service contracting investments and make them more complicated for the both parties. The uncertainty about the interpretation of the instrument by the ministry also adds to the transaction costs of both parties. According to the interviewee Pospis - Perpar (2010), the ESCO has put a lot of effort and time into explaining the instrument and the differences between leasing and similar forms of energy service contracting to the staff at the Ministry of Finance responsible for contract approvals in the public sector. A clear definition of Energy service contracting, energy supply contracting and energy performance contracting is necessary to avoid misinterpretations and unnecessary delays of the projects. Also in Germany legislative barriers are reported, however they do not seem as large as in case of Slovenia. However, the barriers coming from the accounting procedures seem to be limiting in both countries. Clear accounting rules and clear Basel II rules interpretation for contracting project would diminish the uncertainty and lower transaction costs of energy service contracting.

A lack of technical knowledge is another frequently reported barrier that raises the transaction costs of contracting. There is a lack of technical knowledge on the side of potential clients in the public sector, which results in complete denial of the project or in tender offers for energy efficiency projects that are unclear, non-comprehensive and sometimes unfavourable to energy service contractors. Poor tenders impose uncertainty and risks and require additional time for interpretations, which increases the transaction costs of potential contractors. On the other hand, there is a lack of knowledge about all possible technical energy efficiency solutions, due to the size of the market and lack of different type of energy efficiency solutions providers. Also poor cooperation among actors adds to the transaction costs that derive from the small size of the market. Also here standardisation would help to remove the barrier.

There are two important barriers reported on the side of determinants of production costs: *long pay-back periods* and *no economies of scale*. Long pay-back periods are another barrier that could be tackled with a more favourable policy. The problem of long pay-back periods is reported specially for the thermal insulation of the buildings where the technical potential for energy efficiency improvements is among the largest. Longer contract period mean that client has a limited capability to replace the contractor, to negotiate new terms if conditions on the market change. The problem of risk, which requires higher rates of returns, could be tackled by subsidies for the most expensive but often also the most efficient measures. The problem of economies of scale comes from very low or no opportunities to bundle public buildings together in the same project, because on average very few buildings belong to the same municipality in Slovenia (municipalities are on average very small). Again, the policy measures on a government level would be necessary to tackle the problem that makes the instrument less economically viable.

The energy efficiency policy measures to stimulate energy savings through reducing transaction costs for the ESCO or a client are therefore:

- Providing information to boost awareness and knowledge about saving energy measures, possible energy efficiency investments and financing possibilities;
- Regulations addressing the energy service contracting, regulations on standards for energy efficiency measures, procedures and contracts. In the residential sector also standardized agreements to address market failures like split incentives (landlord/tenants) by agreements with both parties.
- Market based instruments to enforce savings measures
- Improved legislation (clear and understandable), clear accounting and procurement procedures

Energy efficiency policy measures to stimulate energy savings through reducing production costs for the ESCO or a client

- Financial support in forms subsidies, soft loans or guarantees for energy audit and thermal insulation - Contracting is most problematic for investments that require high asset specificity and high rate of return (Sorrell, 2007).
- Focus of ESCOs on cross-sectional technologies to overcome the barriers of limited knowledge on specific technologies
- Taxes (energy and/or CO2)(Boonekamp, 2007; MURE, 2010)

A legislation that would allow the energy service contracting seems to be a necessary condition for the Energy service contracting uptake, while there are many more determinants that compose sufficient conditions for the energy service contracting uptake. Among the later are better and easily available information about the instrument, available standard methods for project risk evaluations, and better technical knowledge on the energy related issues in the public sector. However, the problem (a market failure) of limited competition remains. Also a problem of a lack of actors on the market that are able to provide partial services of the Energy service contracting and could potentially add to the abilities of ESCOs to take over larger projects (where economies of scale are possible).

Also a problem of a relative size of the ESCOs and potential clients persist in Slovenia. The most promising potential client (with lowest default risk) for Energy service contracting in Slovenia is a public sector. However, this client is usually bigger then the ESCO in Slovenia, and that makes Energy service contracting less attractive to it for two main reasons. First reason is of financial nature, since smaller ESCOs usually can't receive better credit conditions on the commercial financial market or better conditions on a on the energy market when

purchasing the energy. Second, the knowledge and the ability to take over larger projects can be questionable in such a case. However, an option can still prove viable if the public sector's (municipalities') budget is limited to the extent that own financing is not an alternative. Moreover, there is not just the small 'pure' ESCO on the Slovenian market offering the Energy service contracting. There are also two bigger energy companies and for them the discussion about the disadvantages of the relative sizes is not relevant. However, they seem to represent the entry barriers. There is no association that could help small new ESCOs that want to enter the market to cooperate with other actors on the Energy service market. The problem of lack of actors, especially smaller that could cooperate on bigger projects, seems to persist on the Slovenian market, which imposes high transaction costs to the potential clients.

It seems that Energy service contracting can prove more valid on some markets with certain market structure then on the others. Some markets can impose relatively high transaction costs that cannot be easily overcome. Some may require a lot of effort from the policy side and implementation of policy measures that may cost more then they bring benefits. These possibilities raise the questions of the methods available to evaluate the instrument. Mundaca & Neij (2009) in the discussion about the policy evaluation in a case of Tradable White Certificates scheme point to the lack of evaluations of energy efficiency policy instruments. There is a lack of evaluation methods that would enable policy makers to evaluate the impacts and outcomes of the policy instrument. In Slovenia, there are some efforts on the side of policy makers to promote the Energy service contracting and bring it to the higher level of uptake. However, there has been no evaluation made about the economic viability of the instrument on the Slovenian market. Barriers such as unfavourable legislation could probably be removed relatively cheap comparing to the barriers coming from the lack of knowledge, lack of information and specially lack of competitiveness on the market.

There are therefore two types of evaluation methods lacking that would make it possible for the actors and policy makers to decide on the economic viability of the instrument. Actors on the Energy service contracting market need methods to evaluate the risks and volatility of the project and policy makers need beside that also methods to evaluate the economic viability of the instrument on the specific market.

In addition, the cost development on the certain market is a long-term procedure, influenced also by the experience (learning) curves (Neij, Borup, Blesl, & Mayer-Spohn, 2006), which would make the estimates of economic potential of the instrument on the Slovenian market even harder. Leaving these factors aside, a quantitative economic analysis that would compare the potential savings in the total production costs and rise in transaction costs when using Energy service contracting instead of other types of investment could explain the economic viability of the instrument for the Slovenian market. Such analysis is beyond the scope of this research, however, further research could be performed in this direction.

10 Conclusions

This final chapter aims to outline the contributions and outcomes of this research, to answer the research questions and to suggest few considerations for future policy and research

10.1 Contributions the research

This research contributes to the understanding of barriers and incentives on the Energy efficiency market and also to the understanding of the importance of the evaluation of the appropriateness of the instrument for the Slovenian market.

First, this research responded to the lack of knowledge about the barriers and possible drivers for the Energy service contracting development in Slovenia. The research examined the determinants of the transaction and to the lesser extent also production costs of the Energy service contracting in Slovenia and outlined the barriers and incentives that are important from the perspective of transaction (and production) costs and from the perspective of the actors on the market. A legislation that would allow the energy service contracting is among the biggest barriers on the Slovenian Energy service contracting market. Its importance comes from the fact that it represents a necessary condition for the Energy service contracting uptake. If this barrier is not removed, the removal of the other would not improve the uptake. Other determinants of the transaction costs compose sufficient conditions for the energy service contracting uptake. Among the later, the most important is a favourable political framework that would allow a better and easily available information about the instrument. Other important conditions are available standard methods for project risk evaluations, and better technical knowledge on the energy related issues in the public sector. However, the problem (a market failure) of limited competition remains.

Second, the research raised a question about the validity of the instrument on the Slovenian market. There may be some market failures on the Slovenian market that cannot be easily overcome by applying certain policy measures. Such a failure is a lack of competition on the market and it raises a question of the economic viability of the instrument. To answer this question, evaluation of the instrument should be made. However, there is a lack of methods developed to evaluate policy instruments in the area of the energy efficiency market. A decision on the promotion of the Energy service contracting use in Slovenia is mainly based on the requirement by the European Union to promote energy efficiency financing mechanisms then on a base of evaluation of its appropriateness for the Slovenian market. An evaluation of the instrument would be however necessary to make sure that the right instrument is promoted and that there are no instruments to promote energy efficiency investments available that are more desirable from the social cost perspective.

10.2 Main conclusions regarding the research questions

There have been three research questions answered by the research.

- Which are the drivers and barriers on a developed (German) market and undeveloped (Slovenian) market that have been identified in the previous research?
- Which are the additional drivers and barriers that are identified by different stakeholders as important in the context of Slovenia and are beyond the insights of the existing surveys.
- Which of the barriers and drivers from this set are important when they are explored through the transaction cost economics framework.

The lack of information about the instrument is identified as one of the biggest barriers to Energy service contracting market development and causes transaction costs to potential clients that look for the information on energy service contracting possibilities. It can partly be attributed to the poor policy mix in Slovenia. Also lack of best practice examples and information raises the transaction costs of the actors on the Energy service contracting market.

Lack of trust in providers is another barrier that is frequently mentioned and a large share of scope for providers opportunistic behaviour comes from the limited competition on the market. There are also barriers coming from a lack of standards available in Energy performance contracting. There are no standards to compare own financing with the contracting alternative, there is no contrat standars that could be used in Slovenia (Ministry of Finance prohibits the European standards available), there are also no standard procedures for measurement and verification and energy audits. Among policy measures that could lower the transaction costs is therefore standardisation and also ESCO certification. Lack of information about the instrument could also be addressed by establishing the risk and volatility assessment framework.

The most restrictive to the Energy service contracting uptake is unsupportive legislation. The existing legislation in Slovenia imposes high transaction costs in the public sector. Complicated administrative procedures and non-compatible accounting rules are also among the most frequently mentioned regulatory barriers. Also a lack of technical knowledge imposes high transaction costs.

There are two important barriers reported on the side of determinants of production costs: long pay-back periods and no economies of scale.

The energy efficiency policy measures to stimulate energy savings through reducing transaction costs for the ESCO or a client should be therefore very much focused on improved legislation (clear and understandable), and improvement of the political framework, in particular on providing information to boost awareness and knowledge about saving energy measures, possible energy efficiency investments and financing possibilities, regulations addressing the energy service contracting, regulations on standards for energy efficiency measures, procedures and contracts.

10.3 Considerations for future policy and research

The question that was raised during the research about the validity of the instrument could be explored in the further research. The validity could be evaluated from the policy perspective where the social costs of the instrument could be compared to the social costs of the alternative instruments for promoting energy efficiency investments. The validity could also be evaluated from the perspective of the ESCO and/or potential clients. For both such evaluations, the appropriate models should be developed. On the policy side the models to evaluate the validity of the instrument and on the side of the contractors/clients the models to evaluate the risks and volatility of the investments.

Bibliography

- Andersen,Lars-Morten & Bleischwitz,Raimund. (2009). *Informational Barriers to Energy Efficiency – Theory and European Policies*. Bruges European Economic Research Papers, College of Europe, Bruges, Belgium; BEER paper no. 15, December 2009
- Androschin-Bleyl, Jan W. & Ungerböc, Reinhard (2009): *What is Energy Contracting (ESCo services)? Concept, Definition, Two Basic Business Models*. International Energy Agency report, Grazer Energieagentur GmbH, Graz, October 2009.
- Arrow, K. (1969). *The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Non-Market Allocation*. The Analysis and Evaluation of Public Expenditure: The PPB System, Vol 1. U.S. Joint Economic Committee, 91st Congress, 1st Session. Washington, D.C.: U.S, Government Printing Office. pp. 59-73.
- Berger, Susanne & Schäfer, Moritz (2009): *Framework Conditions for Energy Performance Contracting*, National Report Germany, European Energy Service Initiative (EESI), November 2009.
- Bertoldi, P., Renzio, M., Adnot, J., Vine, E. (2003). *How EU ESCOs are behaving and how to create a real ESCO market?* ECEEE 2003 Study, Time to turn down energy demand, France, European Council for a Energy Efficient Economy.
- Bertoldi, Paolo, Boza-Kiss, Benigna, Rezessy Silvia. (2007). *Latest Development of Energy Service Companies across Europe - A European ESCO Update*. Institute for Environment and Sustainability, European Commission, Joint Research Centre Institute Environment and Sustainability
- Bleyl, Jan W. (2009). *A new Model to Combine Energy Efficiency and (Renewable) Energy Supply*. Integrated Energy Contracting, IEA dsm Task XVI Discussion Paper, download available from www.ieadsm.org
- Bloomberg, 2010
- Boonekamp, P.(2007): *Applied policy measures for energy savings in end-use sectors in EU countries: what is best?*. W.A. Presented at ECEEE 2007 Summer Study, La Colle sur Loup, Côte d'Azur, France, 4-9 juni 2007)
- Boonekamp, Piet & Vethman, Paul. (2010). *Change Best,Task 2.3: Analysis of policy mix and development of Energy Efficiency Services*. Wuppertal Institute for Climate, Environment, and Energy, Wuppertal, Germany, 15 April 2010
- Bundesministerium der Finanzen. (2008). The Budget System of the Federal Republic of Germany, Berlin, November 2008
- Bundesamt für Bauwesen und Raumordnung. (2009). *Contracting im Mietwohnungsbau*. Forschungen Heft 141, bearbeitet von B. Eikmeier et al., Bremer Energie Institut, Energetic Solutions und BBSR, Berlin/ Bonn.
- Bunse, Maike (2010). Interview
- Bunse, Maike, Irrek, Wolfgang, Siraki, Klara & Renner, Gisela. (2010). *Change Best, Task 2.1: National Report on the Energy Efficiency Service Business in Germany*. Arbeitsgemeinschaft fur sparsame Energie- und Wasserverwendung im VKU (ASEW), Wuppertal / Cologne, 30 March 2010
- Directive 2006/32/EC. Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC.
- Dreessen, T. (2003). *Advantages and disadvantages of the two dominant world ESCO models; shared savings and guaranteed savings*. In: Bertoldi, P. (Ed.), Proceedings of the First Pan- European Conference on Energy Service Companies
- Ecofys. (2001). *Economic evaluation of sectoral emission reduction objectives for climate change*. Topdown analysis of greenhouse gas emission reduction possibilities in the EU. Ecofys, 2001
- EIA. (2010): Annual Energy Outlook 2010, Energy Information Administration. Retrieved from web site: http://www.eia.doe.gov/oiaf/aeo/
- Eikmeier, B., Seefeldt, F., Bleyl, J. W. & Arzt, C (2009). Contracting im Mietwohnungsbau, Abschlußbericht, Bundesministerium für Verkehr, Bau- und Stadtentwicklung (BMVBS)Bonn April 2009
- Enercee (2010). http://www.enercee.net/slovenia/energy-policy.html)
- EU Commission Synthesis. (2009). *EU Commission Synthesis of the complete assessments of the 27 National Energy Efficiency Action Plans (NEEAP) as required by Directive 2006/32/EC on energy end-use efficiency and energy services*. European Commission, SEC(2009)889 final, Brussels, June 2009
- European Commission (2006). *Fuelling our future: the European Commission sets out its vision for an Energy Strategy for Europe*, IP/06/282, Press release, Brussels, 8 March 2006
- European Commission (2010). *Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage*. Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions,

SEC(2010), COM(2010) 265 final, Brussels, 26.5.2010
- Ferrari Claudio G. (2008). *Third Party Financing, New Financial Tools for Energy Efficiency – An International Perspective*. Sustainable Energy Production and Consumption, Thursday, May 29, 2008, Springer Netherlands, pages: 171-183
- Fischer, F. (1995). *Evaluating Public Policy*. Wadsworth Group, Belmont, CA
- Gardner, Gerald T. & Stern, Paul S. (2008). *The Short List: The Most Effective Actions U.S. Households can Take to Curb Climate Chang*e. Environment 50 (5).
- GEA. (2009). Grazer Energieagentur GmbH, www.grazer-ea.at 2009
- GEFMA 540: German Facility Management Association Energie- Contracting. Erfolgsfaktoren und Umsetzungshilfen GEFMA 540, Ausgabe 2007-09
- Geissler, M., Brand, M., Bertoldi, P. (2003). *Innovations in CHP and lighting: best practice in the public & building sector*. Proceedings of the First Pan-European Conference on Energy Service Companies. Milan May 2003.
- Globerman, S., Vining, A.R. (1996). *A framework for evaluating the government contracting-out decision with an application to information technology*. Public Administration Review 56 (6), 577–584. Hansen, S.J., Weisman, J.C., 1998. Performance Contracting: Expanding Horizons. Fairmont Press Inc., Lilburn
- Gomez-Mejia, Luis R., Wiseman, Robert M. (2007). *Does agency theory have universal relevance*? A reply to Lubatkin, Lane, Collin, and Very. Journal of Organizational Behavior; Jan2007, Vol. 28 Issue 1, p81-88, 8p
- Greenpeace & EREC. (2007). *Energy Revolution: A sustainable world energy outlook*. Greenpeace, International and European Renewable Energy Council, The Netherlands.
- Hansen, S. 2004). Personal Communication. Kiona International, USA January.
- Hansen, S.J., Weisman, J.C. (1998). *Performance Contracting: Expanding Horizons*. Fairmont Press Inc., Lilburn.
- Hansen, Shirley J., Langlois, Pierre & Bertoldi, Paolo. (2009): *ESCOs Around the World: Lessons Learned in 49 Countries*. Fairmont Press, 2009
- Helle, C. (1997). *On energy efficiency-related product strategies—illustrated and analysed using contracting approaches in Germany as an example*. Utilities Policy 6 (1), 75–85.
- ICF International. (2007). *Introduction to Energy Performance Contracting*, National Association of Energy Services Companies. for U.S. Environmental Protection Agency Energy Star Buildings, March, 2007.
- IEA. (2007). *IEA energy efficiency policy recommendations to the G8 2007 Summit*. Heiligendamm. International Energy Agency, Paris. International Energy Agency. 2007b. Information Paper: Experience with energy efficiency regulations for electrical equipment. International Energy Agency, Paris.
- IEAdsm. (2009). *Task XVI „Competitive Energy Services" of the IEA (International Energy Agency) Demand Side Management Implementing Agreement*. Task flyer available www.ieadsm.org
- Intergovernmental Panel on Climate Change. (2001). *Climate Change 2001: Mitigation*. A report of Working Group III of the Intergovernmental Panel on Climate Change. IPCC Working Group III.
- Irrek, W., Thomas, S., Attali, S., Bemke, G., Borg, N., Figorski, A., Fillpowiz, M., Labanca, N., Pindar, A. & Ochoa, A. (2005). *Public internal performance contracting: managing and financing energy efficiency measures in public administrations*. ECEEE 2005 Summer Study, Mandelieu, France, European Council for a Energy Efficient Economy.
- Jackson, Jerry. (2010). *Promoting energy efficiency investments with risk management decision tools*. Texas A&M University, 3137TAMU, College Station,TX77843,USA, Energy Policy 38 (2010) 3865–3873
- Jaffe, Adam B. & Stavins, Robert N. (1994): *The energy efficiency gap, what does it mean? Energy Policy,* Volume 22, Issue 10, Pages: 804-810.
- Jan W. Bleyl-Androschin Reinhard Ungerböck, Grazer Energieagentur GmbH Graz, October 2009 : *IEA DSM TASK XVI "Competitive Energy Services (Energy Contracting, ESCo Services)"* in cooperation with: European Energy Service Initiative (EESI) What is Energy Contracting (ESCo services)? Concept, Definition, Two Basic Business Model Jan W. Bleyl-Androschin Reinhard Ungerböck, Grazer Energieagentur GmbH Graz, October 2009
- Jensen, M. C., & Meckling, W. F. (1976). T*heory of the firm: Managerial behavior, agency costs, and ownership structure*. Journal of Financial Economics, 3, 305
- Kats, G.H., Rosenfeld, A.H., McGaraghan, S.A. (1997). *Energy efficiency as a commodity: the Emergence of a Secondary Market for Efficiency Savings in Commercial Buildings*. ECEEE Summer Study, France, European Council for an Energy Efficient Economy
- Labanca N. (2010). *Change Best, Task 2.1: Status and development of the energy efficiency service business in 18 EU countries*. EERG – Politecnico di Milano – Dipartimento di Energia, Milano, 29 April 2010.
- Laitner, John A., Ehrhardt-Martinez,Karen & McKinney, Vanessa. (2009). *Examining the Scale of the Behaviour Energy Efficiency Continuum*. In Proceedings of 2009 ECEEE Summer Study. La Colle sur Loup, Côte d'Azur, France.
- Lamers, Patrick & Berger, Susanne. (2007): *Der Markt des Energiespar-Contracting in Deutschland. Status quo, Potenziale und Trends*. Berliner Energieagentur, Endbericht zum Forschungsvorhaben FKZ 205 41 101

des Umweltbundesamtes.
- Langnissa, Ole, Praetorius, Barbara. (2006). *How much market do market-based instruments create? An analysis for the case of "white" certificates*. Energy Policy 34 (2006) 200–211
- Lubatkin, M. (2005). *A theory of the firm only a microeconomist could love*. Journal of Management Inquiry 14: 213-216.
- Masten, S.E. (1993). *Transaction costs, mistakes and performance: assessing the importance of governance*. Managerial and Decision, Economics 14, 119–129.
- Matthews, R.C.O. (1986). *The economics of institutions and the sources of growth*. The Economic Journal 96 (384), 903–918.
- Maw, Ingham, A., J. & Ulph. A. (1991). T*esting for barriers to energy conservation—an application of a vintage model*. The Energy Journal 12: 41-64.
- Me´nard, C. (2004). *Transaction Costs and Property Rights*. Vol.2.Firsted. Reference Collection, Cheltenham UK and Northampton MA.
- Merse, Stane, Kranjcevic, Evald. (2010). *Change Best, Task 2.1: National Report on the Energy Efficiency Service Business in Slovenia*. Institut Jozef Stefan, Ljubljana. Issued by Wuppertal Institute Berliner Energieagentur, March 2010
- Merse, Stane. (2010). Interview
- Mickwitz, P., 2006. *Environmental Policy Evaluation: Concepts and Practice*. The Finnish Society of Sciences and Letters, Vaajakoski.
- Millsa, Evan, Kromerb, Steve Weissc, Gary & Mathew Paul A. (2006). *From volatility to value: analysing and managing financial and performance risk in energy savings projects*. Energy Policy 34 (2006) 188–199
- Mundaca, L. & Neij, L. (2009). *A multi-criteria evaluation framework for tradable white certificate schemes*. Energy Policy 37 (2009) 4557–4573
- MURE. (2010). *Database on energy efficiency policy measures in European countries*, IEE project Oduyssee-MURE, ISIS (www.mure2.com):
- NEEAP Germany. (2007). *National Energy Efficiency Action Plan (NEEAP) of the Federal Republic of Germany in accordance with the EU Directive on "energy end-use efficiency and energy services"* (2006/32/EC), Submitted by the Federal Ministry of Economic Affairs and Technology
- NEEAP Slovenia. (2008). *National Energy Efficiency Action Plan for the period 2008–2016*, number: 36000-1/2008/13, Ljubljana, 31.01.2008
- Neij, L., Borup, M., Blesl, M., Mayer-Spohn, O. (2006). *Cost development—an analysis based on experience curves*. Deliverable 3.3—RS1A of the NEEDS (New Energy Externalities Development for Sustainability) project, co-funded by the European Commission within the Sixth Framework Programme.
- Nelson, R.R., Winter, S.G. (1982). *An Evolutionary Theory of Economic Change*. Belknap, Cambridge, MA CTI (Climate Technology Initiative), 2003. Guide to Working with Energy Service Companies in Central Europe. CTI Secretariat Tokyo.
- Novak, Ivo, Urbancic, Andreja (2010). *Predlog NEP: okvir, cilji, ukrepi, scenariji zunanjih okoliscin in energetske politike*. Ministrstvo za gospodarstvo, Institut Jozef Stefan, Startegic workshop
- OECD/IEA (2007). *Mind the Gap, Quantifying Principal-Agent Problems in Energy Efficiency*. In support of the G8 Plan of Action, International Energy Agency, 2007.
- OECD/IEA. (2010). *Scenarios & Strategies to 2050*. Energy Technology Perspectives, 2010
- Petek. Janez. (2010). Interview
- Petrol. (2009). *Annual report Petrol d.d.*, Ljubljana za leto 2009
- Pospis Perpar , Blazenka. (2010). Interview
- Sanstad, Alan H. & Howarth, Richard B. (1994): *'Normal' markets, market imperfections and energy Efficiency*. Energy Policy, 1994 Volume 22, Issue 10, Pages: 811-818
- Sathaye, J., & S. Murtishaw. (2004). *Market failures, consumer preferences, and transaction costs in energy efficiency purchase decisions*. Public Interest Energy Research (PIER) Program, California.
- Sharma, A. (1997). *Professional as Agent: knowledge asymmetry in agency exchange*. The Academy of Management Review 22: 758-798.
- Singer, T. (2002). *IEA DSM Task X-Performance Contracting—Country Report*: United States. International Energy Agency, Paris.
- Sorrell, S. (2007). *The economics of energy service contracts*. Energy Policy 35 (2007) 507–521
- Sorrell, S., Malley, E. O., Schleich, J. & Scott, S. (2004). *The economics of energy efficiency: Barriers to Cost-Effective Investment*. Edward Elgar Cheltenham, UK.
- Spence, M. (1973). *Job market signalling*. Quarterly Journal of Economics 87, 355–374.
- Stanicic, Damir. (2010). *Framework Conditions for Energy Performance Contracting*. National Report Slovenia, European Energy Service Initiative (EESI), February 2010
- Suerkemper, Felix. (2010). *Change Best Task 2.4: Economic incentives and barriers for EES and the relation between Energy companies and ESCOs*. Wuppertal Institute for Climate, Environment, and Energy, Wuppertal, 12 August 2010
- Suerkemper, Felix. (2010). *Change Best, Task 2.4: Economic incentives and barriers for EES and the relation between*

Energy companies and ESCOs. Issued by Wuppertal Institute Berliner Energieagentur, 12 August 2010
- The Bank for International Settlements (2010). Retrieved from web page http://www.bis.org
- Ürge-Vorsatz, Diana, Köppel, Sonja, Liang, Chunyu, Kiss, Benigna, Nair, Gireesh Goopalan, Celikyilmaz, Gamze. (2007). *An Assessment of on Energy Service Companies (ESCOs) Worldwide*. Central European University, WEC ADEME project on energy efficiency policies, March 2007
- Valentincic, Miha. (2010). Interview
- VfW (2009): Verband für Wärmelieferung Der Verband für Wärmelieferung in Zahlen Hannover 2009.
- Watt, James. quoted after Wikipedia http://de.wikipedia.org/wiki/Contracting as of 18.7.2010
- Wikipedia 2010. Retrieved fro the web page: http://en.wikipedia.org
- William H. Golove and Joseph H. Et. (1996). *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency*. Energy & Environment Division Lawrence Berkeley National Laboratory University of California,Berkeley, California 94720, March 1996
- Williamson Oliver E. (1979): *Transaction Cost Economics: The Governance of Contractual Relations*. Journal of Law and Economics, October 1979, 22, 233-261.
- Williamson, O. (1985). *The Economic Institutions of Capitalism* . New York: Free Press, 1985
- Williamson, O. (1989). *Transaction Cost Economics*. Handbook of Industrial Organization, Vol. 1