HEATING TARIFF SYSTEM IN DONETSK

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Abstract

In different countries, such as Ukraine and Sweden, there have been differences in the way of administrating the systems which dictate the way of living and the way the societies function. Different approaches have been adopted over the time when it came to setting up the rules for how the state’s vital organizations, such as tax administration, health care, police, army, education system and many others should work and function. The idea in many modern countries is the same, but the ways and procedures can differ a great deal from country to country. This applies to the sphere of district heating services as well.

The purpose of this thesis is to gain understand with the help of economic theory why heating tariffs are managed in a country that has had transition from plan economy to market economy the way they are, and how the management of heating tariffs could be improved when taking into account the experience of a country with long established market economy. During field studies performed in Sweden and Ukraine, particularly in the city of Donetsk, a comparative analysis of the two heating tariff systems have been performed in order to outline and highlight the differences between them and to answer the main questions of the study.

The results include the status report of the situation concerning the district heating tariff systems in Sweden and Ukraine, comparative analysis of the two systems and suggestion on improvements of the district heating tariff system in the city of Donetsk. The outcomes and suggested improvements do not provide the full picture and all the aspects of the situation, due to the fact that more extensive studies, involving larger resources, would have to be conducted in the area. However, the report provides a good starting point for further studies within the field of district heating tariffs in Ukraine and Sweden.

Key words: District heating, tariff, Ukraine, Donetsk.
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1 Introduction

This part focuses on the problem background, objective of the study, scope and delimitations, target group and the outline of the report.

1.1 Problem background

In different countries there have always been differences in the way of administrating the systems which dictate the way of living and the way the societies function. Different approaches have been adopted over the time when it came to setting up the rules for how the state’s vital organizations, such as tax administration, health care, police, army, education system and many others should work and function. The idea in many modern countries is the same, but the ways and procedures can differ a great deal from country to country. This applies to the sphere of housing and communal services as well.

In the former Soviet Union, the economy was based on the principle of state ownership of the means of production, industrial manufacturing, and collective farming, which led to that the planning of almost all economic activities was centralized as well\(^1\). All plants, factories and enterprises were owned and managed by the state and that concerned the communal services area as well.

With the fall of the Soviet Union, all former republics, including Ukraine, faced big challenges. There no longer was a centralized power, a central organization that could issue clear directives for how things within the communal services should be done and managed. Much had to be restructured and reorganized in order to be able to adapt to the different nature of the democratic state, the market-oriented economy, and all the changes that came along with it\(^2\).

Ukraine has been an independent country since 1991, and even though it is a democratic country some remains of past can still be found in the way of thinking and managing communal services. That, combined with outdated technology, creates a system that is desperately in need of improvement.

Sweden, on the other hand, has followed a different path to that of Ukraine’s. Many aspects of life have during many decades been stable compared to Ukraine. The growth of the economy and more or less competitive markets have left its footprints on many systems and markets, including communal services.

Studying the heating tariff systems in Ukraine and Sweden provides an interesting insight in the ways those systems were formed and managed over the years and how they are managed today. The difficulties that arise due to the circumstances that are more or less unique in the respective countries are important to understand in order to successfully deal with the different systems.

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\(^1\) CIA's Analysis Of The Soviet Union, “Investment and growth in USSR”, (1970)

The management of the heating tariffs in Ukraine has not yet been optimized and has many problems that have to be dealt with. Due to the fact that Ukraine’s development took a drastic turn in 1991, when it became an independent democratic country, many of the political and social components had to be changed and adapted to the new reality. However, even though almost two decades have passed since the renowned events, many things have remained the same due to the lock-in effect that emerged partly because of the centralized management system in the Soviet times. Several generations of managers that are active in different sectors have inherited the “old” way of thinking and are still having problems nowadays in adopting the way of thinking that enables a certain degree of success in the reality of the modern world.

These problems have not bypassed the management of the district heating systems. The district heating was, as almost all other areas of communal services, owned by the state and managed centrally. The operation directives to the district heating net were issued in Moscow, sent to the capital of the republic, which in Ukraine’s case is Kiev, after that they were forwarded to the city of regional centre, where the responsible managers executed the orders. The management vertical was straight and clear. Due to the fall of the Soviet Union in 1991 and restructuring of the government, that system had to change with the goal to switch from plan economy to market economy. In every city and region district heating companies were formed. Most of the companies are still more or less owned by the cities, or the government. Because of the transition to the market economy, the district heating companies now bear the economic responsibility, have consumers and have to gain profit from their activities. Nevertheless, many leftovers from the Soviet times are still found in the everyday life of the modern Ukrainian district heating companies. That concerns the heating tariff system as well.

Having a deeper understanding of the heating tariff system that Ukraine has adopted after the fall of the Soviet Union and is using nowadays can help the European companies to adapt a strategy that will enable them to deal with many difficulties that inevitably materialize as the companies enter the Ukrainian market.

EcoEnergy Scandinavia AB is one of the European companies that are on its way to enter the Ukrainian market. EcoEnergy Scandinavia is an energy recovery company whose objective is to develop, design, finance, build and operate Waste-to-Energy facilities on the global market. When a WTE facility is in use and the waste is being incinerated, the electricity and heat is produced. A bigger part of the heat energy that is produced during the winter season can be utilized for district heating. It means that a company that owns the facility can make a profit by selling the heat that is produced as an after-product in the process to the local heating companies. In many cases with WTE facilities it is a win-win situation, where the local district heating company saves the alternative fuel that is used to warm the water by

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3 CIA’s Analysis Of The Soviet Union, “Soviet economic problems and prospects”, (1977)
4 From here on WTE.
buying already heated water from the WTE plant and the company owning the plant maximizes the utilization. Furthermore, the environmental impact is often positive from such cooperation between the district heating company and the WTE plant. This applies especially to the areas where the alternative sources of energy that is used to heat the water used in the district heating net are not environmentally friendly\textsuperscript{5}. In many areas in the world, energy produced by a WTE-plant substitutes the energy produced while using fossil fuels, such as oil, coal and others. Ukraine is one of the countries that are using natural gas as a primary source fuel in the district heating. Natural gas is considered to be one of the cleanest fossil fuels. However, the gas is purchased and transported from Russia, meaning that the local fuel resources, e.g. household waste, are not utilized at all.

Consequently, it is important for EcoEnergy Scandinavia, being a company which eventually will own the WTE facility in Donetsk and producing the heat as an after-product of the waste incineration, to get a deeper insight in the Ukrainian heating tariff system and especially in the system that is used in Donetsk. That insight will give the company a stronger negotiation position when having negotiations with the local authorities about the prices for the heated water. My task became to get as much information as possible about the heating tariff system in Ukraine and specifically in Donetsk. The particularly interesting were what kind of system is in use today, what it is based on, how it is managed and regulated, what difficulties the local heating company experience. But for me as a researcher writing my master thesis at the Royal Institute of Technology, it was vital to get a deeper knowledge not only in the field of the heating tariff system in Donetsk, but within a wider field as well. Therefore, I made a choice to combine the task from EcoEnergy Scandinavia and make a study not only of the Ukrainian heating tariff system, but that of Sweden as well. After the comparison of the two systems was made, the scope became broader and the attention was focused on the aspects of management of the heating tariffs in Donetsk. That led to the main questions of this work:

1.2 Main questions
The main questions that are to be answered in this report are the following:

1. "How does the heating tariff system in Donetsk differ from the typical Swedish system?"
2. “What consequences does the managing of the heating tariffs in Donetsk have on its district heating system?”
3. “How should the heating tariffs in Donetsk be managed in order to maintain the financial sustainability?”

1.3 Objective of the study
The aim of the study is the following:

To understand with the help of economic theory why heating tariffs are managed in a country that has had transition from plan economy to market economy the way they are, and how the management of heating tariffs could be improved when taking into account the experience of a country with long established market economy.

1.4 Scope and Delimitations
The choice was made to concentrate on understanding the heating tariff system that is used in Ukraine, due to the fact that Ukraine is a vivid example of a country that has recently gone through a transition from plan economy to market economy. Furthermore, the choice was made to concentrate on studying the heating tariffs used in the city of Donetsk, because the city of Donetsk is the fifth largest city in Ukraine, and having a developed district heating net is an interesting object for the study. Besides that, the district heating tariffs present special interest for EcoEnergy Scandinavia AB and other European companies that intend to enter the Ukraine market within the fields where the tariff structure of communal services, such as for example district heating, will be concerned.

Sweden, being a country with long established market economy, was chosen as a study object in order gain a better understanding of the management of the heating tariffs in a country that has followed a different path if compared to that of Ukraine’s.

The main scope of the study will lie on how the Ukrainian heating tariff used in Donetsk is managed and how it could be improved when applying the economic theory and the Swedish experience.

1.5 Target Group
This study is designed first and foremost as a master thesis, resulting in a master thesis report. But it can also interest European companies, such as EcoEnergy Scandinavia, that intend to enter the Ukrainian market in the Waste-to-Energy sector or in other fields that concern the Ukrainian heating tariff system. It can also be of interest for the companies and students who intend to conduct similar researches in Ukraine due to the fact that some essential dissimilarities between European and Ukrainian ways of doing business, cultural and political differences are highlighted as well.

1.6 Outline of Report
Background
This part gives a short introduction of the background of Ukraine, Donetsk, EcoEnergy Scandinavia AB and objective of the study.
Methodology
In this chapter, the methodology of this thesis is described.

Theory
In this chapter, the theories used during work with this thesis are described.

Study in Ukraine
This chapter describes the field studies conducted and the materials discovered in the field of district heating tariffs in Kiev and Donetsk, Ukraine.

Study in Sweden
This chapter describes the studies conducted and the materials and information discovered in Sweden.

Analysis and Results
This chapter presents the results of the studies and analyzes the results. The questions posed in the beginning of the study are answered.

Conclusions and Reflections
This chapter presents the conclusions and reflections of the study. The credibility of the report and possibilities for future studies within the field of heating tariffs in Ukraine are presented as well.
2 Background.
This part describes the background of Ukraine, Donetsk and EcoEnergy Scandinavia AB.

2.1 Ukraine

2.1.1 Facts
Population: 46 000 000

Demographics: Ukrainians – 77,8%, Russians – 17,3%, Others – 4,9%.

Capital: Kyiv (population of Kyiv is about 3 000 000)

Language: official language is Ukrainian. However, Russian is widely spoken especially in eastern and southern parts of Ukraine.

Government: Parliamentary republic (one chamber, president).

Ukraine, with its area of 603,628 km², is the largest country in Europe. It is bordered by the Russian Federation to the east and northeast, Belarus to the northwest, Poland, Slovakia and Hungary to the west, Romania and Moldova to the southwest, and the Black Sea and Sea of Azov to the south and southeast respectively⁶.

Figure 1: Ukraine

⁶ Basic facts about Ukraine, www.state.gov/r/pa/ei/bgn/3211.htm
2.1.2 Economic affairs

Ukraine has always had and still has rich farmlands, a well-developed industrial base, highly trained labor, and a good education system. With these components, Ukraine has the potential to become a major European economy. Following a robust expansion beginning in 2000, Ukraine’s economy experienced a sharp slowdown in late 2008, which continued through 2009. Real GDP contracted 14.1% in 2009, but is forecast to grow over 3% in 2010. 

Table 1: UAH to Euro exchange rate. Source: www.oanda.com

Shown in the table is the currency exchange rate of UAH to Euro for the period 2005-2010. It could be noticed that there was a longer period of stability when the rate of Ukrainian currency to Euro was similar to the Swedish Krona. That was followed by a steep downfall in the fourth quarter of 2008, symbolizing the impact of economic crisis on the currency of Ukraine.

Despite the fact that Ukraine’s economy is to a high degree burdened by excessive government regulations, lack of law enforcement, and corruption, the government takes steps to improvement. The Ukrainian government is actively working on formulating and implementing a state strategy of economic reforms using international practices such as preparing legislative proposals for submission to parliament. Furthermore, according to the official data presented by the Ministry of Economy of Ukraine, foreign trade and investments are encouraged by the Ukrainian government.

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7 U.S. Department of State: www.state.gov/r/pa/ei/bgn/3211.htm
8 Ukrainian Hryvnya
9 Oanda: www.oanda.com/lang/sv/currency/historical-rates/
10 www.state.gov/r/pa/ei/bgn/3211.htm
11 Ministry of Economic Development and Trade: www.ukreexport.gov.ua/eng/economy/trade/?country=ukr
2.1.3 Background of Donetsk

The city of Donetsk is an industrial center and the capital of the Donetsk region. The city is located in the eastern part of the Ukraine at a distance of about 500 km south-east of Kiev. The city of Donetsk is the fourth-largest city in Ukraine with approximately 1 000 000 inhabitants\textsuperscript{12}.

The city of Donetsk has a well-developed social sector with the provision of education, health and cultural services. The scientific and cultural potential of the city are associated with the strong industrial tradition and basis on one side, and with the presence of leading universities and their branches, supporting the continued development of the city and the region on the other. The infrastructure in the city is well developed; basic infrastructure services such as electricity, water, sewerage, heating and solid waste collection and management cover practically the entire city area. However, the infrastructure services are not always working in a reliable way, partly due to outdated technology and damages.

The annual production of municipal waste in the region is 470 000 tons\textsuperscript{13}, and taking care of such volumes has during the last years become an increasing problem. The existing landfills are on the edge of closure due to the environmental risks and overflow, placing the city of Donetsk in a dangerous position where the local authorities have to come up with some solution. One solution may be an erection of a WTE plant. A WTE plant would relieve the pressure on the existing landfills by incinerating the municipal waste. Incineration of waste with today’s technologies will generate production of electricity and hot water, the latter of which can be directly used as both hot water and to warm up buildings and living spaces.

\textbf{Table 2: Natural Gas Prices in Ukraine. Source: EcoEnergy Scandinavia AB}

\begin{center}
\begin{tabular}{|c|c|}
\hline
Gas Price, UAH incl. VAT & Population \\
\hline
01.04.2005 & 01.04.2008 \\
01.07.2006 & 01.07.2008 \\
01.07.2007 & 01.05.2008 \\
01.01.2007 & 01.08.2008 \\
01.07.2008 & 01.10.2008 \\
01.08.2008 & 01.11.2008 \\
15.11.2008 & 01.12.2008 \\
01.01.2009 & 01.01.2009 \\
01.05.2009 & 01.08.2010 \\
\hline
\end{tabular}
\end{center}

\textsuperscript{12} Official information about Donetsk, www.town.dn.ua/about

\textsuperscript{13} EcoEnergy confidential internal information
Today the district heating company in Donetsk is facing big difficulties on many different fronts. The maintenance of the heating system, including the central heating points and the pipe system, requires new investments that nowadays seem to be impossible to acquire. Furthermore, the gas prices are constantly increasing, and with the latest rise with 50%, the situation forces the local heating companies all over Ukraine to raise the tariffs for hot water and heating with at least 25%.

The problem is that the heating tariff system of today barely keeps the heating system floating. The constant flow of money from the state budget is the only thing that allows it to be financially sustainable. Only limited investments in the heating system and equipment have been made during the fall of the Soviet Union, which has rendered it outdated and ineffective. The tariff that is used in Donetsk today is calculated on a “cost-plus” basis, which is in essence a one-part system. When calculating heating tariffs, the heating company makes an estimation of the coming year’s expenses and sets the tariff to cover the estimated costs plus up to 12% of profit. The level of profitability is set by the company, but at the same time it is regulated centrally by the “Heating Law of Ukraine”. This tariff system lacks connection with the real situation today and its ineffectiveness is slowly but inevitably destroying the district heating system of Donetsk.

The one-part tariff system that is used today does not guarantee the cost recovery of the district heating company in Donetsk for the provided services and it does not provide the needed incentive for the company for cost reduction and efficiency increase. It does not supply the local district heating company with enough funds to make new investments in new equipment, technology, education of personnel and the needed efficiency recovery programs.

Furthermore, the difficulties that the local heating company is facing in the forms of system breakdowns and poor service quality tend to awaken mistrust and discontent among the consumers. This results in that the consumers loose trust for the local heating company and choose to take the heating supply in their own hands. They choose to disconnect from the central heating system and place boilers in the apartments, cottages, private organization’s buildings and so on. One phenomenon that has arisen during the last decades is that new buildings that are constructed by private construction companies are usually equipped with their own boilers, which are usually placed in the attic. That happens even though there is an option of connecting to the district heating net. The result of this is that the district company is constantly loosing potential consumers. This is also one of the many problems that local government in Donetsk together with the district heating company has to face and deal with.

14 From 1 August 2010
15 Interview with the Ministry of Housing and Communal Services of Ukraine from 27-10-2010.
16 Interview with Donetsk Heating Company from 8-11-2010
17 Ibid
Now it seems to be only a question of time before the changes have to be done in the heating tariff structure, in order to make it more realistic and able to cover the real costs of the heating company and enable it to make the investments needed to guarantee its survival.

2.1.4 Background of EcoEnergy Scandinavia AB

During the last two decades, more and more environmental issues have come into focus. A consciousness about the limited natural resources of oil, coal and gas has triggered the search for renewable and sustainable sources of energy.

At the same time, the problem of waste and landfills are becoming critical. In some countries almost 100% of the household waste is transported to landfills. The landfills are at the same time creating a possible source for deceases and poisoning of the environment. The generation of waste is strongly linked to the economic situation in a country. Increased wealth leads to a larger amount of waste. As an example the amount of waste within the EU varies from slightly less than 300 kg/capita (Czech Republic) to approximately 750kg/capita (Ireland). At the same time biological type waste is also an increasing problem for a number of industries.

Turning the energy from Municipal Solid Waste into electricity, heating, cooling, process steam and potable water as well as using biological refuse and biogas for diminishing the society’s need for energy has become a viable alternative to the use of oil, gas and coal at the same time as it solves the society’s different waste problems. Another strong driving force for incineration is to reduce its impact on the climate from greenhouse gases that many components of landfill gas actually are.

Landfill gas is estimated to be 40-60% methane. The remainder is mostly carbon dioxide. Landfill gas also contains varying amounts of nitrogen, oxygen, water vapor, sulfur and a hundreds of other contaminants - most of which are known as "non-methane organic compounds". Inorganic contaminants like mercury are also known to be present in landfill gas. Sometimes, even radioactive contaminants such as tritium, that is radioactive hydrogen, have been found in landfill gas. However the focus is often put on the methane, due to the fact that methane leaking landfills are a very real threat to the climate since methane about eighty times stronger greenhouse gas than carbon dioxide.

Sweden has a long standing history of handling the problem of waste and biological refuse and turning it into useful energy. Hence the amount of household waste that went to

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18 Confederation of European Waste-to-Energy Plants: www.cewep.eu
20 www.cewep.eu
21 Primer on landfill gas as “Green Energy”, Mike Ewall, http://www.energyjustice.net/lfg/#2
22 Houghton, (2005), p. 1362
landfills in Sweden during 2009 is only 1.4% of the total amount actually produced by society. Sweden’s knowledge regarding the technique for Waste to Energy and handling of biofuel refuse represents a business possibility that could be exploited all over the world.

EcoEnergy Scandinavia AB is a Swedish energy recovery company whose objective is to develop, design, finance, build and operate WTE facilities on the global market. By treating waste and residual products efficiently and environmentally for municipalities and industry, EcoEnergy provides energy (electricity, heat, cooling and process steam) for an enhanced living environment and a sustainable development.

The company has two main business areas; EPC Turnkey Contractor and Project Development & Finance. EcoEnergy’s personnel have been involved in the design, procurement and construction of the ten latest WTE facilities in Sweden. EcoEnergy has identified this as an opportunity to export Swedish knowledge and turn it into a business in itself. In order to take care of this knowledge and experience EcoEnergy have combined its resources regarding Waste to Energy and biofuel for an international venture into the energy providing field.

2.1.5 Description of a WTE plant

A WTE plant that EcoEnergy is planning to build in Donetsk resembles the ones that are commonly used in the Scandinavian countries and in the central Europe. Regular household waste will be used as the fuel, and no separation of waste will be done before the incineration. Therefore, the plan is to use the reciprocating grate incinerator, which is the most common incinerator used nowadays. The heating value of the fuel that can be used in a reciprocating grate incinerator is between 6.5 – 19 MJ/kg.

Due to the robustness of such an incinerator, it allows large variations in the composition of the fuel, which fulfills the condition of not separating the waste before feeding it to the incinerator. A single reciprocating grate boiler can, at the present time, handle up to 50 tonnes of waste per hour and operate 8000 hours per year with only one scheduled stop for inspection and maintenance of about one month’s duration.

The description of the waste incineration process as it is planned in the Donetsk WTE-plant can be described as follows:

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23 Svensk Avfallshantering, www.avfallsverige.se/avfallshantering/svensk-avfallshantering/deponering
24 www.ecoenergy.se
25 EcoEnergy confidential internal information
26 Amovic and Johansson, p. 30
27 Ibid
Trucks with waste will be unloaded into a waste bunker in a closed waste receiving building. The bunker will be designed for a waste storage of about 2 days. The waste in the bunker is fed to the boiler with a crane and a fuel feeder and the waste is combusted on a movable grate. At the combustion hot gases with a temperature of about 1,200°C will be formed and superheated steam will be produced from the heat in the gases. The combustion gas will be kept at a temperature of minimum 850°C during 2 seconds in accordance with the EU directive 28. The steam super heaters will be designed to withstand acid gases formed at the combustion. The steam is lead to a steam turbine where electricity to the electrical grid and heat to the district heat network is produced 29.

The combustion gases leaves the boiler at about 160°C and the gases are led to a flue gas cleaning equipment where dust, acid components, heavy metals, dioxins, and other harmful gases are removed in accordance with the EU directives. Hydrated lime and active coal will be used as absorbents. Removed components will be transported to special landfills for ash. Nitrogen Oxides will be removed by injection of caustic ammonia (25%). The slag is less harmful than ash and can be used as filler material at road constructions or for covering landfills.

28 European Waste Incineration Directive 2000/76/EC
29 EcoEnergy internal technical information
In the figure a condenser is shown before the ID fan. This installation is commonly used in Scandinavian countries for fuels with high moisture content and when the incoming temperature in the district heat system is 55°C or less. Heat is then recovered by condensation of moisture in the flue gases. The condenser uses the incoming district heat water as coolant. Harmful components in the condensate are removed in a condensate treatment plant. The WTE plant in Donetsk will be designed for one maintenance stop during one summer month and two shorter stops during autumn and spring\textsuperscript{30}.

\textsuperscript{30} EcoEnergy internal technical information
3 Methodology

In this part, the methodology of this thesis is described. The description consists of the scientific methods used in the study, as well as the choice of the theoretical and practical background of this thesis.

3.1 Scientific approach

In the beginning of the study the plan was to follow the path of the research paradigm called \textit{positivism}, which comes from natural sciences, and is underpinned with the aim to measure a phenomenon\textsuperscript{31}. In my case, such phenomenon would be the heating tariff system in both Ukraine and Sweden. However, as the work on the study proceeded it soon became clear that due to the circumstances in which I found myself in Ukraine, it would be more appropriate to deviate from the initial plan and follow the path of \textit{interpretivism}. \textit{Interpretivism}, emphasizes that the social reality is not objective and thus hard to measure\textsuperscript{32}. The reasons why the research has to a large extent followed the paradigm of \textit{interpretivism} are the following:

- I rely on both a theoretical framework and on empirical observations together with the studies that were conducted specifically within the scope of the area.

- Reliability is achieved by the depth of the interviews. The interviews were formed in a way that enabled to gain the specific information by using both questions prepared before the interview and open conversations with follow-up questions.

- The analysis is based on the quality of the interviews and observations. That is achieved by concentrating on the quality of the interviews and the information received through it. Rather than doing many, the choice was made to do few, but longer and deeper interviews with the persons involved in the field.

The methods that were used during the study are the following:

- Literature study
- Interviews with key organizations in Ukraine
- Field studies
- Study visits

There is little published research within the field of heating tariff systems, which partly depends on the fact that it is not one single research area. However there is plenty of knowledge within the field of both district heating and tariff systems. Thus, a lot of attention was devoted to the study of the background of district heating and tariff systems generally. The Main part of the theory that was considered necessary was identified before the empirical studies were conducted in the field; however, as the work proceeded, new questions arose along with the need for a new theoretical background. New theories were

\textsuperscript{31} Collins and Hussey, (2009), p. 56-57
\textsuperscript{32} Ibid
then studied. The theoretical background combined with the extensive empirical research enabled me to perform an analysis, to reach the conclusions and to answer the main questions of the study.

3.2 Information gathering
The information used during the work on this thesis was obtained mainly through the interviews, document studies, literature studies and observations. The core part of the study was conducted through an in-depth analysis of the situation within the different systems and therefore by the means of collecting *qualitative data*\(^{33}\) in the field it is a *qualitative study*. Furthermore, a comparative analysis of the two heating tariff systems have been performed in order to outline and highlight the differences between them and to answer the main questions of the study.

3.2.1 Study in Sweden
The study in Sweden had a preparatory character and aimed to get a deeper insight into the problem before conducting the main field work in both Sweden and Ukraine. The methodology that was used during the preparatory study in Sweden was literature and documents studies, the larger part of these studies was conducted in Stockholm. It included the study of the Swedish heating tariff system, the laws of Ukraine that were considered significant to the heating tariff system, the statistic data regarding tariffs in different cities, the reports provided by EcoEnergy together with other information that was available in EcoEnergy’s Stockholm office. The reports that were studied are confidential. However, I was granted permission to refer to some of the parts of these reports in my thesis report and I shall refer to them as “EcoEnergy confidential internal information”.

While performing this study many interesting documents were discovered, analyzed and used in the thesis work. The study of the Swedish heating tariff system consisted mostly of the literature and internet research that was made in Stockholm. Due to the fact that most information that was needed for the study of the Swedish heating tariff system is well-documented, there was little need for the interviews. However, the contact was made with Swedish District Heating Association where additional hints about the studied area were received. The main focus was put on large private companies such as Vattenfall, E.ON., and Fortum.

3.2.2 Field study in Ukraine
In order to get a deep and thorough insight into the Ukrainian heating tariff system, a field study has been conducted in the capital city of Kiev and the city of Donetsk. In both cities, a large part of the empirical information gathering was done. Due to the nature of the studied system, the physical presence in the field was necessary in order to obtain certain information about the Ukrainian heating tariff system, laws and legislations for that specific

\(^{33}\) Yin, p. 132-133
area and procedures that are being used on different levels to calculate, assert, regulate and change the tariffs.

3.2.2.1 Interviews
The main methodology that was used during the field studies in Kiev and Donetsk was interviews, literature and document studies, observations and study visits.

Interviews are commonly being one of the primary sources of information in many case studies. In the study conducted in Ukraine, the interviews were an essential source of the information. Following the definition of an interview used by H. J. Rubin & Rubin\(^\text{34}\), the interviews used in Kiev and Donetsk were more or less guided conversations, rather than structured queries, where I have chosen to pursue a consistent line of inquiry while keeping the actual stream of questions fluid rather than rigid.\(^\text{35}\) The interviews held during the study had a semi-structured and in-depth form. That enabled me to ask the respondents about the facts as well as their own opinions about the situation. Getting an answer about the respondents' opinion, however, was not always possible due to the nature of their position. Altogether, the main plan was to get as much valuable information as possible without intimidating the respondent and therefore excluding the possibility of getting genuine answers.

During the preparatory work before the field visit to Ukraine, the key organizations that according to my estimations were able to provide the information regarding heating tariffs were identified. After that the initial contact was made with them in order to make a preliminary booking for the meetings. However it soon became clear that a physical presence would be necessary to get both the attention and contact needed for securing the meetings. With the help of EcoEnergy’s partner BiogasProm and recommendation letters, it finally became possible to successfully book the meetings with the key persons within the organizations that were directly and indirectly involved or had certain knowledge in the studied area.

\(^{34}\) Qualitative Research Guidelines Project: www.qualres.org/HomeInte-3595.html
\(^{35}\) Yin, p.106
<table>
<thead>
<tr>
<th>Organization: Ministry of Housing and Communal Services of Ukraine</th>
<th>Department: Tariff planning</th>
<th>Date of interview: 27.10.2010</th>
<th>Time of interview: 1,5 hours at office and 30 minutes telephone.</th>
<th>Type of interview: Email, at office, follow-up telephone interview.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Electricity Regulatory Commission of Ukraine</td>
<td>Heating tariff / Cogeneration</td>
<td>3.11.2010</td>
<td>1 hour at office and 30 minutes telephone</td>
<td>Email, telephone, at office.</td>
</tr>
<tr>
<td>Donetsk Oblast Heating Company</td>
<td>Accounting</td>
<td>9.11.2010</td>
<td>1 hour at office and 30 minutes telephone</td>
<td>Telephone, at office.</td>
</tr>
<tr>
<td>Donetsk Oblast Heating Company</td>
<td>Tariff planning</td>
<td>11.11.2010</td>
<td>1,5 hours at office and 20 minutes telephone</td>
<td>Telephone, at office, follow-up telephone interview.</td>
</tr>
<tr>
<td>Donetsk City Heating Company</td>
<td>11.11.2010</td>
<td>30 minutes telephone.</td>
<td>Interview with representative.</td>
<td></td>
</tr>
<tr>
<td>Donetsk City Heating Company</td>
<td>Boiler House at Kuybishevskij District</td>
<td>12.11.2010</td>
<td>1,5 hours on site (including study visit) and 15 minutes telephone.</td>
<td>Telephone, on site.</td>
</tr>
</tbody>
</table>

Table 3: Interviews

The first interview that was made in Kiev was done with the Ministry of Housing and Communal Services of Ukraine\(^{38}\). The procedure of the interview was the following: the key persons within the organization received a petition to meet a Swedish student doing his master thesis within the area of heating tariff systems. After the confirmation that there was a possibility for a meeting, a list with preliminary questions was sent to the person. The meeting itself in the beginning had a strictly formal character, but it soon became clear that the answers that were received were restrained and formal. Therefore a decision was made to abandon the structured form of the interview and adapt it into a guided conversation,

\(^{36}\) Full name in English: Donetsk Communal District Heating Company. In Russian: DonetskTeploSet

\(^{37}\) Full name in English: Municipal Commercial Enterprise of Donetsk City Council. In Russian: DonetskGorTeploSet.

\(^{38}\) From here on MHCSU
where the interviewee got the chance to speak more freely about the different areas of the heating tariff system.

The result was that the disposition of the interviewee became more relaxed and valuable information has been received as a result. Furthermore, a good contact was established with the interviewee, which enabled two follow-up telephone interviews to be conducted during the following month.

The second interview was conducted at the National Electricity Regulatory Commission of Ukraine\(^{39}\) and resembled the same pattern as the first one. The key person responsible for the matters of the heating tariffs and cogeneration facilities was identified and a formal letter with a request of a meeting was sent to the organization. NERC is an organization that is not so easy to book a meeting with. After several persistent attempts and three days of waiting it became possible to meet and interview the key person. The rigid interview pattern was quickly adapted to the situation and the interview was transformed into a guided conversation where many interesting facts were discovered. A follow-up telephone interview was made a week later in order to clarify a couple of questions.

The rest of the interviews conducted in the city of Donetsk followed the same pattern as the first two interviews in Kiev. Smaller differences were made to the questions and more emphasis was put on the local traits. The local district heating companies provided interesting information about the heating tariff system that could later be compared to the information received from Kiev. By performing a data triangulation\(^{40}\) of the information obtained in both cities through documents, interviews and observations, more accurate conclusions could be drawn which improves the level of validity of the result. Having performed data triangulation, the events and facts of the study became supported by more than a single source of evidence. One of the aims apart of getting a better result of the study was addressing the internal validity, the main purpose of which is seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships\(^{41}\).

### 3.2.2.2 Study visits and observations

Throughout the field work in Ukraine, study visits to the key organizations were made. Apart from doing the telephone interviews, better understanding and perception of the situation was gained through visiting the offices of the organizations and companies involved in the area of the district heating and the heating tariff system. That included the Ministry of Housing and Communal Services of Ukraine, National Electricity Regulatory Commission of Ukraine, Donetsk Oblast Heating Company, Donetsk City Heating Company and one of the boiler houses in Donetsk.

\(^{39}\) From here on NERC
\(^{40}\) Yin, p. 116
\(^{41}\) Yin, p 40
Due to the fact that the larger part of field studies were conducted in the natural setting of the “field”, in this case Ukraine, there were many opportunities for direct observations. The phenomena of interest\textsuperscript{42}, the heating tariff system, have not been purely historical and therefore its history was not altogether documented, and therefore many relevant facts and conditions were available for observation. During the field work in Ukraine, a number of observations of meetings, interviews, field visits, work environments and conditions were made. That was a valuable source of evidence that combined with other sources of information provided invaluable aids for understanding the state of things within the system and organization. That was later analyzed and used for building up a better overall picture of the situation.

3.3 Ethics and credibility
During the early stages and through the whole field study in Ukraine it became clear that the persons that were interviewed did not allow me to use their names in the official version of the report. The reason for that is that some of the information that was obtained during the interviews can be viewed as sensitive but nonetheless is important to the study and therefore had to be used in the analysis. Even though I could not use the names and subsequently the positions of the interviewees in the official version of this report, I was granted a permission to refer to the organizations to which the interviewees belonged. The interviewees from the key organizations that were chosen for closer study subsequently acquired the role of informants, and were critical to the success of the study\textsuperscript{43}. The informants provided the insight into the situation and at the same time initiated access to corroboratory and sometimes contrary sources of evidence. However, taking in account the risks of getting distorted information from an informant, that were highlighted by Yin (2009), the study relied on other sources of evidence to corroborate any insight by such informants and to search for contrary evidence as carefully as possible.

\textsuperscript{42} Yin, p. 109
\textsuperscript{43} Yin, p. 106
4 Theory
This part provides a description of the theories that are used in order to understand and analyze the situation in the two studied countries together with their respective systems.

4.1 Price discrimination
Price discrimination is a phenomenon that appears when a firm makes a transaction of identical goods or services to different consumers at different prices, regardless of the fact that the prime cost for the product or service remains unchanged\(^{44}\). The situation can also be regarded as a form of price discrimination when a consumer pays the unchanged amount of money for a product or a service even though there are variations in the prime cost of the offered product or service. Generally speaking, the price discrimination phenomenon appears when the difference in price between the consumers is not proportional to the difference in the firms’ expenses to provide the product or the service to the consumer.

This price discrimination theory was chosen to study the Ukrainian heating tariffs in order to understand how and why they are set and managed the way they are today.

4.2 Two-part tariffs in a monopolistic competition
When a firm has a sort of monopoly position, it also usually gets the power to price discriminate. Then, the existence of a firm using a two-part tariff in a competitive market would be unmotivated when another competing firm could always charge a single price that consumer would prefer and earn a certain profit\(^ {45}\). But the reality seems to be different from the standard assumptions, and two-part tariffs do exist in many markets that are competitive.

In her paper, Hayes (1987) embarks upon showing and explaining why monopoly power is not required for the existence of a two part tariff, that two-part tariffs can often be found in environments with uncertainty, and that often the price discrimination using two-part tariffs is preferred by consumers to a single price in competitive markets.

In the case with heating in Donetsk, because of the specific nature of the product, the consumers’ demand is homogenous. When consumer’s demand is homogeneous, an assumption can be made that the market consists of a certain amount of identical consumers. In order to understand this model, the focus is put on one consumer who interacts with a firm which has no fixed costs and costs per unit are constant – that gives the horizontal marginal cost line. In the table 1 it is represented by MC line.

\(^{44}\) Waldman and Jensen, (2000), p 436
\(^{45}\) Hayes, (1987), p 41
The demand curve represents the consumer’s maximum preparedness to pay for any given output, in our case the heated water. As long as the consumer gets the right amount of goods, in the table it is marked by Qc, then he will be prepared to pay his surplus ABC in addition to the cost per unit, the area under the demand curve up to Qc.

When the firm has reached perfect competitiveness, it would want to charge price Pc and supply quantity Qc to the potential consumer, making no profit and producing an output that is allocatively efficient. But if the firm happens to be a non-price discriminating monopolist, a price Pm would be charged per unit and quantity Qm would be supplied. Thus, the profit would be maximized, but the output would be produced below the allocatively efficient level marked with Qc. A situation like would yield economic profit\(^{46}\) for the firm that is equal to the area B, surplus of the consumer that is equal to the area A, and a so called deadweight loss, the inefficiency, that is equal to the area C.

The firm has the capacity to extract more money from consumers, if given the scenario that it has a position of a price discriminating monopolist. Then it can charge a lump sum fee combined with a cost per unit. If the firm aims to sell the maximum number of goods or services, it has to charge the competitive price per unit, Pc, because this is the only price at which it is possible to sell Qc units. In order to compensate for the lower cost per unit, a fee that equals to ABC is imposed upon the consumer, which is the firms’ consumer surplus\(^{47}\).

By using the lump-sum fee, the firm is enabled to capture all areas that represent the consumer surplus and deadweight loss, which results in a profit that is higher than a monopolist that is non-price discriminating could manage\(^{48}\). This results in a firm that has a price per unit that is equal to the marginal cost, unlike the total price, which fulfills one of the qualities of price discrimination. If there are many consumers that have homogeneous demand, the received profit would be equal to the number of consumers multiplied by the area ABC\(^{49}\).

Two-part tariffs in industries characterized by economies of scale have been around for some time. The main idea is to ensure an efficient allocation of resources i.e. large fixed


\(^{47}\) Ibid


\(^{49}\) Economides and Wildman, (2005), p 4
costs. The most obvious examples are perhaps the electric and gas industries\textsuperscript{50}. A proportional charge is made to each customer for the individual use of the service. At the same time an extra charge is made for the costs on other buyers that a customer’s demand imposes at the peak of the system’s capacity\textsuperscript{51}. Public goods, such as district heating, are often characterized by high fixed costs.

4.3 Salient and reverse salient

Historically, the “salient” refers to a bulge in the advancing line of a military front. The term is commonly used to analyze military campaigns, where opposing military forces create uneven sections in respective battle lines. The reverse salient is thus a backward bulge in the advancing line and its significance lies in the idea that while it is there, the forward progress of a military front is slowed down or even halted\textsuperscript{52}. This happens because opposing forces threaten to break through the military line along this bowed back section that is often weaker than the rest of the front. This consequently requires effort in bringing the reverse salient section forward, evening it with the rest of the military front.

Salients and reverse salients can also occur in technological systems that are often seen as nested structures of technological parts. The system in this case is considered to be a composition of interdependent sub-systems that are in their turn comprising further sub-systems\textsuperscript{53}. The combination of the sub-systems is therefore forming the holistic system and its properties. Technological systems are also regarded as socio-technical systems that together with technical sub-systems contain social sub-systems. Social sub-systems can be represented for example by creators and users of technology, and in some cases overseeing regulatory bodies.

In his work “The Evolution of Large Technological Systems in The Social Construction of Technological Systems” (1983), Thomas P. Hughes, a historian of technology, proposes that technological systems pass through three phases during the system’s evolution:

1. Invention and development carried out by inventors and entrepreneurs.
2. Technological transfer between the regions and societies.
3. System growth and expansion. In this phase the performance of the system is improved in terms of economic outcome or/and output efficiency.

Hughes considers the development of the technological systems to be a co-evolutionary process that is highly dependent upon the combined cause and effect processes amongst technical and social components. The balanced co-evolution of the system components plays a vital role in the desired future progress. This statement leads to a conclusion that a sub-system that does not evolve at a sufficient pace prevents the technology system from

\textsuperscript{50} Kahn, (1970), p 95-100
\textsuperscript{51} Mueller, (2003), p 16.
\textsuperscript{52} Hughes, (1983).
\textsuperscript{53} Tushman. and Murmann, (1998).
achieving its targeted development and is called a reverse salient system. A sub-system that evolves at a pace that is too fast, leaving the remaining sub-systems behind, is thus called a salient system.

The reverse salient concept is often used by researchers and analytics when analyzing different technological systems. In the case of this thesis the choice has been made to use this concept when analyzing the situation with the heating tariff system in Ukraine and especially in Donetsk. In this case, the heating tariff system will be regarded as a socio-technical system with the main focus put on the social part of the phenomenon. The main purpose with this approach is to facilitate the perception of the heating tariff system and to use it as one of the tools when analyzing the situation.

### 4.4 Public Choice

Public choice is a research field in which economic analysis is applied in the studies of political phenomenon. The starting point is usually a theoretical modeling of the key players in terms of their motivation, information, and ability to process information. The key players are traditionally politics, voters, public officials, and stakeholders and the emphasis is placed on the interaction between them. Political decisions are regarded as a result of that interaction. The main analysis is usually done in two steps: theoretical modeling followed by empirical evaluation. Given that the theoretical modeling has successfully produced a number of hypotheses, the empirical evaluation of model’s ability to explain and predict the reality is carried out.

One of the main reasons for why public choice historically has come to existence and became popular among many researchers active in the combined field of politics and economics, was a discontent with how political science and economics analyzed politics. The problem with the political science’s way of looking at the politics was the lack of theoretical basis behind it. The problems with the classic economics’ way were that the political institutions were commonly regarded as changeless, the assumption were often made that the politicians were unselfish and perfectly informed persons whose main purpose was to maximize the systems welfare, and that the way of analyzing human behavior was incoherent – depending on the way one chose to follow a person acting on the market were considered to act out of self-interest whereas the same person put on a political arena was considered to be unselfish. The main idea with public choice is to combine the systematic approach of economics with logically connected assumptions about the human behavior within both economic and political environments.

The most common way of modeling the players on the political arena within the public choice field has become to model them as rational human beings that act out of self-interest and often without sufficient information about the environment in which he or she is active. The assumption about the players on the political arena having self-interest is what signifies

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55 Ibid
public choice, gives the way of looking at different political and economic phenomenon an extra dimension and what makes it particularly interesting for my study. Also, an interesting aspect that is highlighted within the public choice field by researchers, such as Dennis C. Mueller, is the interaction between the politicians and the voters. Many times one of the main concerns of the politician is getting the reelected, and thereby, the politician dedicates work and resources to getting the voters’ sympathy.56

The problems that emerged during the field study in Ukraine, were those that required that extra dimension, which would enable a deeper understanding of the situation. The Ukrainian officials’ and politicians’ behavior had to be analyzed with the help of the public choice theory due to the fact that both the system and the environment in which these persons are active differs from that which can be found in Europe. That includes many factors beyond the political systems and has a lot to do with typical human behavior, mentality and traditions of the region.

4.5 Public Good
The economist Paul A. Samuelson is often accredited for developing the theory of public goods. In his paper “The Pure Theory of Public Expenditure”, Samuelson defined a public good in the following way:

...[goods] which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtractions from any other individual's consumption of that good...

The public good is defined as a good that is non-excludable and non-rival. Non-excludability means that no one can be effectively excluded any individual from consuming it, and non-rivalry means that consumption of the good by one individual does not reduce accessibility of the good for others to consume.58

Examples of public goods are: clean air and other environmental goods, defense, public fireworks, lighthouses, and so on. Some goods need special governmental encouragements to be produced, but do not the requirements of being non-excludable and non-rivalrous, and, therefore can’t be classified as public goods. Law enforcement, education and streets are often misclassified as public goods, but in economic terms they are technically classified as quasi-public goods, because it is possible to exclude them, but such goods still fit several characteristics of public goods.59

4.5.1 The Free Rider Problem
Public goods give us a significant illustration of market failure, where market-like behavior of individual gain-seeking fails to produce efficient results. The production of public goods results in positive externalities which are not compensated. If a private organization doesn’t

57 Samuelson, (1954)
59 McConnell, Brue, & Flynn, (2009), pp 104
obtain all the benefits of a public good which it has produced, the incentives to produce it voluntarily might be insufficient\(^{60}\).

When taking into account the conception of the human being as purely selfish and purely rational—extremely individualistic, bearing in mind only those costs and profits that affect directly him or her, consumers can have a tendency to take advantage of public goods without making a sufficient contribution to their creation. This phenomenon is often called “the free rider problem”. If there are too many consumers who decide to free-ride at the same time, private costs would exceed private benefits and the incentive to provide the good through the market would vanish. The market would thus fail to deliver a good or service that is needed on the market\(^{61}\).

4.7 Externality
Within the field of economics, **externality** is often defined as “a cost or benefit, not transmitted through prices, incurred by a party who did not agree to the action causing the cost or benefit.\(^{62}\)” The benefits that are caused by such externalities are called external benefits or positive externalities. Meanwhile the costs are called external costs or negative externalities.

Positive and negative externalities describe situations when prices charged for a product or a service do not fully reflect benefits or costs of consuming or producing a service or a product. Furthermore, all costs or benefits may neither be taken nor reaped by consumers or producers of the economic activity, leading to the situation, when in terms of benefits and overall costs to society, too little or too much of the goods are consumed or produced\(^{63}\). In this case, overall costs and benefits to society are defined as a total sum of the economic costs and benefits for all the parties that are involved. As an example of a negative externality, air pollution from steel production can be mentioned.

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\(^{60}\) Powell, (2008), p 352

\(^{61}\) Ibid

\(^{62}\) Fang

\(^{63}\) Laffont, (2008)
In Table 5, the effects of a negative externality are demonstrated. If only the consumers’ own private costs are taken into account, they will get the quantity $Q_p$ at the price of $P_p$.

Nevertheless, the quantity $Q_s$ at the price of $P_s$ prove to be more efficient, due to the fact that $Q_s$ and $P_s$ reflect the fact that the marginal social cost should be equal to the marginal social benefit, meaning that the production volume should not be increased if the marginal social cost is higher than the marginal social benefit. The free market proves consequently to lack the efficiency, because the social costs exceed the social benefits, which leads to the situation when it would be better for the society if the goods between $Q_p$ and $Q_s$ are not produced.

Furthermore, the free market and sometimes even the competitive market prove to fail to solve the incoherence between marginal private and social costs. According to the economic theory\(^{64}\), a collective solution, such as for example court system or governmental regulations, are needed to affect situations when negative externalities appear.

### 4.8 Important terms

1. **Costs** in a company can be divided in:
   - Fixed costs and
   - Variable costs

   The total *variable costs* change when the *business volume* changes. The total *fixed costs*, on the contrary, remain unchanged when the business volume changes.

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\(^{64}\) Gravelle and Rees, (2004)
Business volume indicates the amount of goods/services produced and/or sold during a certain period of time.\textsuperscript{65}

2. \textit{Prime Cost} is defined as “\textit{the total of direct material costs, direct labor costs, and direct expenses}”.\textsuperscript{66}

3. \textit{Direct Material Cost} is defined as “\textit{the part of raw material cost that can be specifically and consistently associated with or assigned to the manufacture of a product, a particular work order, or provision of a service}”.\textsuperscript{67}

4. \textit{Direct Labor Cost} is defined as “\textit{the part of a payroll that can be specifically and consistently assigned to or associated with the manufacture of a product, a particular work order, or provision of a service}”.\textsuperscript{68}

5. \textit{Direct Expense (or Direct Cost)} is defined as “\textit{the expense that can be traced directly to (or identified with) a specific cost center or cost object such as a department, process, or product. Direct costs (such as for labor, material, fuel or power) vary with the rate of output but are uniform for each unit of production, and are usually under the control and responsibility of the department manager. As a general rule, most costs are fixed in the short run and variable in the long run. Also called direct expense, on cost, operating cost, prime cost, variable cost, or variable expense, they are grouped under variable costs}”.\textsuperscript{69}

6. \textit{Expenditure} is defined as “\textit{the payment of cash or cash-equivalent for goods or services, or a charge against available funds in settlement of an obligation as evidenced by an invoice, receipt, voucher, or other such document}”.\textsuperscript{70}

7. \textit{Cost-based pricing} is a “\textit{pricing method in which a fixed sum or a percentage of the total cost is added (as income or profit) to the cost of the product to arrive at its selling price}”.\textsuperscript{71}

8. \textit{Market orientation} is a “\textit{business approach or philosophy that focuses on identifying and meeting the stated or hidden needs or wants of customers}”.\textsuperscript{72}

\textsuperscript{65} Skärvad and Olsson, (2008).
\textsuperscript{66} www.businessdictionary.com
\textsuperscript{67} Ibid
\textsuperscript{68} Ibid
\textsuperscript{69} Ibid
\textsuperscript{70} Ibid
\textsuperscript{71} Ibid
\textsuperscript{72} Ibid
9. *Monopoly* is a “market situation where one producer (or a group of producers acting in concert) controls supply of a good or service, and where the entry of new producers is prevented or highly restricted. Monopolist firms (in their attempt to maximize profits) keep the price high and restrict the output, and show little or no responsiveness to the needs of their customers. Most governments therefore try to control monopolies by imposing price controls, taking over their ownership (called ‘nationalization’), or by breaking them up into two or more competing firms. Sometimes governments facilitate the creation of monopolies for reasons of national security, to realize economies of scale for competing internationally, or where two or more producers would be wasteful or pointless (as in the case of utilities).”

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Ibid
5 Study in Ukraine
This part describes the field studies conducted in Kiev and Donetsk, Ukraine.

5.1 Study in Kiev
The study in Kiev consisted mainly of the interviews with MHCSU, NERC, document studies, local field observations and information gathering of other kinds. During the study a lot of assistance and valuable information was received from EcoEnergy Scandinavia’s partner in Ukraine, company called Biogasprom. Biogasprom provided active help in getting in touch with the persons within the MHCSU and NERC together with some vital documents containing the Ukrainian laws and the overall information about the district heating net in Donetsk. The findings and facts that were discovered in Kiev offer a substantial base for understanding the situation in Ukraine and making a further study in Donetsk.

5.1.1 Different types of heating tariffs used in Ukraine.
The modern practice of charging the consumers for the delivered heat was established and developed in Ukraine in the beginning of 1991. It was basically a one-part tariff system where the consumers had to pay a regular monthly fee based on the economic prognosis of the district heating company together with the administration of the communal services. In the beginning, the tariffs had a symbolic character and the state was subsidizing the larger part of the fee. After some time, when the funds were cut, the measures had to be taken and the heating tariffs were increased in order to cover more of the real costs of the district heating companies. This raising of the tariffs was taken negatively by the consumers, partly as the result of little knowledge of the real costs and the economic reality in which Ukraine together with many other former Soviet republics found themselves in 1991.

From the year 2000, the Department of Justice of Ukraine issued a directive that stated that the local heating companies could choose to use two-part tariffs. It is, however, an option which the local authorities can choose instead of the older and more common one-part tariff system, leaving it up to the city councils or the regional administrations to decide which tariff system they will use.

However, four of the cities and the larger part of the regions are still using one-part tariffs and 6 are using a third version of the tariff system, which is called “season”. “Season” tariff resembles the one-part tariffs with the exception that the heating company puts all planned expenses for the year together divides it by 6, which allows the company not to charge the consumers during the summer season 15 April – 15 October.

The table below describes the situation in Ukraine regarding the different tariff types:

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74 Interview with MHCSU (27.10.2010)
75 Resolution of the Cabinet of Ministers of Ukraine № 231 (231-2010) from 02.03.2010
5.1.2 One part tariff

According to the resolution of the CMU №955\(^{76}\) from 10.07.2006 one-part tariff for the production, transportation and supply of district heating and hot water is defined as a cost of the unit of delivered service that is not divided into constant and variable parts\(^{77}\). That is basically a simplified approach for setting the annual tariff based on the expenses and the situation on the energy market from the previous year. The companies present the calculated annual tariff, based on the costs and the profit for approval by the state and when the tariffs are approved the consumers have to pay the monthly fee that often remains unchanged during the whole year. It is important to note that both the fixed costs of the company and the variable costs are melted together.

The one-part tariffs that are set by Ukrainian district heating companies often do not cover the actual costs of the company, mainly due to the fact that the costing is done incorrectly. In some cases, it becomes apparent that it is a part of the political game, where the players on the political arena make a deliberate decision to hold the heating tariffs on the same level or slightly higher than the previous year, even though it seems to be clear that they do not cover the costs of the companies.

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\(^{76}\) “Approval of the tariff-setting on the production, transportation, supply of heat energy and services to the district heating and supply of hot water.”

\(^{77}\) Resolution of CMU № 231 (231-2010) from 02.03.2010
5.1.3 “Season” tariff

The season tariff is an interesting and from European perspective unusual approach to setting the tariff. It has emerged during the late post-soviet period and can be partly explained with the public choice theory where the consumers of the heating company, due to the lack of trust, have chosen to pay only for the district heating service as it is consumed. The “I pay for what I get” approach has become preferred by the consumers, which is fully understandable, given the assumption that the consumers do mistrust the district heating company and have little understanding of the how the district heating works. The players on the Ukrainian political arena, represented by the local authorities instill little trust into the “voters”, who in our case can be regarded as the consumers of the services of the district heating company as well. That happens because of the longer periods of political instability and economic uncertainty in the country. This type of social environment breeds players on the political arena that act principally out of self-interest and often letting the maximization of the systems welfare fall to the second place on the priority list. This type of behavior cannot be unnoticed by the public for a long time and after some time the feeling of resentment and discontent begins to crystallize in the minds of people.

That was exactly the case with Ukraine, and soon many politicians and public officials found themselves in a position where they simply lacked the trust and support of the electorate. Many aspects of everyday life were affected by this negative attitude among the people, and the sphere of communal services was not an exception. Furthermore, the Ukrainian people inherited the soviet way of thinking when it came to the communal services – during the communism, people simply did not pay for the hot water and district heating. After the introduction of the heating tariffs shortly after the fall of the Soviet Union the majority of the population had difficulties with adapting to the new economic reality and did not like the fact that all of a sudden they had to pay for the services that were “free of charge” before. That combined with the fast and decrease of faith in the system and the players on the political arena and the unstable economic environment formed the way the consumers think and act on the market of the communal services and many other areas as well.

The “season” tariff that is used in many regions and 6 major cities of Ukraine grants the consumers an understanding and a feeling of security by offering a somewhat transparent system for paying for the services. By imposing the annual planned expenses upon the consumers during the six month of the heating season, the district heating companies no longer have to worry about the consumers not understanding what they pay for. This approach is widely accepted by the consumers and as long as the bills are paid, the heating companies seem to be satisfied as well.

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79 Telephone interview with MHCSU 28.10.2010
81 Interview with Donetsk Oblast Heating Company 12.11.2010
82 Interview with MHCSU 27.10.2010 and Donetsk Oblast Heating Company 11.11.2010
Even though equilibrium of interests seems to have been established, the district heating companies face many problems. For instance, many consumers do not understand the mechanisms that dictate the work and reality of the heating company, for example the fact that the actual expenses of the typical heating company are stretched over the whole year. During the summer period, when there is no need of warming the living spaces and the demand has decreased to that of the warm tap water, the heating company does a larger part of maintenance of the pipes, boilers and other equipment. That requires a strategic fund reserve in the company. Having the strategy of planning the whole year in advance and putting the payment on the months of the heating season (15 October – 15 April) causes many problems, such as:

1. Even minor mistakes in planning of the annual budget often have a major impact upon the whole system towards the end of the year.
2. It is difficult to foresee in advance what kind of maintenance and service, and to what extent that will be necessary during the summer season; therefore it is difficult to make a reasonable estimation of the costs. In reality the practice of the season tariff have a negative impact on the maintenance of the district heating system.
3. The nature of the district heating system is such that unexpected weather fluctuation and emergency breakdowns can occur, inflicting extra costs in terms of fuel consumption and repair costs. In order to deal with such unforeseen circumstances as these, the system has to allow a certain degree of flexibility, for example raising the tariffs during the season or having reserve funds. Today, the district heating companies using the “season” tariffs lacks such measures.
4. The main fuel that is used for heat production in Ukraine is natural gas, purchased from Russia. In the case of Donetsk, the natural gas accounts for close to 98% of the entire fuel consumption of the district heating company. The 50% increase in gas prices on August 1 2008 had a shocking effect on the communal heating sector. That makes the district heating company extremely sensitive to gas price fluctuations that can occur during the year. While concentrating the tariffs for the heating season, the company unwillingly creates a lock-in effect for the tariffs during the planning stage.
5. The procedure of changing the tariffs during the season has proved to be difficult and time consuming. According to the information that I have received from both Kiev and Donetsk, it usually takes 2-4 months for the company to change the tariffs. Taking in account that the heating season is 6 months, the system becomes too rigid and inflexible to be able to adapt to situations such as an unplanned increase in gas prices or extreme weather in the middle of the heating season.

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83 Interview with MHCSU 27.10.2010
84 Interview with Donetsk Oblast Heating Company 11.11.2010
85 EcoEnergy confidential internal information
86 Interview with Donetsk Oblast Heating Company 12.11.2010
5.1.4 Two-part tariff

Many cities have chosen to use the two-part tariff system, and some of them have used them for a long time now. For example the city of Ternopol has switched to a two-part tariff system already in the beginning of the year 2000, and is now using it. According to local authorities and MHCSU, overall positive response and few official complaints from the local population, the city administration or the heating company have been received. The statistic data shows that 17 out of 27 major cities in Ukraine have switched to the two-part tariffs during the last 10 years.

MHCSU, however, has no real power to make decisions regarding the tariffs – it is up to the regional authorities to make such decisions. What the Ministry can do is to recommend improvements or other actions. One of the recommendations that were given to all the cities and regions during the last five years was the transition to two-part tariffs. One of the main reasons for that was that it was thought to encourage a better planning within the district heating companies, because of the fact that the common practice has shown that in many cases the companies’ planning is imperfect and has to be performed more carefully. According to MHCSU, the two-part tariff system will encourage the companies to perform a more careful planning and to oversee the ingredients of the tariff more clearly.

According to the resolution of CMU №955 from 10.07.2006 a two-part tariff system for the production, transportation and supply of district heating and hot water consists of two parts:

1. Constant part – an annual subscription fee, the costs of the company supplying the heat energy derived from the maintenance of the production facilities, equipment, distribution nets and the part of the profit that is strictly regulated.
2. Variable part – this part of the tariff includes the costs of the company supplying the heat energy derived from the volumes of the delivered energy and the part of the profit that is strictly regulated.

When calculating two parts that the company has to take into account – the constant part that includes the costs that do not depend on the heat production or consumption, and the variable part that is directly dependent on the heat production and consumption the company will have to dedicate more time and more thought to the planning process. MHCSU and people that support the two-part tariffs hope that this will result in tariffs that are better suited for the real environment in which the heating company operates.

87 Interview with NERC 3.11.2010
88 Interview with MHCSU 28.10.2010
89 “Approval of the tariff-setting on the production, transportation, supply of heat energy and services to the district heating and supply of hot water.”
90 Resolution of CMU № 231 (231-2010) from 02.03.2010
91 Ibid
5.1.5 The Interaction “triangle”
There is a clear interaction “triangle” consisting of the state (local authorities, public officials), the inhabitants (the consumers) and in our case a local heating company that in most regions of Ukraine belongs to the state in the shape of local authorities.

In this triangle there is a so called balance of interests, which is sensitive and somewhat unstable. The interests of each participant in this “triangle” often collide with each other, which is a natural state of affairs, and often is seen to be the driving force behind progress within the social and political field. However, beside the positive impact that it can bring, the negative sides emerge as well. In the case of a typical situation in Ukraine, the balance of interests is somewhat tilted to the side of consumers.92

Because of the fact that the prices for communal services concern the larger part of the population of Ukraine, the regulation of the service tariffs, including the heating, has become a powerful political tool in the hands of the public officials. For example, by making promises of keeping the same level of tariffs, the local administration wins extra votes and that can help to win the election. On the other hand, if a politician that is in power decides to raise the tariffs, it will most probably lead to him and his administration losing the support needed to win the election. This conclusion could be drawn on the basis of the interviews that were done during the field studies in both Kiev and Donetsk. Due to the complex economic situation that the population of Ukraine and Donetsk is living in, all kinds of price

92 Interview with Donetsk Oblast Heating Company 12.11.2010
increases are not taken well\textsuperscript{93}. This applies to the communal services tariffs and the heating tariffs especially, due to the fact that the heating is already considered to be an expensive part of communal services among the population.

One of the main tasks of the local heating companies is planning the budget and the profits that the company wants to make. However, there is a restriction provided by the Cabinet of Ministers of Ukraine\textsuperscript{94} placing the maximum profitability of the heating company level to 12\%. What this restriction means is that the heating company is allowed to have such incomes that would cover the costs of the operation of the company and have a profit (net income = total revenue and gains – total expenses and losses) of only 12\%. However, one of the main problems is that due to the fact that the heating companies lack the financial muscle to reinvest in the new technology and equipment. That restriction also makes it virtually impossible for the district heating companies to set the tariffs that will enable them to raise enough funds for the investments that many of the desperately need today.

However, the main reason for this restriction is the fact that the district heating market is more or less monopolized by the Ukrainian state and that the management approach in this case is quite simple: the heat should be delivered, and it should be done with as low costs as possible\textsuperscript{95}. Whether this approach is right or wrong is to be discussed later in this report.

The actual profitability of the heating companies is very low in cases with many regions. Furthermore, many of the local heating companies do show negative result, which forces the state, as the direct owner of the companies, to go in with more money to cover the actual costs of the company\textsuperscript{96}. Since the year 2006 the state has a temporary practice of covering the costs of the local heating companies in case the company fails to do it on its own hand. That practice proved to be very popular among the local authorities and heating companies due to the fact that it enabled them to perform somewhat careless planning without thinking twice about the consequences and the local authorities can also use it as a political tool. However, the state is now trying to abolish this practice, partly by encouraging the regions to switch to two part tariffs and to perform a more careful planning\textsuperscript{97}.

The overall situation is that the existing heating tariff system is not encouraging the companies to grow and develop. By setting a restriction on the profitability level and imposing other restrictions on the economic management of the district heating companies, the state owned district heating companies, which today greatly outnumber the private companies, are deprived the advantages that a price discriminating monopolist would usually have. Even though the documents regulating the procedure of calculating the tariff take into account almost all heating company’s activities, the tariffs that are set in reality in many cases are not able to cover the expenses, leave alone to create possibilities for

\textsuperscript{93} Ibid
\textsuperscript{94} Resolution of CMU № 955 from 10-07-2010.
\textsuperscript{95} Interview with MHCSU 27.10.2010
\textsuperscript{96} Interview with Donetsk Oblast Heating Company 12.11.2010
\textsuperscript{97} Phone interview with MHCSU 28.10.2010
investments in new technology. The management staff and the regular workers of many district heating companies in Ukraine feel unmotivated to perform energy savings or efficiency improvements.  

5.1.6 Calculation of the heating tariffs in Ukraine

The procedure of calculating the heating tariffs in Ukraine is regulated by the resolution of the Cabinet of Ministers of Ukraine №955 from 10.07.2006. The tariffs on the heating energy are calculated in the following way:

The main principle is that the tariffs for the heating energy should include the costs of repair, renovation and other investments and renewals within the limits defined by the law.  

The size of individual components of the expenditure (Bj) in the monetary value (cost of a single resource) is defined by the equation:

\[ B_j = P_j \cdot U_j \quad (1) \]

where \( P_j \) is the demand for the appropriate resource, and \( U_j \) is the unit price of the resource.

Calculated in accordance with (1), the individual components are grouped in the expenditures with the help of the following equation:

\[ B_i = \sum_{j=1}^{m} V_j \]

where \( B_i \) is the size of the individual head of expenditure in the monetary value, \( m \) is the number of individual components of expenditure.

The cost of a separate article in terms of per-unit price for production, transportation and supply of heat energy \( (A_i) \) is defined by the equation:

\[ A_i = B_i/Q_n \]

Where \( Q_n \) is the planned sales volume of heat, expressed in Gcal.  

The per-unit price of the production, transportation and supply of heat energy \( (R_{Bk}) \) is defined by the equation:

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98 Ibid  
99 The limits could be found in the resolution of the Cabinet of Ministers of Ukraine №955 from 10.07.2006.  
100 Unit for energy.
\[ \Gamma_{\text{ВК}} = \sum_{i=1}^{n} A_i \]

where \( n \) is the number of the separate articles in each group.

The total planned prime cost for 1 Gcal of heat energy (\( \Pi \text{C} \)) is defined by the equation:

\[ \Pi \text{C} = \sum_{k=1}^{l} \Gamma_{\text{ВК}} \]

where \( \Pi \text{C} \) is the total sum of the expenses from all the groups of expenses for a unit of service. \( \Pi \text{C} \) is measured by UAH per 1Gcal.

and where \( l \) is the number of the groups of expenses.

The economically justified tariff (\( T \)) is determined by the equation as the total sum of the planned prime cost (\( \Pi \text{C} \)) and planned profit that is to be allocated to the implementation of the new investments of the heating company:

\[ T = \Pi \text{C} + \Pi \]

Where \( \Pi \) are the (expenses for new investments exkl. VAT) per 1 Gcal.

The last step is that the VAT is included in the tariff.

5.1.7 New regulatory commission for the heating tariffs

The data that was analyzed during the field study in Kiev has shown that there has been issued a law\(^{101} \) in Ukraine about establishing an institution; a commission that would be responsible for licensing, regulation and control of the heating tariffs. This institution should start functioning 1-01-2011, however, according to the interviewees both in Kiev and Donetsk no actions had yet been made in order to start the establishment of this new commission. NERC is temporarily performing the tasks of the new commission.

One of the commissions’ main tasks will be to facilitate the process of regulating the heating tariffs, which would be a significant help to the system on the region level. By creating such an institution, the Ukrainian government aims to create a powerful tool that will enable a better control of every city and region, shorten the decision time and make the system more flexible and therefore more efficient. The hope is to solve the old problems that the planning departments in almost every district heating company in Ukraine have to face when confronting the problem of having to make a swift adjustment to the heating tariffs. Often

\(^{101} \) The law has been issued 9-06-2010.
the bureaucratic procedures of making changes in the tariffs were so complicated and time consuming, that the heating companies neglected the fact that the changes were necessary and waited until the next annual approval of the tariffs instead of acting immediately. That often caused considerable economic losses.

Furthermore, with the establishment of the new institution the government intends to obtain an improved control over the tariffs before the approval, meaning that the commission will have to make a more thorough evaluation of the tariffs than is made today. This procedure will reveal the potential faults within the tariffs resulting in an early correction. The ultimate result is hoped to be tariffs that will better correspond to the reality.

5.2 Study in Donetsk
The study in Donetsk was conducted in the beginning of November 2010, directly after the study in Kiev. During the information gathering and analysis stage in Kiev, the preparations were done for a deeper investigation in Donetsk, including identification of key contacts and key organizations, preparation of the interviews and planning of the activities on site. The study itself mainly consisted of the interviews with the Donetsk Oblast Heating Company and the Donetsk City Heating Company, as well as a study visit to the boiler house and information and documentation gathering.

5.2.1 Organizational and institutional assessment of the Donetsk City Heating Company:
The municipal heating services in Donetsk are structured in the following way:

- Heat is produced and distributed by two separate municipality owned District Heating Companies\textsuperscript{102}, and by other industrial heat suppliers\textsuperscript{103} which operate the heat sources and transmission and distribution networks. Those two companies operate in overlapping areas and are in one sense competing with each other. There have been discussions concerning merging those two companies, but the anti-monopoly authorities have not approved such an action yet.

- The Municipality of Donetsk owns the assets; the two companies only operate and maintain the heat sources, transmission and distribution networks, central heating stations\textsuperscript{104} and heat and hot water supply networks between the CHS’s and the buildings. All these facilities are in the ownership of the municipality making it a municipal fund of the state property.

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\textsuperscript{102} Donetsk City Heating Company with approximate market share 80% and Donetsk Oblast Heating Company with approximate market share 15%.
\textsuperscript{103} Market share less than 1%.
\textsuperscript{104} From here on CHS
Inside the buildings, the heating systems are also owned by the municipality. The internal heating systems are operated and maintained by the city housing company.

The border of responsibility in heat supply is at the entrance of the building, technically defined as the first flange at the pipeline entering into the building.

5.2.2 Key figures of Donetsk City Heating Company\(^{105}\)
The following figures have been received from EcoEnergy Scandiavia, and have been confirmed by the local heating company. Even though these figures were prepared during 2005, not many changes have been made within Donetsk City Heating Company and, therefore, the following figures can be considered valid.

As it was mentioned earlier in this report, the existing district heating system in Donetsk consists of small local nets connected to boiler houses with gas fired boilers. There are 166 boiler houses containing 657 boiler units with a total capacity of 2600 MW in the Donetsk area. The district heating nets supply the connected consumers with both hot tap water and heat.

- Heat load of the end-users: 2 100 MW
- Installed heat capacity: 2600 MW
- Total number of staff: 2 600
- Total length of the heat transmission pipelines: 900 km (with two pipes)
- Total number of buildings connected to the district heating network: 4 350 (of which number of residential buildings 3 900)
- Annual heat sales: 2 239 GWh (for around 864 000 inhabitants in the City)
- Invoiced revenue (2004): 192,5 MUAH\(^{106}\)

5.2.3 Supply of heat energy in Donetsk
Heat for space heating is supplied during the heating season only in Donetsk. The start and the end of heating season is set according to the outdoor temperature with the limit being +8°C with duration of three days. However, in practice, different boilers are used during the winter heating period and the summer time, and the rearrangement of the system is time-consuming action. Thus the heating seasons always starts 15th of October and lasts until 15th of April. Therefore, the duration period of heat supply is 183 days\(^{107}\).

The present practice in Donetsk is a consequence of the lack of automatic control systems at the customers. Heating is started and stopped by the technical maintenance staff by opening

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\(^{105}\) Information is dated from 2005 EcoEnergy internal report, however it is confirmed during the interviews that most of it is still considered valid.

\(^{106}\) Unfortunately, I was not able to get the new data on the invoiced revenue.

\(^{107}\) Information received from EcoEnergy and confirmed by Donetsk City Heating Company.
and closing the shut-off valves at customer buildings (compared to the Swedish system, where every household regulates their own consumption of heat energy). Every building is in turn connected to a central heating substation, and there are in total about 90 such stations all over Donetsk. Heat consumption in this case is production driven, and a lot of energy is wasted during this process\textsuperscript{108} during to the poor condition of the pipes and other equipment used in the heat supply chain.

5.2.4 Heating tariff in Donetsk
In Donetsk City and in the region, the heating companies use the “season” tariff. The practice of using it has its roots in the middle of the year 1990, when the decision was made to adopt this way of setting the tariffs for heat energy. Over a shorter period of time after year 2000, there was an attempt to switch to the two-part tariff, but the idea was soon abandoned due to the administrative difficulties together with protests from the consumers. Especially in the case of the Donetsk region, where there are about 53 smaller towns, the company had not enough resources to make a proper introduction of the two-parts tariff system. That led to misunderstandings among the mayors’ administrations and the company, and after some time the decision was made to switch back to the “season” tariff system again. The fact that consumers seem to lack trust for the tariffs and have little understanding of how the tariff system works, the needs and expenses of the company made it virtually impossible for the two-part tariff to be accepted and implemented. The fact that the “I pay for what I get”-attitude seems to be prevalent among the inhabitants of the Donetsk region and that due to the lack of resources little or no effort has been made to change the public opinion, the “season” tariff has gained a strong foothold.

5.2.5 Donetsk Oblast Heating Company and Donetsk City Heating Company
Donetsk Oblast Heating Company and Donetsk City Heating Company are, according to the persons that were interviewed in both companies, similar in many ways. Both companies belong to the state and are managed in the same way. The largest difference is the geographic spreading of the heat consumers: Donetsk City Heating Company is active within the city and Donetsk Oblast Heating Company has 15% of the city and the rest of the customers are spread over the Donetsk region. Otherwise the two companies are almost identical.

5.2.6 Discovered weak spots within the heating tariff system – Moldova example
One of the most interesting and important phenomena that were discovered during the interviews with the representatives of the local district heating companies in Donetsk is a feature of the heating tariff system; a so called inbuilt failure that brings the whole tariff system to a standstill. During the preliminary study the same phenomenon was discovered in Moldova, where the local district heating companies experienced major problems with financing the maintenance of the district heating nets all over the country. The situation can be described as follows:

\textsuperscript{108}EcoEnergy confidential internal information confirmed by the Donetsk Oblast and City Heating Companies.
After the fall of the Soviet Union, Moldova gained its independence and was left with all the district heating nets built according to the soviet standards. From that period of time no new investments were made in the system, partly depending on the financial difficulties that the country experienced right after its independence.

During the Soviet Union period the communal services were owned and managed by the state. The system was fully centralized when it came to the financial flow within the country, and in the case of Moldova if there were any shortages in the budget, they were more or less fully compensated by Moscow. After the fall of the union, this was no longer possible and the government of Moldova had to rely on themselves.

The transition to a market economy followed shortly after the independence, and the heating tariffs were introduced. Nevertheless, the tariffs were very low and covered only a minor part of the expenditures that the district heating companies were facing. This situation soon led to shortages in the budgets of the heating companies all over the country, and a peculiar mechanism of trying to maintain the status quo was initiated\textsuperscript{109}.

The heating companies pled for more money from their direct owners – the municipalities. The funding was granted and everything remained stable for some time. But as soon as the municipalities’ budget was ran out of money for this kind of subsidiary activities, the request for support was sent to the regional authorities. The money was received once again and the system stabilized for a while longer. Soon even the regional authorities ran out of money, and the request was forwarded to the state government. The request was satisfied once again and the system remained more or less stable for a while longer.

The vicious circle was thus a fact, and after some time the difficulties with financing the district heating systems became more vivid\textsuperscript{110}, but the pattern still remained the same, leading slowly but inevitably to the vast budget deficit that Moldova still tries to get rid of today.

Furthermore, during the two decades since the collapse of the Soviet Union, virtually no new investments have been made in the district heating system itself: the pipe systems are outdated and are in need of constant repair, and the boilers efficiency is low, which leads to unnecessary fuel consumption etcetera.

5.2.7 Discovered weak spots within the heating tariff system – Ukrainian case

The event pattern in Moldova is almost the same in the case of Ukraine. Due to the size of the country and the fact that the economic situation is slightly better in Ukraine\textsuperscript{111} than it is in Moldova, the process of getting into a dead end takes more time. But according to the indications that were learned during the studies in Kiev and in Donetsk, the situation will

\textsuperscript{109} European Bank for Reconstruction and Development, Renewable Development Initiative: http://ebrdrenewables.com/sites/renew/countries/Moldova/profile.aspx#Overview

\textsuperscript{110} Ibid

\textsuperscript{111} GDP per capita $6,400 in Ukraine compared to $2,400 in Moldova (2009 est.). Source: www.theodora.com
soon reach a critical point. The practice of compensating for budget deficits of the heating companies has been adopted by the Ukrainian government shortly after the country’s independence and has slowly escalated ever since, leading to increasing debts within the system. Instead of letting the consumers pay the price that would cover the heating companies’ expenditures for production of the consumed heat energy, the Ukrainian government subsidizes the shortages in the budgets.

Furthermore, the same situation as was experienced and has recently become more acute than ever in Moldova, regarding the poor condition of the district heating nets and equipment, is now widely experienced in Ukraine. During the interviews with the heating companies in Donetsk, it was often mentioned that the costs that should cover companies’ expenditures related to the maintenance of heat generation sources and supply networks to operational conditions are only partially covered by the existing budget. The need for new investments in new technology and renovation of equipment has been mentioned several times as well. This situation became obvious after the study visit to the boiler house at the Kuybishevskij district, where the maintenance crew highlighted the constant lack of resources for preventive and corrective maintenance. One could see with the naked eye that a big part of the equipment was outdated, and in many cases it was merely the skill of the maintenance team that enabled it to continue functioning.

The district heating nets are generally in poor condition and there is a vivid need for new investments in maintenance of the existing heating nets, boilers and equipment, as well as future acquirement of equipment and technology. The problem is that there is a lack of money within the state budget, and, unfortunately for the heating companies in Donetsk and the rest of Ukraine, there seems to be no changes of this in the near future.

During the interviews with the Donetsk district heating company, it became clear that the mayors of the smaller towns in the Donetsk region either did not understand the real situation in which the heating company was operating or neglected the pleas for more money for the company operational needs. This behavior could be explained by the fact that the mayors lack enough political power to perform the needed changes, and such decisions should be made on the regional level or even in Kiev. However, there is more to it than a lack of power. With the help of public choice theory, and the indications received during the interviews, the situation can be modeled in the following way: the town’s mayor is a politician, a public person that beside the will to maximize the systems welfare is also a rational human being that acts out of self-interest and has insufficient knowledge about the environment in which he is active. The voters, the common people, are in their turn modeled as rational human beings acting out of self-interest, historically having little trust in the politicians and with little knowledge about the environment and practically no knowledge at all about the mechanisms behind the district heating system. This approach enables us to look upon the situation from another angle, and, for instance, the fact that the

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112 Interview with MHCSU (27.10.2010) and Donetsk Oblast Heating Company 12.11.2010
voters have little expectations for the politicians to improve the situation; one of the main priorities during the election would be not improvement, but stability. Hence comes one of the driving forces behind the politician’s behavior – promises of stability can mean a lot for the voters, and the person who can not only promise it, but also deliver it, often is the winner on that given arena. On the other hand, by increasing the heating tariffs, the politician would lose some of his popularity among the voters, due to the fact that the equilibrium of expenses of a regular consumer would then be shattered.

When looking upon the situation in Donetsk and in the rest of Ukraine, it becomes clear that no player on the political arena would want to be a “bad guy”, and within the election program promote an increase of the tariffs, even if he had enough knowledge of the situation within the district heating. As became clear during the interviews, some of the players on the political arena were indirectly opposing themselves any raise of the tariffs proposed by the district heating companies, due to the fact that they saw it as a sensitive issue for the upcoming election. A local politician who would make an open statement about the deteriorating conditions of the district heating companies and decide to raise the tariffs to the level that would correspond to the actual expenses would be literally committing a political suicide. This might be one of the problems that exist in the Ukrainian system, but, unfortunately, this is how it is. Even though one could argue that using such arguments, no society would make long-term investments. Instead, the course of actions that has proved to be more reliable is falling into the vicious circle within the system, and using the money that the state provides to cover the uncovered expenses of the heating companies. And that is the course of actions that has been actively practiced by the players on the Ukrainian political arena for many years now.

As was demonstrated in the Moldova example, the vicious circle will sooner or later bring the system to the point of collapse, when it will no longer be possible to maintain the status quo and keep the system alive. By the practice of compensating for the coverage of the budget deficit of the district heating companies from the state budget, the system is kept alive, but due to the fact that little or no investments at all are made in the new pipes, boilers or other necessary equipment, the district heating system is moving towards its collapse.

The consumers of the heat energy are paying tariffs that do not cover the expenditures of the heating company. The state goes in with money in order to cover the rest. The obvious question is: Where does the state take this money from? The answer is – the taxes. If backtracked even deeper, the money comes in a way from all the tax payers (both companies and private persons), who are in majority of cases the very same consumers of the heat energy. This is not understood by the consumers of the heat to a large extent,

113 Interview with Donetsk Oblast Heating Company 12.11.2010
114 Ibid
115 Interview with MHCSU 27.10.2010, confirmed by the telephone interview Donetsk City Heating Company 11.11.2010.
because of the lack of information from the district heating companies and the authorities. Some attempts to inform the public regarding the mechanisms behind the tariff-setting mechanism have been made, however, due to the shortages in budget and little attention from the heating companies’ management; the attempts are insufficient to make a larger impact. The leadership of the heating companies’ seems also to be passive when it comes to this kind of questions due to the fact that the question is politicized. This fact was highlighted during the interview conducted with the Donetsk Oblast heating company.
6 Study in Sweden
This part describes the studies conducted in Sweden.

6.1 History of district heating in Sweden:
The first known example of an early technical district heating system in Sweden is Sabbatsberg hospital in Stockholm\textsuperscript{116}. The hospital was built in 1878, and all its buildings were connected to the centralized heat source. Using knowledge and experience from USA and neighboring Germany, several attempts were made to introduce district heating in several major cities in Sweden during the first half of the twentieth century; however, all those attempts have failed due to several reasons, such as negative attitudes from authorities and financial problems. But the main reason for not introducing district heating in Sweden before the end of world war 2 was the national surplus of hydropower\textsuperscript{117}.

When the utilization of the hydropower resources began to reach its top, the interest in extended use of thermal power began to grow. That led to the introduction of the first municipal district heating system in Karlstad in 1948, being shortly thereafter followed by Norrköping, Malmö, Göteborg, Sundbyberg and Stockholm. This development continued throughout the century, and today practically all towns and cities in Sweden have a district heating system. District heating has become the dominating form of heating in multi-dwelling and non-residential buildings in the main town (administrative centre) of 247 of the total 290 municipalities in Sweden\textsuperscript{118}. The densely populated areas of the city and places where there were many multi-dwelling buildings were the first target. By 1975 the proportion of buildings with central heating was about 96\%\textsuperscript{119}.

During the period between 1950 and 1990, the main part of the local district heating utilities were owned by the municipalities, but the situation has changed, and after some time the larger part has been transformed into municipal energy companies. The municipal energy companies operate more or less like regular companies in terms of management, procedures and economic goals. During the early 1990s, because of the deregulation of the energy market, which included district heat and electricity, and the financial problems that many Swedish municipalities found themselves in, many municipal energy companies have been sold to large private companies, such as Vattenfall, E.ON., and Fortum\textsuperscript{120}.

\textsuperscript{117} Ibid
\textsuperscript{118} Wirén, (2008).
\textsuperscript{119} Werner, (1991).
\textsuperscript{120} Ericsson, (2009).
6.2 Swedish district heating system today
An important fact that has to be mentioned about the Swedish heating system, is that the heat is supplied throughout the year. Heat supply is regulated by the customers themselves with the help of automatic control systems that are installed specifically at every heating element. Every heated building has in turn a so called individual heating substation, meaning that the heat consumption is demand driven.

At the present time, the share of the municipal energy companies in terms of delivered heat energy is close to 60%. The private companies accounted for 20% and the companies owned by the state for 20%. Multi-dwelling buildings are the largest consumer type judging by the delivered volume of heat energy. Approximately 80% of all multi-dwelling houses in Sweden are connected to a district heating system. The second largest consumer type is non-residential premises consisting of both public premises and others. Small houses together with the industry correspond to the rest of the delivered heating energy.

District heating corresponds to about half of the energy used within the heating market in Sweden. Four large companies (E.On Värme AB, Fortum Värme AB, Vattenfall Värme AB and Göteborg Energi AB) are responsible for 42% of the delivered heat volume, but have only 25 delivery points\(^1\), which means that their consumers purchase large volumes of heat. Middle size companies deliver 31% of the heat and have 38 delivery points. Small size companies deliver 26% of the heat and have about 35% of the delivery points.

\(^1\) Energimarknadsinspektionen, (2010).
6.3 District heating tariffs in EU and Sweden

In western and northern Europe the handling of electricity, natural gas and district heating have been naturally integrated in the same company that is owned by either the municipality, the region or the state. Due to the fact that district heating is a local phenomenon, the municipalities have traditionally had a big influence. In northern Europe, and especially in Sweden, it became common that the heat was produced and distributed by the municipal enterprises.

Unlike in Eastern Europe, in Northern Europe the heat was produced and distributed on a trade basis, often through companies, and there was little need in merging production and distribution functions of a district heating company or restructuring in order to sustain the benefit for the population as the case was with the electricity sector. A typical characteristic trait of the Northern European district heating companies is that they are both the producers and the distributors of heat at the same time. One of the reasons for that, according to the World Bank\(^\text{122}\), is operational optimization in order to compete with the individual heating systems.

The district heating sector generally is characterized by a large amount of small enterprises or entities in every district. In most European countries, the district heating became a natural monopoly within the areas where the heat was produced and distributed. However, it is not common with regulations by law or other means when it comes to district heating, and the price is often considered to be self-regulated by the market. Where there are regulations for the tariffs, they are often aimed at holding them at a reasonable level, where there is a connection between the tariffs and the costs of production and distribution of the heat.

The heating tariffs in Northern Europe are distinguished by the fact that they are cost-based and market-oriented. Two-part tariffs are preferred and widely used. The first part of the tariff is a fixed part that is either flow-based or effect-based. The second part is a variable part that consists of the fee for the consumed energy. Usually, the costs for the fuel that is used for heating can come up to 50% of the heating tariff, which creates dependability upon the costs of the fuel that is used to create heat. In cases when the tariffs are regulated, the district heating companies still have a possibility to adapt the variable part of the tariff to the fuel price fluctuations without having to confirm the change with the authorities.

Furthermore, the need of new investments within the Northern European district heating systems is often financed by either funded resources, the raise of equity or by loans. In the first case, with the funded resources, the source of those can be tracked to the consumer’s payments – the fixed part of the tariff often includes a part for new investments.

\(^{122}\) Swedish Government report: [www.regeringen.se/content/1/c6/03/79/76/3d887c9a.pdf](http://www.regeringen.se/content/1/c6/03/79/76/3d887c9a.pdf), p 139.
6.4 District heating in Sweden – a natural monopoly

Due to the fact that large investments are required in order to build and maintain a heating pipe network, the companies that produce and distribute heat seldom compete in the same geographical region. It is simply too expensive to have parallel pipe networks. Distribution of the heat enables the company that historically succeeded in getting a foothold in one area to enjoy economy of scale because it is more efficient for the heating company to expand in the area than for another company to be established. Therefore, a natural monopoly appears.

District heating nets in Sweden can be equated with the nets that are used for transporting electricity or natural gas. However, district heating is distinguished by the fact that it is bound to a specific area and is not protected by concessions or any similar regulations\(^\text{123}\). The regulation that is in use in Sweden today restricts the access to the heating net to those who are not direct owners of the net. Furthermore, there are currently no regulations regarding the distinction of production, trading and distribution of the heat. A debate has been raised among the population and organizations in Sweden emphasizing the fact that regulations that are currently used for electricity and natural gas that are based on the third party entrance on the market on non-discriminating conditions should be adopted as well\(^\text{124}\).

6.5 Heating tariff system in Sweden

The heating tariff system used in Sweden looks more or less the same for all the heating companies on the district heating and energy market\(^\text{125}\). The tariff is basically divided into three parts\(^\text{126}\):

1. **Fixed part** – consists of a fixed annual fee (SEK\(^\text{127}\)/year) and an energy fee (SEK/MWh). The size of the annual energy fee is calculated by multiplying the energy price (SEK/MWh) by the normal corrected annual energy consumption. The fixed part is calculated for the whole year, but is broken down to a monthly fee.
2. **Energy part** – consists of a variable fee depending on the amount of consumed heat energy. For the heat energy that is delivered to the heat central, the fee is paid per energy unit (MWh). The energy part is often differentiated between the summer period and the winter period.
3. **Effect part** – consists of the annual fee based on the heat producing facilities’ last two years annual effect (kW).

The heating tariffs used by Swedish heating companies are distinguished by the close bond to the direct expenses of both variable energy part and the fixed part that the company has regardless of the production volumes. Almost ever since the beginning of the district heating

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\(^{123}\) Energimarknadsinspektionen: www.energimarknadsinspektionen.se/upload/Rapporter/Fjv/EIR201004.pdf

\(^{124}\) Ericsson, (2009).

\(^{125}\) Ibid

\(^{126}\) Examples taken from Fortum Värme AB, Håbo Energi AB, Mullsjö Kommun.

\(^{127}\) Swedish Krona.
in Sweden, the consumers were paying the whole bill for the companies’ operational expenses. That was possible by implementing the actual cost based tariff system, combined with principles of openness and information to the public. However, it is necessary to keep in mind that the process of getting the Swedish district heating system together with its tariffs to where it is now took about 60 years\textsuperscript{128}, and the development has not always been smooth.

\textsuperscript{128} Werner, 1991
7 Analysis and results
This part presents the results of the studies and analyzes the results. In order to summarize the result of the study, the choice was made to concentrate on answering the question posed in the beginning of the study, which were: "How does the heating tariff system in Donetsk differ from the typical Swedish system?", “What consequences does the managing of the heating tariffs in Donetsk have on its district heating system?” and “How should the heating tariffs in Donetsk be managed in order to maintain the financial sustainability?".

7.1 Major differences between the district heating tariff systems in Sweden and Donetsk
Compared to the typical Swedish heating tariff system, the heating tariff system that is used in Donetsk has several major differences in the way the tariffs are set.

The district heating companies in Ukraine are owned by the cities or the regions and have their roots in the old Soviet system, where all communal services belonged to the state and had no profit requirements. The main task was to deliver heat to the residential buildings, industry and administration buildings, which they did – all the costs and expenses including the new investments were covered by the state. In that matter the district heating companies could be regarded as full monopolists. However, after the fall of the Soviet Union, many typical district heating companies, such as Donetsk heating company, faced the reality of the market economy where they practically stopped receiving the funds from the state and had to cover their operating costs by introducing the heating tariffs that in theory would cover all the expenses and the new investments. But that was only in theory – what happened in reality was different. The heating tariffs were introduced, but even though the transition to the market economy officially took place, the state kept its ownership and heavily reduced funding. Thereby the result was that the heating companies, transformed into being managed as a modern and independent company but at the same time being strongly influenced by its owner, the state, kept the monopoly over the district heating market.

The heating tariffs in Ukraine were introduced immediately after 1991, but they did not correspond to the reality in which the heating companies found themselves in. The real operating costs were not covered and the state had to cover the rest where it was possible. That resulted in big debts and shortages in financing the overall activity of the companies and literally no new investments were made during longer periods of time.

In Sweden, the situation with the heating tariffs has proved to be different. The long period of economic and political stability within the country has enabled the “natural selection” of

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129 Interview with MHCSU (27.10.2010).
130 Ibid.
an effective system\textsuperscript{131}. The approach where the real costs of the heating companies along with the investments in new solution and technology were calculated within the heating tariff that the consumers had to pay enabled the survival and prosperity of the district heating system.

The markets in which Swedish and Ukrainian district heating companies established are often those of a monopolistic nature and the consumer’s demands are homogenous – which enables the firms to use the two-part tariffs in order to gain economic and strategic advantages. This theory will be used in the work to understand both systems and perform an analysis.

The first major difference is the structure of the tariffs. In Donetsk, a variation of a one part tariff, so called “season” tariff, is used, while in Sweden, a variation of a two part tariff is used. The main idea of the tariff in Donetsk is to make the consumers of the heat get a more comprehensible feeling that they “pay for what they get”. By dividing the annual sum of the calculated fee into six monthly invoices, the heating company in Donetsk enables their customers to pay only during the heating season, which stretches from 15 October to 15 April. This tariff system has evolved from the basic one part tariff system that is widely used in Ukraine for pricing different services, mainly in the communal sector. The tariffs are set by the heating companies on an annual basis, based on the estimations and calculations performed by the planning department without taking into account the natural gas price fluctuations and other external factors that can affect the direct expenses of the company during the year. This, however, is partly compensated by the possibility to change the size of the tariff during the year, but as it was confirmed during the field study, the process of changing the tariff often takes two to four months. The process is time consuming, complicated and involves many parties, which subsequently leads to a situation where sometimes the heating companies ignore the need to the tariff change (from the authorities) and retain the size of the tariff as it was set in the beginning of the year. This, of course, leads to negative result for the company in the end of the year.

Furthermore, the existing structure of the heating tariffs in Donetsk lacks the flexibility in another aspect: the unforeseen breakdowns and maintenance stops. These events are often difficult to foresee and plan for. Information that was gathered during the field work in Kiev and Donetsk points to the fact that already during the planning stages, there are many estimations that are known to be faulty already from the beginning, but nothing can be done due to the rigidity of the system and the lack of incentives for this.

The situation in Sweden looks differently. The heating tariff system that is commonly used is a two part tariff system, with one constant and one variable part. The system developed over a longer period of almost 60 years, and has always been market-oriented, due to the

\begin{footnote}{131}Werner, (1991).\end{footnote}
fact that the district heating companies have been transformed into municipal energy companies and private energy companies.

The district heating in Sweden, as well as in Ukraine, is considered to be a natural monopoly. Because of the nature of the product and the limitations in transportation of the heat energy, the heating companies obtained a unique position when it came to pricing. However, in both Ukraine and Sweden there are existing regulations, that have to be followed by the heating companies in order to regulate the tariffs and hold them on a reasonable level.

Price differences between different cities in both Ukraine and Sweden exist as well, and can be explained by the fact that smaller towns or districts are often more expensive to supply with heat than larger ones. The cost of the heating company to supply a certain amount of heat energy decreases with the amount of consumers in the area. These variations of the tariff levels are present in both countries. One of the main reasons for that is the fact that the amount of pipelines that have to be installed does not depend on the amount of potential consumers; e.g. the same length of the pipe has to be installed whether there are five residential houses or just one in the potential area.

7.1.1 Comparison of the typical European district heating company and Donetsk city heating company
During the study of the documents acquired from EcoEnergy Scandinavia, a comparison of the operations of the typical European company and the Donetsk City heating company was presented in the figure below:
Both companies use natural gas as the main source of fuel, and both sell a similar amount of heat annually. Even though the analysis for this figure was done six years ago, the indexes were verified and confirmed in both Sweden and Ukraine. One major correction that has to be made is the price of fuels and energy – the price of natural gas in Ukraine has almost reached the level of the price in Europe, so the light blue columns in the figure should be at the same level. Apart from that, the main differences between the two companies can be summarized (not all of them are depicted in the Figure 4):

- Heat production efficiency is considerably lower in Donetsk\(^\text{132}\). That gives a higher fuel consumption per unit of sold heat compared to the European company.
- Personnel cost is higher in the European company. However, the number of employees in Donetsk is almost ten times higher\(^\text{133}\).
- European companies purchase large quantities of new materials, which means that a lot of old and outdated equipment is being continuously replaced by new. In Donetsk, the old equipment is being repaired rather than replaced. This results in low efficiency and instable availability due to breakdowns.
- Depreciation is much higher in the European company, which is explained by the fact that the company invests in new technologies and new equipment. The heating company in Donetsk does not invest in this field and, hence, is the low depreciation.

\(^{132}\) EcoEnergy confidential internal information confirmed by the interview with Donetsk City Heating Company 12.11.2010.
\(^{133}\) Ibid
The district heating company in Donetsk suffers from insufficient funding, outdated technology, and increasing fuel costs, which puts it in an inconvenient position where something has to be done in order to improve the efficiency and profitability, but there is neither motivation nor investment money to do so. Furthermore, the level of profitability has been set to 12% at the highest by the government, which makes it even more difficult for the company to improve their processes and their equipment.

7.1.2 Political situation

One of the significant and interesting issues that came up during the study and analysis of the heating tariff system in Donetsk was the concealed political reasons for why the system is managed as it does today. Upon several occasions it was mentioned during the interviews that the changes that are being proposed by MHCS, when it comes to modifying the tariff system and transforming it into the two part tariff system, are met with either unwillingness or resistance from the decision makers on the local level. According to the sources in Kiev, this kind of phenomenon can be observed in many parts of Ukraine and, therefore, is widespread. This type of behavior is difficult to understand if no closer attention is paid to the political aspects of the issue.

When applying public choice theory to this particular case, and looking on the situation from a different perspective, some interesting details start to emerge. If we make a choice to rely on the information that was collected during the field studies both in Kiev and Donetsk, a conclusion can be made that the politicians and decision makers in many parts of Ukraine are opposing the idea of having the two part tariffs when it concerns heating, and, what is most important, the decision makers seem to oppose the idea of raising the heating tariffs so that the district heating companies can cover their actual expenses and make investments in new technology and new equipment. Taking this assumption into account, the standard hypothesis that the politicians are unselfish and perfectly informed persons whose main purpose is to maximize the systems welfare is therefore incoherent and has to be adjusted to the reality of the political environment of Ukraine as it looks today. Hence, the decision was made to model the players on the Ukrainian political arena with the help of public choice, where they are modeled as rational human beings who act out of self-interest and often without sufficient information about the environment in which they are active.

The combination of looking at the decision makers with the help of the standard assumption and public choice gives the case an extra dimension. The politicians are of course struggling to maximize the systems welfare, but at the same time, while acting of self-interest, they want to remain in a position of power. The position of power is granted to the politician when he or his party wins the election, and therefore is highly dependent on the voters and their perception of the politician’s image, track record, promises and many other factors. In order to be elected or reelected, the politician often has to make the “right” decisions and

see to that the public is aware of that fact. The Ukrainian political arena requires, like many other political arenas in the world, a set of certain skills from the politician if he or she wants to succeed. The promises that are made before the election have to be more or less congruent with what happens when the election is won.

When looking upon the economic situation that has been prevalent in Ukraine during the last two decades, it becomes clear that a lot of people within different layers of the Ukrainian society have been influenced by the changes that emerged. The market economy has entered the stage to substitute the plan economy, and many changes had to be done, not to forget the tariff systems within the municipal sector. The biggest change to the tariff systems was letting the consumers pay for the services, which due to the plan economy and the communistic government was not the case before the year 1991. A typical consumer of the municipal services, in most cases, has limited information about the political games that are being played by the decision makers and politicians. What concerns the consumer, in many cases, is simple things like monthly bills and availability of the services. This concern is highly applicable to the heating tariffs as well, and, as the field study revealed, this attitude of the consumers is still prevalent in Ukraine today.

Now, a model of the situation, that is based upon the assumptions that were made with the help of the results of the field work, can now be put together and applied to the heating tariff case that is being analyzed. On one side we have the politicians and the decision makers, who are dedicated to maximizing the systems welfare, and at the same time lack sufficient information about the situation and act out of self-interest. On the other side we have the regular consumers, who also lack sufficient information about the situation with the heating tariffs, and the lack of funds and resources that the local district heating companies experience. The consumers’ main concern is that the heat is delivered and that the monthly bills from the district heating company are as low as possible. In this situation a balance of interests between the politician and the consumer is crucial, and the politicians are aware of it. However, not all the consumers, which in this case can be regarded as both consumers and voters, are aware of it. For many consumers, this balance is not an issue of high priority as long as their interests are taken into account. Now, a dangerous equilibrium appears, balancing the politicians who want to keep their positions and thus continue having the political power on one side, and the consumers who do not want to see the raising of the heating tariff fees on the other. This equilibrium has been present since the system was erected, which is approximately since the year 1991. The problem that arises is that the district heating companies virtually ran out of proper funding, due to the fact that the state has barely enough money to keep the district heating system floating. The politicians have, since the beginning not dared to make a drastic raise of the tariffs because of the nature of the issue. For instance, if a politician announces to the public that he or she will raise the heating tariffs with 50% or 100% in order to correspond to the heating companies’ actual
expenses and new investments in equipment, that would most likely be equal to a political suicide. Such politician would not be elected. On the other hand, if a politician that has been elected makes a similar move, he would most likely lose the next election. This will happen regardless of the fact, that even if provided with the proper information regarding the poor condition of the district heating systems in the most cities in Ukraine, the consumers would still dislike such a decision. Even though many politicians are aware of the poor conditions and would like to make long-term investments, the situation in Ukraine at the present moment seems to be different, and as the practice reveals, many of them prefer short-term moves to those that are long-term. 

When looking at the situation from this angle, it becomes easier to understand why the politicians and decision makers chose not to make the needed but at the same time drastic changes in the heating tariff system. Thus, the vicious circle within the tariff system gets another dimension and is more difficult to break.

### 7.2 Consequences of the managing of the heating tariffs in Donetsk on its district heating system

Among the main consequences that today’s management of the district heating tariffs have, the following three are worth to be mentioned:

1. Because of the price discrimination that is clear in the case with the heating tariffs in Donetsk, the Donetsk City district heating company has constant lack of funds and resources when the financing of the companies’ activities and investing in new technology and equipment is concerned. This problem is well-known but not dealt with due to the lack of money. The fact that the Donetsk City Heating Company is lacking money every year initiates a chain reaction consisting of the company itself, the Donetsk city, the Donetsk region and the state. The request for money goes through the city and the regional government to the state, and the money is sent from the state’s budget. Every link in this chain is aware of the problem of faulty tariffs that are unable to cover the costs of the heating company, but little is done to solve it.

2. The staff of the Donetsk Heating Company lack motivation to carry out the effectiveness improvements and other organizational and technical improvements due to the poor economic situation that they experience. They seem to understand the need of certain changes in the technique and organization, but at the same time they lack funding to make any decisive action.

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136 According to field observations and analysis performed in Ukraine, combined with the results of the interviews.
3. The equipment and technology that is used by the heating company is to a larger extent outdated, and more and more often in need of repairs, which decreases the level of reliability and makes many consumers switch to alternative heating methods. For instance, many inhabitants of the modern residential houses that are built in Donetsk choose not to be connected to the district heating nets, and instead have their private boilers either separately in every apartment or one for the whole house. This solution is widely considered not to be sustainable and lacks the advantages that the economy of scale that district heating boilers have.

7.2.1 Heating tariff system as reverse salient
The heating tariff system in Donetsk can be regarded as a social sub-system within a socio-technical system that is the district heating in Donetsk. When looking upon the heating tariff system this way, and taking into account the problems that this systems causes for the district heating as a whole, the heating tariff system is thus regarded as a reverse salient system. The needs of the Donetsk Heating Company in terms of investments in new equipment, new technology and other investments that have to be made in order to improve the effectiveness and reliability of heat production and supply cannot be supported by the outdated and ineffective approach which is used in the tariff system in Ukraine. In Sweden, on the other hand, ever since the beginning of the district heating, the tariff system was built up in a way that made the consumers pay for the delivered heat. The two part tariffs were early implemented in Sweden and this approach made it possible for the heating companies not only to cover the expenses, but also to make constant improvements and new investments. No reverse salient was therefore created within the Swedish heating tariff system.

In Ukraine, during the times of the Soviet Union, the plan economy and constant allocation of the capital also enabled the development to stay on the same track as it was in Sweden until approximately the end of 1970-th\(^{137}\). Then, due to several political and economic reasons, the progress in the Soviet Union within the district heating halted and Sweden took the lead. For the past two decades, after the transition to market economy, the heating tariff system as it looks today was born in Ukraine. However, as the research conducted in this thesis points out, there are several defects in the heating tariff system that create the reverse salient system that halts the future development of the Ukrainian district heating companies.

As the results of this research point out, there are organizations and people in Ukraine that understand the problem. Furthermore, decisive steps are being taken to resolve it: the two part tariffs are implemented in several cities all over the country, and the regulations are being rewritten in order to be more applicable today. However, there are other political forces that may hinder the continuation of the improvements and therefore keep the reverse salient system for some more time.

\(^{137}\) EcoEnergy confidential internal information
7.3 The “Free Rider” Problem of the District Heating in Donetsk

The district heating in Donetsk fits into the definition and can be regarded as a public good due to the reason that it is:

- **Non-rival** – due to the fact that consumption of the district heating by one individual does not reduce availability of the consumption of district heating by others, and
- **Non-excludable** – due to the fact that no one can be effectively excluded from using the district heating, given an assumption that the bills are paid by the consumer on time.

However, it is important to note, that there may be no such thing as an absolutely non-rivaled and non-excludable good; but economists think that some goods approximate the concept closely enough for the analysis to be economically useful\(^{138}\). Such is the situation with the district heating in the city of Donetsk: theoretically, a consumer can be excluded from using the district heating when choosing not to pay the heating company for provided services, however, I choose to make an assumption (confirmed by the interviews with Donetsk Oblast Heating company), that it happens extremely seldom due to the fact, that the district heating, likewise water and electricity, belongs to the necessary part of living. Deliberately choosing not to pay for the district heating will eventually lead to the consumer freezing to death during the harsh winters of the Donetsk region, and actually, the heating companies seldom shut off the heating, even though the bills are not being paid by the consumers\(^{139}\).

In the case with district heating company in Donetsk, the company produces and distributes a public good, which is hot water used for heating. The tariffs for the heating do not cover the actual expenditures of the company to produce and distribute heat, which leads to the situation, in which the company doesn’t reap all the benefits of a public good which it has produced and the consumers tend to take advantage of the public good, which is in our case heating, without contributing sufficiently to its creation. The incentives of the company to produce and distribute district heating voluntarily is insufficient, and, to balance this situation, the Ukrainian state imposes strict regulations upon the district heating companies.

The consumers, being according to economic theory, “\textit{homo economicus: purely rational and also purely selfish—extremely individualistic, considering only those benefits and costs that directly affect him or her}\(^{140}\), pay the heating tariffs that are intentionally, according to the strict regulations issued by the state, are set to such a level, that the expenses of the heating company are not covered fully. The part of the tariff that is covered consists mostly of the fuel costs, which is in 98% costs for the natural gas used by the district boilers, and administrative expenses, used to keep the company running. On the contrary, a typical

\(^{139}\) Interview with Donetsk Oblast Heating Company 12.11.2010  
\(^{140}\) Gravelle and Rees, (2004)
Swedish district heating company, has tariffs that would have parts in it that would account for maintenance and new investments.

Therefore, what seems to appear in this case is a free rider problem, which is a result of the management of the district heating companies and the tariff system that was adopted by the Ukrainian state after the fall of the Soviet Union. The free rider problem, in the case given here, is not unmitigated, but rather obscure, due to the fact that the consumers actually, beside the “usual” deviations, pay the bills for the heating. The problem is, however, that these bills that they pay do not cover the actual costs of the district heating company for producing and distributing the heat.

When studying the district heating companies in Sweden, especially those that are owned by the municipalities, such as for example Borlänge Energi, the differences between the typical Ukrainian district heating company and the Swedish one swiftly appear. The Swedish district heating companies have a long history of being managed in an environment that is market-oriented. Even though the district heating is a natural monopoly, an approach of managing it, even if it is owned by the municipality, is still more or less profit-making. Furthermore, when setting the heating tariffs, Swedish heating companies take into account the maintenance and new investments, which in the long run allows to manage the company more efficiently. In the case with Ukrainian district heating companies, an attempt to manage them in a market-oriented way was made, but, nevertheless, despite the fact that the companies have their own management and are trying to manage themselves on their own hand, they are all still owned by the municipalities, and the Ukrainian state, by means of numerous laws restrictions, is still holding an iron grip and regulating the companies.

7.3.1 Possible solution to the “Free Rider” problem

Two of the methods to solve the existing free rider problem of the district heating have been adopted by the Ukrainian state:

1. Subsidies – the difference between the actual expenses and by the private consumers paid tariffs is subsidized by the state.
2. Industry and other consumers – as it is seen in the table below, industry and other consumers pay roughly 50% more for the heating, if compared to the population. By imposing higher tariffs on the industry, the Ukrainian state balances the incomes of the district heating companies. However, it is still insufficient due to the amount of heat consumed by the industries and other consumers when compared to the population, and extensive subsidizing still has to be performed.
What could be done in order to get rid of the free rider problem is raising the heating tariffs for the population to a level, which would make the tariffs correspond to the expenses that the district companies have in order to produce and distribute the heat. For the district heating company’s future, it would also be reasonable to take into account a possibility to increase the funding of maintenance and investments in new material and technology, which would, in a way, guarantee the company’s continued survival. If the government would choose to raise tariffs to such levels, it would of course meet some difficulties along the way, but given enough time, education for the population concerning why the tariffs are raised and an institution that would make sure that the bills are paid, it would in theory be possible to make such changes. However, it is important to take into account the political situation in Ukraine, and especially the situation described with the help of Public Choice theory, when making the steps to raise the tariffs.

### 7.4 Negative externality in the heating tariff system of Ukraine

The way the district heating tariffs are managed in Ukraine today causes a negative externality. The government, being an exclusive stakeholder of the majority of district heating companies in Ukraine, and particularly the Donetsk city district heating company, imposes through laws and strict regulations a tariff system that prove to be unsustainable. The costs of producing and distributing the heat to the consumers are not fully covered by today’s tariffs. That leads to a situation where the marginal social cost is higher than the marginal private cost, which according to the economic theory fits under the description of a negative externality.

The level of the tariffs paid by the population are set to a level that gives comfortable private cost, neglecting the fact that the social cost are actually higher and has to be compensated partly by the state budget and partly by the extensive reduction of the funds for investing in the equipment and new technology. Furthermore, almost all district heating companies in

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141 Laffont, (2008)
Ukraine experience large problems when it comes to maintenance of the existing equipment and distribution nets.  

The incoherence between the private cost and social cost for the district heating is responsible for the deteriorating condition of the district heating companies all over the country. By letting the consumers pay the tariffs that are from the beginning set to a level that does not correspond with the actual level of the heating company’s expenses creates a problem that will make the whole society suffer both directly and indirectly from poorly managed district heating companies.

One of the most common types of solution that are used to solve the negative externality problems of the same character that can be observed within the heating tariffs in Ukraine is an implicit agreement through the political process. Due to the fact that the governments are elected in order to represent citizens and to create compromises between different interests, the deteriorating conditions of the district heating companies in Ukraine can be addressed through specific laws and regulations that would see to that the incoherence between the private cost and the social cost of heating is eliminated. That could be done not by the local authority, due to the reasons described in the public choice part of this report, but by the central government (the president or the parliament).

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8 Conclusions and Reflections
This part presents the conclusions and reflections of the study. The credibility of the report and possibilities for future studies within the field of heating tariffs in Ukraine are presented as well.

8.1 Conclusions
The objective of this thesis was to understand with the help of economic theory why heating tariffs are managed in a country that has had transition from plan economy to market economy the way they are, and how the management of heating tariffs could be improved when taking into account the experience of a country with long established market economy. The report has been based on the field studies conducted both in Sweden and in Ukraine. The larger part of the information concerning the heating tariff system in Ukraine was gathered through interviews with persons actively working in different organizations and companies within the district heating field in both Kiev and Donetsk.

With the help of the field study conducted in Ukraine, Sweden and the theories used to analyze the questions posed in the beginning of the study, many interesting facts were revealed and conclusions regarding how the existing tariff system used in Donetsk could be improved were made. It is nevertheless important, when looking on the proposed solution, to take into account the political aspect of the question. This aspect was described in the report with the help of the public choice theory, which would hopefully help to understand all the difficulties that would arise when altering the existing heating tariff system.

8.2 Proposed steps for improved management of heating tariffs in Donetsk

By summarizing the theoretical background combined with the practical findings of the study and the performed analysis, based on the results and analysis of the conducted studies that is presented in the chapter 7 of this report, the following steps could be recommended for the Ukrainian government in order to improve the management and the situation of the district heating company in Ukraine and Donetsk specifically:

- The heating companies should be allowed to include modernization costs into the tariffs.

- The heating companies should be allowed to adjust the tariffs faster in case of rising natural gas prices. The new regulator should react and approve the tariffs faster, according to the requests from the district heating companies.

- The tariff rates should be set with due regards to the profitability level that is required in order to achieve the break-even of the district heating companies. The return of investments in technical modernization should be provided with proper safeguards, which should be laid at the legislative level. However, there should at the same time be mechanisms that would prevent cases of unjustified tariff increase. This measure will reduce both the free-rider problem and the negative externality
that exists within the system. Furthermore, by implementing this measure through the central governmental body, the problems that are described with the help of public choice theory (part 7.1.2 of the report) could be partly avoided as well.

- The investment part of the heating tariff can be partly balanced by the reduction of heat consumption, e.g. through installing individual heating points in more residential building in Donetsk. This would give the consumers larger control over the heat supply, and the heat will be consumption will be reduced as a result of it. Such measures would also contribute to the sustainable development of both the heating companies and the society.

It is important to note that the proposed steps are based on the research that was conducted during the field studies in Ukraine, combined with the comparative studies in Sweden. A deeper research of the consequences of the proposed actions would have to be conducted in order to strengthen the validity of the proposed actions.

8.3 Credibility

The interviewees that were interviewed during the field studies in Ukraine have chosen to remain anonymous due to the nature of the questions that were asked during the interviews, combined with other political issues. Nonetheless, major part of the results and information that was received through the interviews was cross-checked with other sources; both other interviewees and documentations and can therefore be considered reliable. Nonetheless, the author of the report is fully aware of the fact that the report would carry more weight and be considered to have a higher degree of credibility if the names of the interviewees were included in the report, but that is unfortunately not possible.

Some of the conclusions regarding the district heating tariff system in Ukraine, that were made during the work with the thesis, were based on a supposition that the more or less all the district heating companies in Ukraine experience the same problems as the district heating company in Donetsk. That supposition has been confirmed by the MHCSU in Kiev, which made it possible for me to draw general conclusions in the report. However, it is important to highlight the importance of research and investigation of district heating companies in other Ukrainian cities than Donetsk, in order to improve the credibility and validity of this report.

8.4 Suggestion for further studies

There is wide range of research that can be conducted in the field of both heating tariffs and district heating systems in the Eastern European countries such as Ukraine. However, in order to conduct further research, there is a need of more funding and resources that researchers have to have in order to be successful. The nature of the work in Ukraine and difficulties that arise when working in such environment require support and resources, and the quality of the result will be directly proportional to level of these two factors that a researcher would have available.
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