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District Heating

– Future Scenarios of 2015

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Preface

We would like to express our sincere appreciation to Anders Ydstedt for supporting us in the process. We would also like to extend our special thanks all the people who have contributed to the thesis and reserved time for interviews: Sverker Andersson, Pontus Angland, Göran Ek, Jonas Ek, Gunnar Käck, Göran Lagerstedt, Tom Lindberg, Birgitta Lindblad, Rogert Läckström, Lars-Göran Nilsson, Mats Renntun, Erik Thornström, Lars Vestergren, Sven Werner and Cecilia Örnevik.

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Executive summary

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- Key words: District Heating, Scenarios, Strategic Management, TPA (Third Party Access), Re-regulation
- Problem formulation: Today the district heating market is in an interesting and challenging phase. The deregulation of the state monopoly of the electricity market in the 1990:s started an unbundling process of separation between production and distribution. Today we see the same tendencies on the district heating market. The individual markets of district heating that are ruled by powerful distribution network owning companies in natural monopolies are most probably meeting some sort of unbundling regulation as well in the near future. The market is poorly regulated and the network owners have a strong market position in comparison to the suppliers. Since this regulation would imply a new regulation of a poorly regulated market we refer to it as a re-regulation. This would change the conditions for all parties of the market. How big the changes would be depend on the competitive regulatory structure and whether district heating prices would increase or decrease. We find it very interesting to see what the competitive regulatory structure could look like in the future and how the prices could change in case of a re-regulation. It would also be an interesting challenge to examine how the currently active market parties as well as the new entrants would adjust their strategies to the different market conditions a re-regulation would bring about. These are some of the essential questions that we have found intriguing in this thesis.
- Purpose: The purpose of the thesis is to describe a few possible future scenarios of the Swedish district heating market of 2015 providing, for each scenario, different competitive contexts for existing and new market actors. In each scenario future strategies for the parties involved will be identified.

Methodology: The thesis is based on a future perspective and we have therefore chosen to use scenarios in order to describe a few possible future outcomes of the district heating market of 2015. The method consists of three steps. Initially a pre-study was carried out to understand the electricity and district heating market. Then the scenarios were created based on dialogues with a number of experts on district heating. Finally a strategic analysis was made based on the statements of some of the most important district heating companies in Sweden. In all three steps, interviews were conducted and contemporary theories and secondary data collected and reviewed.

Conclusions: Four scenarios for the future district heating market were identified. The first scenario anticipates the use of nuclear waste heat for district heating as well as a full TPA. The second scenario predicts high taxes on garbage incineration and low taxes on waste heat as well as a customer price-regulation. The third scenario expects a high degree of incompatibility in integrated different district heating systems as well as a full TPA. The fourth scenario presumes that terrorism creates difficult conditions for district heating and that no re-regulation occurs. In each scenario strategic options for the parties involved were identified based on our reflections from the conducted research. The currently active market parties are encouraged to initiate a higher degree of transparency, to reinforce the compatibility development, to join a larger integrated network, to minimise their reserve capacity and to create lock-in effects with their customers. Possible new entrants are encouraged to identify new geographic areas for building new networks as well as finding an alternative use for heating.

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– 1 –

Introduction

This section presents the potential as well as the structure and function of district heating. The problem approach discusses how a possible re-regulation would affect the competitive structure of the market for the currently active companies and new market actors. Finally the purpose and delimitations of the study are presented.

1.1 Background

Waste heat from the Forsmark Nuclear Power plant alone could bring district heating to the entire population of the Stockholm area (www.dn.se, 2004-04-10). It has recently become a hot topic in contemporary Swedish media. The fact that heat, often seen only as an industrial by-product, is being wasted into the sea and air sounds almost like a paradox in times when environmental issues are highly valued. Unused resources and the already highly developed district heating grids together add up to the assumption that district heating has a good future potential as a profitable business. It could become a competitive advantage for existing companies in the electricity market but also for new companies that produce waste heat even though they are active in other industries as for instance steel or lumber (Report, Feb 2004, Svensk Fjärrvärme). Companies from other industries did not have these opportunities a few years ago but the essence of a recent investigation implies that a new reform in the area of district heating is on its way. This new reform might give third party actors the right to make deals with grid owners even though it does not result in any specific benefits for the grid owners (SOU 2003:115).

1.2 District heating

Today, district heating is a resource maximising and environmentally sustainable form of heating. District heating accounts for almost half of all heating of premises and houses in Sweden. (www.fjarrvarme.org, 2004-05-30). District heating is a form of heating environmentally competitive in comparison to other forms of heating based on fossil fuels as oil, coal and gas. District heating could reuse waste heat from industries, power heating or incineration. It could also be produced from geothermal heat. (Interview with Dr. Sven Werner 2004-04-26) District heating could be compared to a miniature electricity network in its structure. The main difference is the size of the networks, where an electricity network is very large, the district heating networks are limited to a local area as for example a city or

town. (Interview with Mr. Göran Lagerstedt, 2004-04-26). One of the main advantages of district heating is that it often uses heat that in other cases would have been wasted into the surrounding air or waters. In the future, one goal of district heating for industries is to reuse more heat from incineration in industrial processes. (Interview with Mrs. Birgitta Lindblad 2004-04-27)

1.2.1 How does it work?

To understand how district heating works in reality we need to take a look at the market of district heating. The market could be divided into three parts; production, distribution and consumption. Many times the producing companies also are the corresponding network owners, which implies a powerful market position. (Interview with Mr. Göran Lagerstedt 2004-04-26)

The product – heat, is extracted from a production source and distributed by fluid, in most cases water, through a distribution network or grid to the final customer where the heat is transmitted to the customers separate water system, e.g. through a heat exchanger (www.fjarrvarme.org, 2004-05-30).

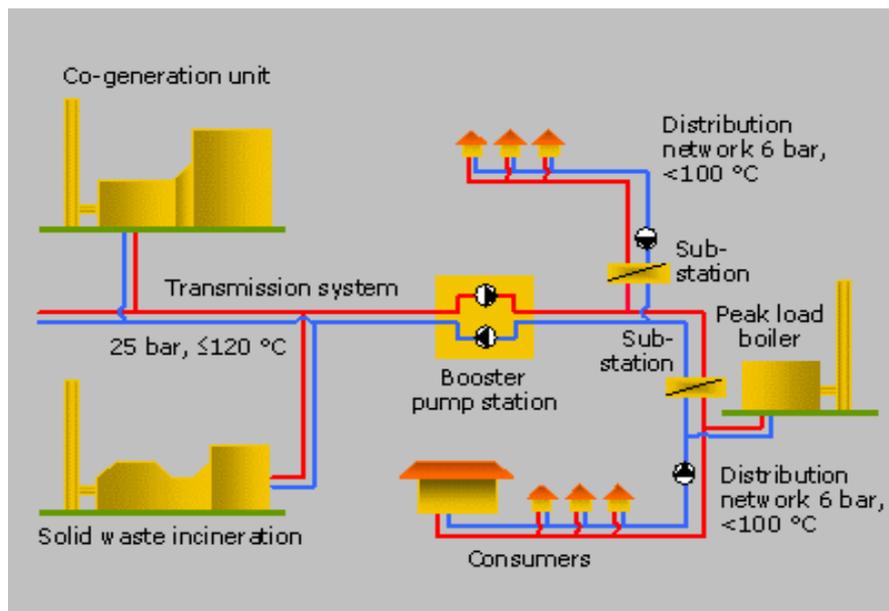


Figure 1.1 – A district heating network (www.ecd.dk, 2004-05-29)

The figure demonstrates how a district heating network provides the customers with hot water from the heat producing units. Heat is generated in a co-generation unit as for instance a power heating plant or in an incineration plant. After the water is heated it is pumped through a distribution network to the final customer e.g. private houses, premises or apartment blocks. The water pressure and temperature are adjusted at different sub-stations before reaching the customer. To be sure to cover peak-load demands as for example during cold winters, a reserve unit – in the picture the peak load boiler is connected to the system. When the hot water reaches the final customers, heat is extracted, the temperature drops and the cooler water is pumped back to the production units and the heating and the distribution process starts over again.

1.2.2 Production and waste heat

In the production process of the industries heat is extracted from various sources such as incineration, geothermal heat (which is ground heat being pumped up to the surface), power heat, sun heat and even heat extracted from a positive heat difference between a lake and the fluid that is to be heated. Incineration, if not defined clearly, could easily be misinterpreted as waste heat. Incineration is the process when garbage is burned in order to create heat. This is a traditional district heating production process. Waste heat is defined as heat that is an industrial by-product which would normally have been wasted into the surrounding sea or air. This could for example be the heat that is wasted in the cooling process of a nuclear power plant or a heat intense industry. Waste heat is a product that could be used for warming up a separate water heating system and then transferred to the distribution net. As we see there are many different possible sources which make district heating very adaptive. In addition to fossil fuels in the combustion alternatives there is also wood chips and bark, a bio-fuel, as well as rest products from the furniture and the logging industries. (Interview with Dr. Sven Werner 2004-04-26 & www.fjarrvarme.org, 2004-05-30).

1.2.3 Distribution

District heating is locally produced and used which means that production and grids differ from each other depending on local conditions and the construction time period (Report Feb 2004, Svensk Fjärrvärme). The distribution of heat from the producer to the customer is mainly carried through water in a distribution net or grid constructed of water pipes, in most cases sub-surface. The grids are of variable sizes and have different structures. In most cases the heat transition is carried through pipes with a water temperature of 70-80 °C to the customer. The heat is often transmitted through a heat-changer before the water is returned to the heat source and the heating process starts all over again (www.fjarrvarme.org, 2004-05-30). The heating process, distribution and extraction of heat at the customer is very low-tech only dependent of the variables temperature, pressure, and fluid speed. (Interview with Dr. Sven Werner 2004-04-26)

1.2.4 Consumers

The first district heating company in Sweden started in Karlstad 1947 and today district heating is used in half of the heated buildings in Sweden. About 30 % of the cities and towns in Sweden have district heating (Report Feb 2004, Svensk Fjärrvärme). In order to form a picture of the district heating consumer we would like to demonstrate a few consumer statistics:

In Sweden around half, 51%, of the heat on the market of district heating is supplying apartment blocks. The typical district heating customer is living in an apartment block and as much as 75% of the Swedish apartment blocks are heated by district heating. Also a large percentage of the premises, i.e. stores, warehouses or public institutions and buildings as hospitals, schools etc., 56% have district heating but still only 7% of the owners of small private houses are connected. In total, district heating controls around 40% of the Swedish market. The advantages of district heating in comparison to other sources of heat is for the

customer that it is cheaper, cleaner, needs less surveillance and does not take up as much space as an oil boiler. (www.fjarrvarme.org, 2004-05-30)

1.2.5 Long term perspective

In a long term perspective the market for district heating has started to grow. EU's political development according to the Kyoto protocol has given district heating better political terms for the future. The expectation of a higher electricity price in a long term perspective will probably lead to a growth in power heating production. The term power heating is used when the heating resources in a company that produces electricity are used for district heating instead of becoming waste resources. However, as electricity demand increases the need for more electricity could make way for spill heat possibilities as the combined power and heating plants enter the market. Taxes are an important factor for the future outcomes. This is why no more than three per cent of the Swedish electricity comes from power heating companies. In Finland the figure is ten times higher. Though, since January 1st 2004 important Swedish taxes related to power heating were lowered, an action clearly underlining the Swedish government belief in the potential of power heating and its positive attitude towards further development of the area (Rapport Feb 2004, Svensk Fjärrvärme, Westin & Lagergren, 2002).

1.2.6 History of the electricity market

To get a good picture of the structure of district heating of today it is important to understand the recent history of the electricity market. Parallels could be drawn to the district heating market, as in the case of product scope, operations and a future re-regulation. During the time period of 1992 to 1996 the electricity market in Sweden started to change dramatically since the Swedish government decided to open up the former state electricity monopoly for competition. A main principle of the reform was that the electricity companies should clearly separate the areas of electricity operations and grid operations and enforce transparency. The action was taken in order to protect the interests of the consumers by creating good conditions for effective pricing in the electricity market (SOU 2003:115). The effect of the deregulation was that third party companies were able to enter the electricity market with a fair chance of competing since the risk of paying unreasonable high transfer costs to grid operations was eliminated.

Today we can see the same tendencies in the market of district heating. The power structure of the market is very uneven, large powerful companies to a large extent control the different networks that each could be seen as a separate market forming a natural monopoly. There is a discussion of opening the networks to new market actors – third parties – companies that today are not allowed access to the different networks. The question is how it would be done. The electricity reform had the effect of forcing the existing electricity companies to open up their value chains for more competitors as more than 200 companies actively tried to compete for the same customers that a few companies earlier had taken for granted. Existing electricity companies tried to compete with the large amount of new market actors by offering total customer solutions including added electricity service, telephone and internet access as value adding accessory services besides the base product, electricity. Still, despite the strategic intentions of delivering a broader product the results have been modest. (www.sydkraft.se & www.vattenfall.se 2004-04-10) District heating also is a part of a total customer solution, but

it has not until recently been a topic of contemporary research. This is due to the fact that the district heating operations still is an integrated part of the electricity operations. However, today district heating might have reached a turning point regarding this structurally defining issue.

1.2.7 TPA – Third Party Access

A Third Party Access – TPA in the district heating market is a market state where any actor, a third party, that could supply heat also has the opportunity to do so. With a low degree of regulation, as is the case today, grid owners decide who may or may not supply heat through their grids. A re-regulation is when a market state is changed to a higher or lower degree of regulation. A new investigation recommends a higher degree of regulation in the district heating market. It encourages a separation of electricity operations and district heating operations and also that third party companies should get access to the market. The risks of cross-subsidisation and price discrimination are identified as the main reasons for harder regulations. In other words a district heating customer should not risk having to pay for costs that can be referred to the electricity market operations of a company. A higher degree of transparency is required and thus revenues and expenses of each operation should be clearly and easily identified. (SOU 2003:115)

1.3 Problem approach

The electricity market reform started a dynamic process of unbundling forces of the electricity market earlier regulated in a state monopoly. This process not only has reset the prerequisites of the market context, but also awakens a whole set of new interesting questions regarding new possibilities brought about from a gradually more open market for district heating. We see the same unbundling process in the market of district heating. A new form of regulation is probably on its way. As it would be a new regulation of a poorly regulated market we refer to it as a re-regulation. This re-regulation would totally reset the market structure of district heating. There are several conditions changing in the market of district heating that are to be taken into account. The parliament has since the deregulation gradually passed bills enhancing the competition in the energy market and the trend could be characterised by openness towards new market actors, imposing of market opening bills regarding the separation of corporate structure for companies in closely related business areas, and regulation of monopolistic characterised market structures. The aim is to enhance competition and the power of the consumer. One of the market restructuring proposals currently under consideration is the one regarding third party entry into the market of district heating. This proposal is very important, because if realised it would have a rather revolutionising effect on the district heating market, because it would form a new competitive structure on the market of district heating. It is important to understand that there are many different perspectives from which the district heating market could be analysed:

Firstly, there is the macro perspective. Our background research indicates that politicians and several interest groups debate the district heating issue for the moment. Therefore we find it likely that a re-regulation is on its way. Still, as always there is a high degree of uncertainty in how the environmental politics will develop. We might see a dramatic change in the future as EU's influence on Swedish energy politics increases. There is also the question of technology

development. District heating is not very high-tech, however, we can not be sure of the future development in the area of technology.

Secondly, there is the micro perspective. What would the future strategies look like in a re-regulated market? Is the value chain as Porter (1983) introduced a relevant term for understanding of how companies in the district heating market create value? Or is it more terms like creating value through networks and entire systems that companies will adapt?

Thirdly, there is the competitive perspective. Competition is defined as a situation where firms are forced to compete for scarce resources. (Parkin et al, 2000) An important question is what would happen with the market going from a regulated to a re-regulated state. There are different forces contributing to the outcome. On one hand there are the actors who are the current market participants. For these companies a possible entry of new competitors would imply stronger competition. The current market strategies that were formed in a time of less competition and a different market structure with different competitors would have to be adjusted to the new competitive conditions. On the other hand there are the new market participants. A possible new market participant, a third party, would theoretically be any market actor that would have the possibility of connecting to a district heating grid and through this connection contribute with heat to the system. A big challenge for new entrants would be to reset their strategies to wanting to charge for heat that was earlier considered a useless waste product. Furthermore a competitive perspective must address the customer's point of view. Perhaps the entry of third parties would enhance the position of the customers and perhaps prices get lower as competition increases? Another question is whether this would form a new market for traders and distributors of district heating. A possible solution could be that a market would be formed with similarities to the current market for electricity trading and distribution, as it is a similar commodity.

To summarise, a number of questions would be actualised to determine what the future of the district heating market would look like in case of a re-regulation. As we see, there are three different perspectives from which it would be possible to analyse the future outcome of the district heating market. We will not try to answer all of the questions mentioned above but focus on a few, and for us, important ones. These are: Is it possible to identify a number of different scenarios for the future or is it more a question of whether a full third party access will happen? How would the existing market actors be affected and how should the strategies of the old and new market actors change? Will the competition benefit the customers and ultimately result in lower prices? Will a new technology revolutionise the market?

As discussed above it is possible that a re-regulation will not happen to its full extent. It is impossible to predict the future. What is possible, though, is to try to describe what the future would or could look like depending on a number of critical variables. To describe possible scenarios is interesting as such but mainly it is done as a valuable tool for strategic analysis. Our primary purpose is to present a number of relevant and possible scenarios for the future of the district heating market but we have also chosen a secondary purpose. This is based on trying to understand the possible strategic options of the parties in a new competitive environment, different with each identified scenario. Our strategic perspective is therefore to study the actions and possible interactions of current and new market participants of the district heating market in case of a re-regulation or variant thereof. The questions to be studied will be how strategies of these companies would be affected in each scenario and we will try to identify strategies that potentially would give a competitive advantage for both existing parties and potential newcomers on the district heating market.

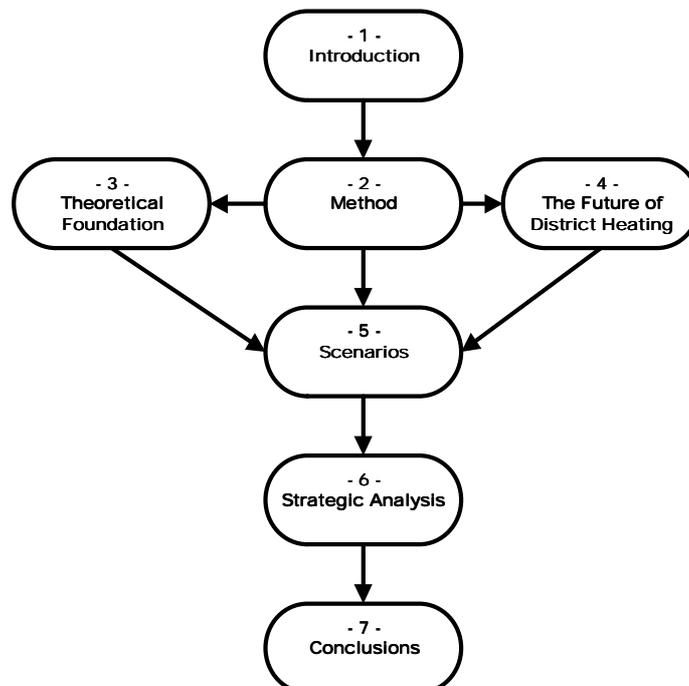
1.4 Purpose

The purpose of the thesis is to describe a few possible future scenarios of the Swedish district heating market of 2015 providing, for each scenario, different competitive contexts for existing and new market actors. In each scenario future strategies for the parties involved will be identified.

1.5 Delimitations

The study is delimited to the Swedish district heating market. The Swedish electricity market will not be studied even though it is presented in the introduction. It is merely presented because it is closely connected to the district heating market and its probable upcoming re-regulation. Variables of the electricity market will only be commented in cases where they substantially add to the analysis of the district heating market. The companies studied are companies currently active on the Swedish district heating market or possible new entrants in case of a re-regulation. Time-wise the study is delimited to the deregulation of the electricity market in 1992 until the outcome of the future scenarios of 2015. The year 2015 is chosen because it is normal to work with a ten year span when using scenarios. Besides we believe it is sufficient time for the changes that we discuss could happen. Theoretically, the focus of the study is based on a business administrative perspective. This entails that our theory and analysis primarily are based on scenario building and strategic management theories.

1.6 Outline



– 2 –

Method

This section presents the thesis' methodology, showing how we have chosen to meet the purpose of the study. The method chapter is divided into three parts. We start by describing our pre-approach. Then, the second section describes the scenario method in general from a theoretical point of view and ends with a description of our preferred scenario method. Finally, we describe the way that we have selected and collected the primary and secondary data. Continuously we reflect over the paths we have chosen and how they might have influenced the results of the thesis.

2.1 Pre-study

Our pre-study consists of two steps – first a pre-study and secondly a problem identifying phase.

Before deciding on exactly what problem area to research, a pre-study was made on a few closely related topics within the electricity market. This pre-study was a part of the Strategic Management master course at the School of Economics and Management at Lund University. Its primary purpose was to investigate how parties of the electricity market differentiated themselves through other products than electricity. Two interviews were conducted with representatives of two Swedish market actors, the communications director at Sydkraft AB (Sydkraft) and the chief press secretary at Vattenfall AB (Vattenfall).

The pre-study contributed with information about the electricity market in general and gave a good view of the development of the market since the deregulation. Furthermore the study gave us a quick overview of the market and its structure, the market actors, their value chains, i.e. the product chain of producers, distribution systems and consumers. During the pre-study we became aware of the fact that district heating seemed to have an interesting potential for a thesis as it is an area where relatively little research is done.

Our problem identifying phase began when we started to discuss which topics that would be potentially interesting to study. We wanted a topic that would have a good potential for further research and possibly could be regarded as a new and exciting application for the parties in the district heating industry. We discussed different areas of interest and tendencies on the electricity market in Sweden together with Professor Claes Svensson and Professor Stefan Yard at the School of Economics and Management at Lund University and Anders

Ydstedt at “Svenskt Näringsliv” (the Confederation of Swedish Enterprise). Mr. Ydstedt is an expert on the electricity market and is currently taking part of the Investigation of District Heating (Fjärrvärmeutredningen) and Mr. Svensson and Mr. Yard are our tutors. Our discussion mainly concluded that a lot of research is done on the electricity market and its development since the deregulation in 1996 and that conducting a new study in the area would entail a considerable risk of recycling old research. What would be interesting, though, would be to investigate the future competitive development of the district heating market.

2.2 Future Studies

2.2.1 Predicting the future

Drucker, the American professor, once wrote that the only thing we definitely can tell about the future is the constant change, the discontinuity (Lundahl & Skärvad, 1999 p. 240). Thus, the future changes constantly and the changes can not easily be identified as the change is not linear. The uncertainty in the modern society, according to Ringland (1998), is the consequence of a complex interaction of forces of various kinds: technological, social, political, economic and environmental. Future studies strive to create frameworks to handle this complexity. Hence, the future is complex and hard to predict although there are several approaches in future studies. The critics to these frameworks state that predictions often are dependent on what the investigator wants to occur. Through our position as not being part of the industry and the fact that we do not operate in it we have tried to take a neutral perspective as observers of the industry. In this way we believe we have minimised this factor more than is common in this kind of future studies. Further criticism towards the methods is the fact that estimations about the future make assumptions based on the present state and historical events (Lundahl & Skärvad, 1999 p. 240). To tackle this problem we have tried to keep an open mind for what is new and not just focusing on the present state (further explanation in 2.3.4 – Analysis method). Moreover it is important to point out that predictions also stimulate debate and that the purpose in future studies not always is the prediction in itself. Even though the future is hard to predict, future studies are used with different purposes by several consulting firms and companies all over the world. Ringland (2003a) determine three important terms that are widely used in future studies:

1. Forecast: a conjunctural estimate, based on present indicators, of the course of events or conditions in the future.
2. Scenarios: a set of logically consistent but distinctly different views of what the future might be.
3. Foresight: a process for developing research policies with a long-term perspective, using networks of knowledge agents who possess improved anticipatory intelligence.

Forecasts bring current trends together and convert them into a single value or range of values for a variable (Ringland, 2003a). Nevertheless, attempts to develop adequate mathematical forecasting equations have failed. The Delphi process, based on joint experts’ opinion, is one forecasting technique that was widely used, but it is not common any more as predictions seldom were accurate (Lundahl & Skärvad, 1999 p. 234-235, 240, Ringland, 1998). However, under particular circumstances, where uncertainty is limited, forecasting methods can be reliable (Ringland, 1998). Forecasts, of costs for example, are especially used for technology development as there is a clear path from the lab to the customer (Ringland, 2003a).

Schwartz argues that scenario methodology is more of an art than a scientific methodology (Schwartz, 1996 p. 27). Scenario methodology has been developed in practice and as a result has not been precisely documented as “a discipline or process” (Chermack et al., 2001). Consequently there is no scientific research that attempt to prove the validity of the different methodologies. Nevertheless, scenario methodology makes it possible to manage uncertainty in a structured way (Ringland, 1998). Scenarios, offer a simple but effective technique of describing and exploring multiple images of what is yet to come (Ringland 2003a). Thus, scenarios provide a broader, more open vision of the future which leaves more freedom for different thoughts. However, humankind’s inclination to structure and create order in the insecure and chaotic is certainly exploited in the scenario technique but that it also makes predictions of the future more difficult, critics’ state. Since the predictions do not cope with discontinuity, predictions about the future can not manage radical changes in the environment. Thus, the psychological limits of the investigator sets limits for what one can predict. (Lundahl & Skärvad, 1999 p. 240) However, Mason (1994) argues that experience is based on past knowledge and may not be carrying new critical information and that one way to tackle this problem is through scenarios.

Foresights are, according to Ringland (2003a), the combination of in-dept investigated forecasts and scenarios, using a wide range of inputs for building of scenarios and the use of business intelligence to observe early indicators.

As our purpose of the thesis is to study the future under a limited time span, the scenario method was considered to be the best option. Since we do not intend to monitor the changes in the environment after the thesis is completed, the foresight method is outside the boundaries of the thesis. However, we are aware that without good forecasts the scenarios will be of limited value (for practical use). Our aim with the scenarios is to provide an understanding of major areas of uncertainty (a theoretical use) – the rest we leave to the companies in the industry. Further, the scenario method was chosen in advantage of the forecast method because of the difficulties involved in predicting one single future. As the aim of the study is to take a broad perspective, including several industry players’ strategic options, we consider multiple images better suited for the strategic analysis. To broaden our psychological limits, which set the span of the images, we have consulted several individuals for feedback and advice (this is explained further later on). This is a way that is done frequently in scenarios and these persons are often referred to as “remarkable people” (Schwartz, 1996, van der Heijden, 1997). However, using multiple images can have influenced the thesis in a negative way creating too many alternatives for future strategic options, which could have resulted in superficial strategic perspectives. Although, we believe there is more to gain in taking a broad perspective as the results should be less vulnerable when more perspectives are considered.

2.2.2 Scenario methodology

Scenario methodology is used for planning and understanding the future in a structured way. More precise, the method describes different possible futures in a single model through various separate scenarios. Scenarios have been defined as “a tool for ordering one’s perceptions about alternative future environments in which one’s decisions might be played out. Alternatively: a set of organised ways for us to dream effectively about our own future” (Schwartz, 1991 p. 4). A scenario creates a holistic picture about the future, which can be at a

specific time or as a developing process for the future (Lundahl & Skärvad, 1999 p. 236). One of these scenarios can be defined as “an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome.” Porter (1985). In this way Porter clearly distinguishes scenarios from forecasting. Further, Chermack (2003) points out the importance between scenario planning and scenario building. “Scenario building is taken to mean the process of constructing the stories themselves, as a component of the larger scenario planning process” (Chermack, 2003).

There are several goals or purposes in scenario methodology. Perhaps the most important goal is to “challenging current paradigms of thinking” (Chermack et al., 2001). Another author, Wack, argues that “Scenarios [for planning] can be successful in structuring uncertainty only when (1) they are based on a sound analysis of reality, and (2) they change the decision maker’s assumptions about how the world works and compel him to change his image of reality.” (Chermack & Merwe 2003). Hence, Wack underlines the use of scenarios as a tool for understanding the world and changing paradigms of thinking. In this way he also stresses the point that the main object of scenarios is not to make accurate predictions about the future. Furthermore, Chermack (2003, p. 9) stresses the effectiveness in terms of usage rather than by predicting through stating that “Research has shown that scenarios are effective because they are highly memorable, conversational, and narrative in nature”. Mason (1994) also emphasize that scenarios can help management to think outside the box and prepare for the future. Scenarios allow companies to challenge all inherited stereotypes and traditions or even the entire way of doing business can be challenged. At its best, scenarios discover new patterns that no one else has yet discovered (Mason, 1994).

A second purpose with scenarios is to prepare management to react quickly; letting management experience upheaval before they occur (Mason, 1994). As the “unthinkable” is investigated the company is prepared when fast decisions are needed or there is a sudden change in the environment.

Another goal in scenario planning is to provide context for future planning. In a broader perspective it can help management avoid taking poor decisions i.e. when a major investment only is profitable in one scenario it can be considered too risky (Mason, 1994). Scenarios can also be used to manipulate forces and potential responses to them in an experimental environment. This process is often referred to as “wind tunnelling” (Chermack, 2003). Finally there is also a school of thought that stresses the use of scenarios to change the industry for the good of all parts (Mason, 1994).

To summarise, scenarios as a method is broadly defined and leaves room for the author to construct and use according to the purpose of the process. Scenarios can have different purposes but the main strength in scenario methodology is to change current paradigms of thinking. Hence, the validity is not as important as in a predictable purpose. This thesis aims at challenge these paradigms as well as providing a context where the strategies of the industry players can be tested. In terms of providing a context for future strategic options, the validity is more of a problem. However, if the future will turn out as described in a scenario, the strategic options identified should be valid. One should though bear in mind; a high degree of deviation from a scenario would imply a low practical meaning in implementing the strategies described in a distinct scenario. When the aim was determined, we looked upon different types of scenarios.

2.2.3 Different types of scenario methods

There are different approaches in scenario methodology that the investigator can choose from. According to Lundahl & Skärvad, both qualitative and quantitative methods can be used although qualitative methods are most commonly used. Yet, there are a few basic criteria common to practically all scenarios. A scenario should be relevant for the purpose of the study and must not be general stories about the future. Further, the scenarios should easily be separated and must be logic as the parts should be internally consistent. Finally, the scenarios should be exciting and interesting but can not be science fiction. (Lundahl & Skärvad 1999, p. 236)

Chermack (2003) argues that although there are several scenario methods, each of them only differs slightly. To further emphasize the similarities, in his article “Scenarios Made Easy”, Mercer (1995) identifies three concepts common to almost all long range forecasting processes:

- Environmental analysis
- Scenario Planning
- Corporate Strategy

In this context Mercer defines forecasting as an overall approach in future studies. Mercer explains this further by stating that “The central part [Scenario Planning] represents the specific techniques which differentiate the scenario forecasting process from the others in long-range planning” (Mercer, 1995 p.82). Even though the different scenario methods are similar, Chermack et al. (2001) identifies three main types as shown below:

- Trend-based scenarios – Seeks current trends in order to predict probable futures. Both qualitative and quantitative methods can be used, or a combination of them. Although qualitative methods are most commonly used as the scenarios serves as complements to quantitative forecasts (Lundahl & Skärvad 1999, p. 237).
- Contrasted scenarios – Explores the extreme outcomes, the worst contra best case. In contrasted scenarios, ignorance will broaden the range of the extreme possibilities (Ringland 1998).
- Normative/horizontal – In normative/horizontal scenarios the company identifies the optimal future, and strives to create this “desirable future” (Lundahl & Skärvad 1999, p. 237).

When we considered different scenario methods, the normative/horizontal methods were quickly excluded. That is because we concluded that a “desirable future” has to connect to a certain perspective i.e. a company, an industry, consumers etc. Further, the aim of the thesis is not to supply material in order to change the future.

Secondly, as the aim of the thesis is to take a broad perspective, including several industry players, contrasted scenarios were not suited for the study. A major reason for that was the fact that worst versus best case also has its standpoint in a certain perspective. One also has to bear in mind the consequences of ignorance in these methods and as we had sparse knowledge of both the district heating industry as well as working with scenarios, it further strengthened our elimination process.

Finally, a trend based approach was identified as the best suited for our purpose. There are several trend based approaches, both qualitative and quantitative ones. A quantitative study is mainly preferred by investigators with deep knowledge of the subject at hand. Moreover, as quantitative approaches in many cases are computer-based we felt that we did not have the right equipment to conduct computer-based investigations. Overall, we felt that we needed more information to conduct a quantitative investigation. Thus, we wanted to use a trend-based method that was based on qualitative investigations. The choice fell upon Schwartz method, which was the method most commonly referred to by the authors in our scenario literature study. We are aware of the fact that it might exist a method that is better suited for our purpose but as we did not find such, we believe Schwartz' method to be well suited for our research.

2.2.4 Schwartz' Scenario method

Scenarios as a strategic tool rather than of more limited academic use were initiated by the oil company Royal Dutch Shell (from now on referred to as 'Shell') in 1971 and Shell has led the world oil industry ever since (Mercer, 1995). Schwartz, a previous worker at Shell, is the creator of the method that we selected for building the scenarios. Schwartz can be seen as a pioneer in scenario development. His process is well documented in contrary to the undisclosed methods used by consultant firms. Schwartz method is a linear process going through several steps, from one to eight, as shown in figure 2.1 (Schwartz, 1996:241ff):

Schwartz method is written for use in a single (unspecified) company and therefore the use of a specific issue is recommended, although not necessary. As the aim of the study is to evaluate possible future strategies for various companies, to choose a specific issue was not possible. However, the issue this thesis is built upon could be said to be; shall the district heating industry be considered beneficial in the future? Therefore, we started by analysing the micro environment as described in Schwartz method. We are aware of the fact that this could have influenced the results in a negative way, making focus unclear. However, the scenarios we have developed could be referred to what Mercer (1995) names "environmental scenarios" or "industry scenarios". The environmental scenarios consider the entire external environment for the whole industry or another way put, the scenarios cover the widest range possible (Mercer, 1995). As this approach is generally used, the absence of a focal issue should be of limited impact on the results.

In section 2.3 we describe the study we have conducted further regarding data collection. In chapter four we further describe the scenario building and scenario logic (step four and five in model) and the scenarios (step six) are presented in chapter five. The implications (step seven) are analysed in chapter six. As this step includes the use of a focal issue, we have deviated slightly from Schwartz method. This was done with the purpose of the study in mind. The aim is simply not to analyse one single decision for a single company; rather, we have concentrated on describing how the focus could be adapted by the companies. Finally we have excluded identifying indicators and signposts (step eight) as the study does not cover the monitoring of the results.

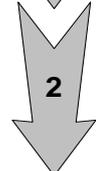
1. Identify focal issue or decision

In scenario development it is best to start from the inside out instead of from the outside in, i.e. to start with a specific decision or issue. Scenarios based on differences in the macro environment may not draw attention to differences that effect individual companies. The most important issues are those of highest impact and uncertainty, the ones that keep one awake at night.



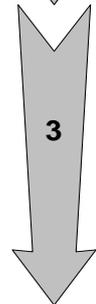
2. Key forces in the local [micro] environment

In this step, the investigator lists the key factors influencing the accomplishment or failure of the issue identified in the first step, i.e. facts about customers, suppliers, competitors etc. Of importance is to find the facts key choices should be based upon. “What will be seen as success or failure and what are the considerations that will shape those outcomes?”



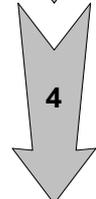
3. Driving forces [in the macro environment]

After the key factors are identified, the process of identifying the driving forces in the macro environment effecting those factors takes place. To be more exact: except for social, economic, political, environmental and technological forces, the forces behind the key factors are of relevance. The level of uncertainty varies among the driving forces, and it is of importance to know what is inevitable and necessary (e.g. demographics) and what is unpredictable. Of relevance is to ask the questions that one would like to know today, in a retro perspective, and investigate what guidance those questions provide at the present time. One example is if the inflation would rise, how would one preferably act today? This, the third step, is the most research demanding step and research could include markets, new technology, political factors, economic forces, trends, trend breaks, etc.



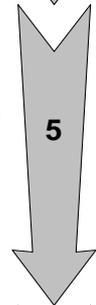
4. Rank by importance and uncertainty

After the driving forces and key factors are identified they are ranked by importance for the success of the focal issue (step one) and the degree of uncertainty surrounding them. This process aims at identifying the two or three factors of most importance and uncertainty. Scenarios are not to differ on predominant elements as they are bound to be in all scenarios.



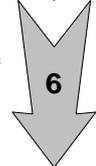
5. Selecting scenario logics

Consequentially, the scenarios will differ along the axes of the two or three forces identified in step four and identifying those axes accurately is of particular importance in the scenario process. The scenarios “must be based on issues basic to the success of the focal decision.” (Schwartz 1996 p. 243) These “scenario drivers”, should be limited to two or three because “only a few scenarios can be developed in detail, or the process dissipates.” (Schwartz 1996 p. 244). When the axes of fundamental uncertainties are identified they can be presented in a spectrum, a matrix or a volume depending on their number. In this model the scenarios are identified but the scenarios are then extended beyond those simple boundaries. “Thus the resulting scenarios may find their core of logic less in the variations of the cells in a matrix and more in the themes and plots of a story”. (Schwartz 1996 p. 244-245). The core of the scenarios is “to identify the plot that best captures the dynamics of the situation and communicates the point effectively” (Schwartz 1996 p. 245).



6. Fleshing out the scenarios

When the scenarios are distinguished, the process of fleshing out the scenarios takes place. This is done by returning to the factors identified in step two and three. In each scenario every key factor is given some attention, but individually managed in the different scenarios. The essence of the scenarios is to reveal such connections.



7. Implications

When the scenarios are done, the company’s implications of the focal issue is evaluated. Strategies are tested in each scenario and if the strategies are poor in several scenarios the risk is very high, especially if the company has no possibilities to change the future outcome. Strategies are, if possible, adapted to survive in several scenarios.



8. Selection of Leading indicators and signposts

In order to evaluate the possible future outcome, it is essential to identify early indicators to monitor the ongoing direction. If the company selects relevant indicators its competitive position strengthens, as the company can easier pick up trends that will reveal the future scenario.

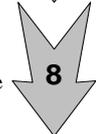


Figure 2.1 – Overview of Schwartz method

2.2.5 Number of scenarios and the time horizon

In scenario building the investigator has to make a decision in terms of number of scenarios that will be used. Too few scenarios tend to capture a too narrow image of possible futures. As the purpose of scenarios is to capture a broader perspective more scenarios makes it more complete. However, too many scenarios are not recommendable either. If too many scenarios are used the purpose can be lost e.g. when they are too many to memorise. The number of scenarios is thus dependant on the purpose of the process.

The number of scenarios, the different perspectives used, is thus dealt with differently considering scenario method and the authors' personal experiences. As an example, van der Heijden (1997) recommends the use of not more than five but more than two scenarios. Wack (1985) however, argues that there should not be more than three, one surprise-free view and two scenarios based on crucial uncertainties. According to Schwartz there are several approaches in selecting scenario drivers and thereby the number of scenarios: a spectrum (two or more), a matrix (four or more) or a volume (eight or more). However, both Ringland (1998) and Schwartz (1996) advocate the use of four scenarios. Finally Skärvad & Lundahl (1999 p. 236) writes that for pedagogical reasons the use of three to four scenarios, are the best option.

When we considered different alternatives for scenarios we concluded that we should consider constructing only a few as recommended by the authors. Further we discussed different variables in terms of uncertainty in order to select the scenario drivers according to Schwartz method. As a result we chose to use a matrix creating four scenarios, which also appeared to be the most commonly used approach.

According to Chermack et al. (2001) the scenarios are not bound to be fixed in time. However there must be a suitable time span. Scenarios regarding short time investments are normally built up on a five year time span while academic scenarios can be stretched to 40 years. We chose to set the time horizon to approximately ten years. This was considered a suitable time horizon due to the fact that people tend to have a more open mind when the time span is longer than five years (Ringland 2003b). A reason is humankind's tendency to focus on current trends in a shorter outlook but it is more open to what is new in a longer perspective. Further, to stretch the time horizon more would probably conflict with the purpose of the study. If a more distant future is considered the defensive mechanisms of the management of the companies involved could be too high and the strategic options might be obsolete i.e. as new theories emerge. Finally, the ten year horizon seems to be the most commonly used.

2.3 Data collection

2.3.1 Primary data

Whether a source is a primary source depends on the participation of the researcher in the process of collecting raw data. Primary sources are sources collected by the researcher himself, (Andersen, 1998 p. 150). The connotation of a primary source is also dependent of the distance of the source to the researcher.

2.3.1.1 Interviews

There are several techniques for collecting primary sources. This could be done through e.g. inquiries, personal interviews or experiments. There are different factors used to categorise the situation of collecting primary sources. One is the degree of standardisation which identifies to what extent the different respondents are going through the same questioning procedure. Another factor taken into account is the structural degree which refers to how much the interviewer is able to set the direction of the interview. This could be realised through having the topics set or conducting the interview or questioning in a special order (Andersen, 1998 p. 152). We have conducted several semi-standardised interviews with semi-structured answers. A semi-standardised interview was necessary because of our explorative purpose and to ask questions without the possibility of complementary questions was considered a disadvantage. The interview questions were formulated in advance but the interviewees were not 100 per cent bounded to any pre-made answering alternatives. That means that the questions were formulated in advance but that the interviewees were free to answer them in the way they considered to be the best. We chose the semi-structured interview because we wanted the interviewees to answer our questions in terms of different scenarios for the future. To let the interviewees speak freely was therefore impossible. The questions were not exposed to the interviewees in advance although all interviewees were informed of what the interview was about in general terms.

The interviews have been conducted in two different ways. Including both the first and second round of interviews - four were carried out by personal visits and sixteen were done by telephone. We do not believe that conducting the interviews in two different ways had any negative validity effect because all the interviews were taped. Still the personal interviews were initially preferred by us but since the study is nation-wide the distances were too long to visit all the interviewees in person. Our financial budget and time schedule simply did not allow that. Therefore we chose to also use telephone interviews after acquiring recording equipment to facilitate the telephone interviewing process.

2.3.1.2 Validity and reliability

Two terms that define the overall quality of a thesis are the accuracy of the study and the question if it really measures what it is supposed to measure. These aspects are labelled *validity* and *reliability* which Holme and Solvang (1997. p. 163) define as follows: The reliability depends on how the surveys are carried through and how accurate we are in our revision of the information, that is, is our information trustworthy? The validity depends on if we measure what is intended to measure and if the results are related to the purpose of the study.

We are aware of the risk with leading questions based on the interviewer's way of questioning and his frame of reference. The fact that we have taped all personal interviews minimises the risk of not realising when that might have happened during the process of transcribing the interviews. All misunderstandings and additional questions were also easily identified because all group members were able to listen to the interviews, if necessary, several times. As mentioned earlier the phone interviews were also recorded but no more than one person was able to do the interviews and therefore there is some subjectivity involved in the conduction of our phone interviews. We have dealt with this fact by, without hesitation, contacting our phone interviewees if any doubtfulness arises regarding the interpretation of the information attained. We have used email contact mainly for complementary purpose when we felt that there were some questions unanswered or poorly described in the interviews

but also to prepare our interviewees that we were going to contact them. We do not think this has had any negative effect on the validity of this study but merely considered an advantage that the interviewee had a chance to think about some of the relevant topics before they were confronted.

2.3.1.3 Selection of the interviewees

The selection of interviewees was done in three separate stages. First stage was to prepare us for topics and questions of the upcoming interview process. Second stage was a selection of an expert group. The third stage was a selection of the people relevant for answering our strategic questions

In the first step, the pre-study, the aim was to collect interesting parameters for creating a foundation for relevant interview topics for our expert group, regarding future scenarios on the district heating market. The interviewees of the pre-study were companies operating in the industry but also from companies that Mr. Ydstedt identified as potential new entries. Of course the interviews were not bound to these parameters only, therefore the initial contact with the companies should mainly be considered as a source of inspiration to identify relevant topics for upcoming interview questions. Secondly it was also a quick source for further understanding of the district heating industry before conducting the interviews.

We selected the companies operating in the industry (see table 2.1) because of their position in the electricity and district heating market. Sydkraft, Vattenfall and Birka Energi together have more than 70 percent of the market and cannot be excluded. Lunds Energi is a smaller local party geographically convenient for us to visit personally. Dalkia and Sysav are possible new entrants which might provide us with other perspectives than the existing parties. The final aspect of the first part of the initial selection process was contacting the municipal interest group (Svekom) for further inspiration and for attaining yet another perspective on the district heating market.

Company	Type of company
Sydkraft AB	Energy Company
Vattenfall AB	Energy Company
Fortum (Birka Energi)	Energy Company
Lunds Energi	Energy Company
Dalkia (Vivendi)	Service Company
Sysav	Waste heat supplier
Svekom	Municipal interest group

Table 2.1 – Companies selected at the first stage

In step two, the selection of an expert group, we categorised people into four main sources of interest groups in order to fulfil the purpose. First, we wanted to hear the beliefs of the future from the current market actors as well as from the potential new players. A technical expert's opinion and to understand the theoretical limitations of the district heating technology, were also considered important. Finally, the authorities that regulate the industry were chosen for the study. To reach a high validity the group of experts were selected from an existing expert group currently conducting the District Heating Investigation. This group represents a good interface of district heating interested parties with representatives of different market actors,

political forces, power intense industry, leading research on the field, network controlling companies and final consumers. These are: the ministry of industry, the ministry of finance, the ministry of environment, the ministry of agriculture, the State Authority of Energy, the Chalmer’s Institute of Technology, HSB, “Villaägarnas riksförbund” (the National Association of owners of private houses), “Konkurrensverket” (the Swedish Competition Authority), Svekom, and “Fjärrvärmeföreningen” (the Association of District Heating).

#	Types of Interviewees:
1	Existing industry players interest organisation
2	Consumer interest organisations
3	Potential newcomers interest organisation
4	Technology expert
5	Regulating authorities

Table 2.2 – The different types of interviewees of the expert group

The only interest organisation identified was “Fjärrvärmeföreningen” (The district heating association) and was therefore selected for the study. As of consumer interest organisations we identified three major organisations: “Villaägarna” (the private house owners), “SABO-Sveriges allmännyttiga bostadsföretag” (Sweden’s public utility home owners), and “fastighetsägarna” (The property holders). Because the organisations, in general terms are representing a homogenous group, only two were chosen for this study since we wanted to limit the number of interviews needed. The choice fell on “SABO” and “Fastighetsägarna” as these represent larger end customers and hence, we assume, have a larger potential for bigger and more standardised district heating systems. Regarding the technology and research aspects a professor with expertise knowledge in district heating of Chalmer’s Institute of Technology, Dr. Sven Werner was interviewed. Dr. Werner has a doctorate degree in district heating. Only one expert on technology was interviewed since the thesis has more a future scenario and strategic possibility aim than a technological one. As of regulating authorities there were many representatives in the group to choose from and it was not realistic to investigate all different government opinions. Instead, in this category the interviewees were selected from different ministries that had the closest relation to the topic.

In step three, the strategy interviews, the interviewed companies were contacted once again. To be specific we interviewed Sydkraft, Vattenfall, Fortum, Dalkia, Sysav, Lunds Energi and finally Mr. Anders Ydstedt once again. The purpose was not to test the scenarios as much as it was to get input regarding possible strategic options in each scenario. It is very important to understand that these interviews were confidential. Strategic possible options are sensitive material for companies to reveal and we were under no circumstances allowed to publish any comments. Therefore the reader will find that the data from the strategy interviews are not summarised in one chapter as for instance the interviews done for the scenario building process. Instead we have chosen to integrate our interviewee’s perspectives anonymously in the strategic analysis with our reflections. Thus we have not been able to follow the traditional research approach but we do not feel that the integrity of the study has been disturbed by this fact.

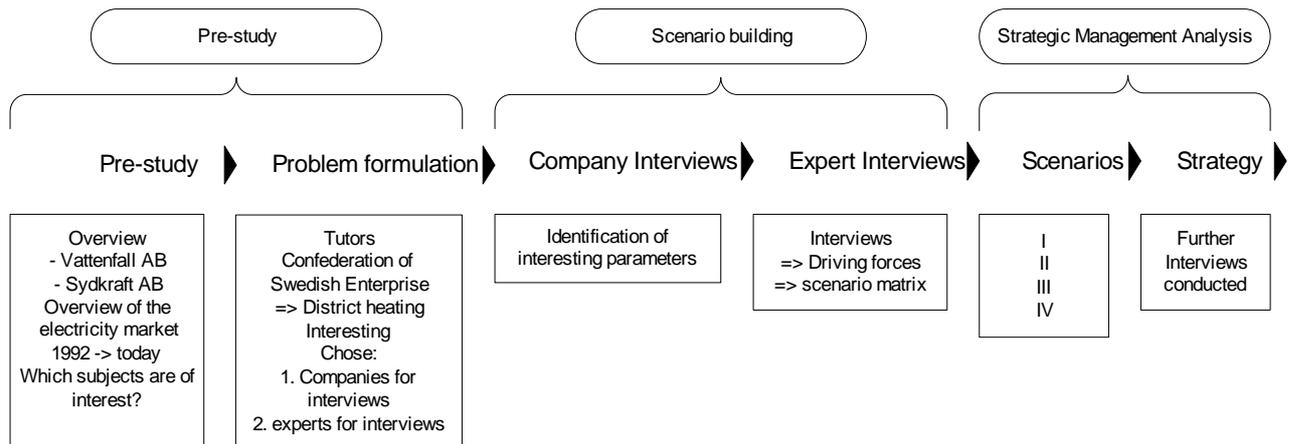


Figure 2.2 – An overview of our method

2.3.2 Secondary data

Secondary sources are information that others have collected, i.e. documented data which has not been collected to fulfil the purpose of our study (Lundahl/Skärvad 1999, p 52).

To create interesting and plausible scenarios a wide variety of relevant secondary data should be collected. Our secondary data consists of newspaper articles from for instance DN, Ny Teknik and Sydsvenska Dagbladet. It also consists of reports found on the Internet from relevant authorities and organisations as for instance Swedish District Heating (*Svensk fjärrvärme*) and Swedish Energy (*Svensk Energi*). Furthermore several homepages and annual reports of current active parties in the district heating market have been studied. These secondary sources were collected to get a complete understanding of the background of the electricity and district heating market. They were also needed to understand the contemporary issues on the market and to get a picture of what to expect of the future. The secondary data was furthermore very useful for us in creating our interview questions.

We are aware of the fact that data often has a political agenda or in other ways personal motives connected to it. Our awareness of this fact has in our opinion helped us to critically go through data and seek different perspectives on the same material – this means that we do not just evaluate the perspectives that back up the writer’s or our own personal assumptions.

2.3.3 Choice of theory

Our theory selection primarily consists of books, scientific journals and newspaper articles. The selection of the books as well as the articles from the scientific journals is based on what we consider to be relevant theory. The choice of theory is based on what would be relevant to meet the purpose of the thesis, to support the interview method and the structuring and analyse of the primary sources.

Our theories are chosen both for the reader to be able to understand relevant aspects of our scenarios and also to support us in the development process of the scenarios. The theories

were attained by reviewing recent contemporary scientific articles through Electronic Library Information Navigator in Lund (ELIN), by studying masters thesis published in Lund about the electricity market and through a dialogue with our tutors. The scenario relevant theory is divided into two sections.

Firstly, we have chosen macro economic theories as regulation theories, market imperfections (monopoly and oligopoly) as well as the paradigm of the political equilibrium. Macro theories on a technology and social level were not chosen in order to keep a business administration focus in the study. Mainly the macro theories have been chosen from “Economics” written by Parkin et al. (1998) who provide a good overview of relevant macro perspectives on an introductory level for business administration students. Furthermore other researchers as for instance Dyrner & Larsen (2001) and Lindblom & Andersson (1998) have contributed to the discussion.

Secondly, we have chosen micro economic theories. These are important for the understanding of both the development of the scenarios but also to prepare the reader for some of the terms discussed in the strategic management theory and further on in the analysis of the strategic options. Changes in the value chain, vertical as well as horizontal in order to create synergy effects is basics in business administration theory and must not be forgotten. Porter (1983) and Normann (2001) are also discussed as new perspectives on the value chain are reflected upon in some of our scenarios but also because a value chain discussion is presented in the strategic analysis. Hagel and Singer’s (1999) theory has also been chosen and in addition, Grant’s discussion on how to structure the organisation effectively was added – mainly for the reader to understand ineffective value chains and how these could be improved.

The third theoretical perspective is based on strategic management theories. The theories were chosen in spite of their close connection to the market of Information and Communication Technology (ICT). We acknowledge possible criticism toward our choices of not focusing more on traditionally competitive theories as the ones of Porter and Grant. However we still believe that the contemporary and challenging perspectives of our chosen theories make them relevant and our intention has been not to recycle old research. We consider the central aspects of the theories used to go far beyond the ICT markets. Some ICT theories are only relevant in an ICT context and therefore we have chosen only a few of the theories that in our opinion fit well with the market of district heating. The strategic management theories as Amit & Zott (2001) and Hax & Wilde (2001) were originally thought of to use in the part of our analysis covering future strategic options. However, it turned out that we also could use strategic management theories in the analysis of the scenarios. One example is the article by Hax & Wilde (2001) introduction of compatibility and complementary theories.

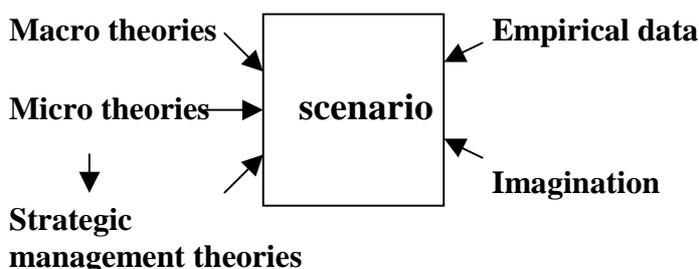


Figure 2.3 – The functions of the theories in scenario building

2.3.4 Analysis method

The analysis can be divided into two parts. One part is the scenario building process and the other is the strategic analysis. The scenario building analysis is done in line with how Schwartz suggests it should be done – with a few modifications of the model that we found would better suit our case. The main reason for refining the method to our study is based on the fact that Schwarz's method primarily is written for one specific company when we are creating scenarios for a whole industry. We do not think that this will have any negative effects on our scenarios which we also have described under Schwartz' scenario method in 2.2.4.

A major difficulty was to decide the relevant parameters for the scenarios. Initially this was done by making a plot over importance and uncertainty (see figure 4.1). The parameters were identified by our experts and rated concerning importance for the future development of district heating. The uncertainty of the variables was not discussed during the interviews which meant that we either had to contact the experts again or make the analysis ourselves. Due to a short time schedule we chose to discuss and evaluate the degree of uncertainty among ourselves and position the variables on the uncertainty axis. When this was done we were able to identify which variables that were the most important and uncertain. In line with Schwartz scenario theory the most uncertain and important variables are the ones that should represent the horizontal and vertical axes forming the foundation of our scenarios. The variables in the upper right corner of figure 4.1 (competitive industry structure and relative price) were the ones considered being the most important most uncertain ones. After having discussed the variables with our tutors and Mr. Ydstedt to exclude any possible correlation between the variables we concluded that no such relation existed and the variables were considered forming a good scenario base.

The next step was to create interesting scenarios without violating the realism adequate to an academic thesis. We decided based on Schwartz method that the realism is important but that it is definitely okay to push it a bit to get interesting scenarios. Examples are weather changes, extensive nuclear popularity and terrorism. These scenario ingredients are not discussed with our experts but created by the authors. They derive from influences of contemporary media and imaginary ideas of the authors. Imagination is in both Schwartz and the authors' opinion very important to reach beyond mental boundaries. The interpretation of the scenarios should therefore be relatively loose. We recommend the scenarios to be perceived only as indicators of possible future events that could happen eventually – at least to some degree.

In the final moment a difficulty was to decide which variables to place in each scenario, which ones that should be represented in several scenarios and to what extent they that should differ from each other in each scenario. Furthermore it was difficult to establish which variables that should not be mentioned at all. Our solution was to initially list the variables available to us in the scenario building process from our empirical study, our theoretical study and our qualified imaginative perspectives from contemporary media. The second step was to identify possible correlating variables with our chosen scenario axes. When using the Nuclear Society, as an example, obvious variables to include were for instance liberal politics and increased negotiation power for suppliers. These variables correlated in our and our experts' opinion with a full TPA scenario. Other variables like transparency and times of prosperity are to some degree correlated with the other axis – which is the price on district heating compared with substitutes. In fact all four scenarios could be built on shifting degrees of these four variables mentioned but in our opinion nothing interesting would then have been

accomplished. Therefore at least one extra external variable has been added to each scenario. In the Nuclear Society it is the use of nuclear waste heat, in the others it is weather changes, surprising politics, unexpected demographics development and terror attacks. These factors are the spice of the scenarios and subjectively chosen and inserted where we felt they were suitable to create coherent scenarios. They have very little connection to our theory or empirical study but strongly correlates with our imagination and influence from media. When it comes to choosing the names of the scenarios it was important to present an instant imagination of the scenario and also the name should amplify the distinguished character of each scenario.

The other part of our analysis was identifying strategic options for currently present market actors and new entrants after a re-regulation. As mentioned when describing the choice of theory our strategic theories were initially meant for analysing and debating issues in markets concerning Information and Communication Technologies. Keeping this fact in mind during the analysis has been important for us. We have dealt with this fact by frequently exemplifying our arguments so the reader knows exactly how we perceived the theory and is therefore free to interpret the analysis differently. Besides that our limitations in the analysis are the following: The strategic analysis consists of identifying possible strategic options for companies currently active in the district heating market - mainly the ones in the production division. We will also analyse the strategic options for the new entrants – that is those who might enter the market in case of a re-regulation. We have chosen not to focus on the customers' perspective and neither have we chosen to reflect significantly about the grid operators' strategic options. Data from the second round of interviews are integrated with our reflections due to internal company information. Other perspectives in the analysis come from our chosen theories connected to strategic management.

Finally there was the problem of deciding which theory that should be applied to which scenario. D'Aveni, and Day were obvious because they relate to a full TPA. In fact, all theories could have given different perspectives to each scenario resulting in a larger amount of strategic options under each scenario. That, however, was not considered being a good option and we therefore chose to concentrate on the theories that we found the most appropriate to each scenario. The advantages were that the different strategic options were presented in a way that was easier to grasp compared with a larger amount of strategic options. On the other hand, some alternatives that might have been relevant are not mentioned because not all theories were ventilated in all scenarios.

2.4 Reflections

It is very difficult to realise when enough relevant information is gathered to meet the purpose of a study. When we felt that we thoroughly had gone through a substantial amount of literature and our chosen articles and books started to refer almost only to one another we decided that we had the information needed. This means that the risk of not revised relevant literature is minimised but nevertheless it still exists. Theories and models about the future are merely assumptions and educated guesses since in reality nobody can predict the future. With this in mind we propose that the likelihood of success in predicting future events depends on how thoroughly the research is conducted. We try to improve the validity of the thesis by revising only what we have found being interesting and relevant theories, as mentioned in our choice of theory rather than covering as many theories as possible.

– 3 –

Theoretical foundation

This section presents the theoretical framework. Macro economic variables as deregulation theory and market imperfections as well as micro economic variables as changes in the value chain in order to gain synergy effects will be discussed. The introduction of both macro- and micro-economic variables is necessary to understand what the parameters in our future scenarios consist of, but also to grasp how the scenarios differ from each other in terms of possibilities and threats for the district heating parties. Furthermore strategic management theories will be identified and discussed in order to provide the reader with a good understanding of what possible competitive options there are, when being a part of a re-regulated industry. The theories have also been a source of inspiration for development of the scenarios.

3.1 Macro economic variables

3.1.1 Deregulation or re-regulation

A regulation consists of rules administered by a government agency. These rules determine price, product standards and the conditions for which new parties may enter an industry. A deregulation on the other hand is the process of removing restrictions on prices, product standards and entry conditions (Parkin et al. 1998 p. 455). Is then a deregulation the opposite of a regulation? The answer is yes and no (Reger et al, 1992). A deregulation can have different kinds of impacts on the market and that is one of our main reasons to develop different scenarios for the future. An industry's regulatory status is normally characterised as either deregulated or regulated but actually neither characterisation is accurate. Regulatory policy has a multidimensional aspect, for instance a company can have a strong regulation policy concerning employees' health and safety but when it comes to product pricing, there are no regulatory restrictions. These different parameters clearly exemplifies that a firm can be deregulated in one sphere and regulated in another (Winston, 1993). The result of deregulation is an increase in the importance of managerial functions of the firm. There are fewer incentives for developing low-cost methods of production when the prices are regulated. Furthermore a price regulation discourages firms to develop innovative pricing and distribution strategies. A deregulation results in operational changes designed to lower costs and to enhance the firm's competitiveness. It also results in an increase of mergers and

acquisitions in attempts to achieve synergies through cost savings and increased revenue. (Kole & Lehn, 1997)

3.1.2 Market imperfections

One variety of an imperfect market is a monopoly. A pure monopoly is when a single firm in an industry produces a product for which there are no substitutes. Furthermore a pure monopoly is characterised by significant entry barriers which prevent other firms from entering the industry. Another kind of imperfect market is an oligopoly. It could be described as an industry dominated by a few firms large enough to influence the market price. The behaviour of one firm in an oligopoly depends on the behaviour of the other firms (Case et al. through Parkin, 1998). These are the basic definitions of market imperfections but there are several subcategories like public and natural monopolies that also must be taken into account.

Public monopoly – In a monopoly the state which means that the customers influence is minimal as compared to within a deregulated market. Here the conditions are based on the customer preferences. A public monopoly is therefore characterised by lack of incentives to become economically efficient. Companies operating under a state monopoly therefore pursue goals other than financial efficiency. Political objectives such as growth, service and employment are common. If the customers had a choice whether they wanted to support the company's objectives by buying its products everything would be in order but the customers of the industry are forced to pay the price. (Dyner & Larsen, 2001) That is because it is almost impossible not to choose to consume the product (i.e. water, electricity and alcohol).

The public monopoly is characterised by price stability. Prices are otherwise strongly connected to a high degree of uncertainty and dependent on supply and demand. Several investigations have shown that prices after a deregulation have started to fluctuate according to season and weather conditions. A public monopoly also creates an environment of sharing information since there is no risk for competitors exploiting the information. In a deregulated market the risk is substantial and hence information sharing is minimised. (Dyner & Larsen, 2001)

Natural monopoly – When the cost structure of an industry is characterised by high fixed costs and low variable costs the industry can often be characterised as a natural monopoly (Lindblom & Andersson, 1998). Grid operations for long-distance transmission as well as local distribution of electricity are good examples. The district heating grid is another one. These industries have in many countries been state owned or strongly regulated in order to utilise the scale economy in the interest of society (Lindblom & Andersson, 1998). In other words it is illegal to build another set of power lines in order to compete with the existing ones from an environmental point of view. Hence a re-regulation does not threaten the grid operations – they continue to act in a protected but regulated environment according to the fact that they are natural monopolies. However the process of price-setting is regulated which minimises the motivation for the grid operators to maintain and improve their product.

3.1.3 Political equilibrium

A political equilibrium is not the same thing as everyone being in agreement. On one side there are parties that devote resources to trying to change existing regulations and on the other

are parties devoting resources at maintaining existing regulations. To describe a political equilibrium it is necessary to understand whether the regulation serves the public interest or the interest of the producer (Parkin, 1998 p. 455).

A traditional view of regulation theory is that a regulation serves the public interest. Normally a deregulation corrects a market failure or a natural monopoly which would improve the social economic welfare. This theory, unfortunately, is based on a perfect information assumption and the premise of the regulative parties maximising social welfare. The theory's strongest critics focus on the fact that firm behaviour has changed towards an anti social economic welfare view and that a deregulation in fact in several examples has created, not eliminated inconsistencies. (Winston, 1993) What Winston refers to is for example markets similar to the district heating market in Sweden. Deregulating the already loose regulation structure would reinforce market imperfections instead of creating fair conditions. The Capture theory is based on the belief that regulations are supplied to satisfy the demand of the producers. Furthermore it states that the political system delivers regulation that serves the interest of the politicians. The politicians cannot satisfy both consumers and producers why they choose to support the group that offer the politicians the biggest return. This is the basics of the equilibrium perspective. The more votes or political contributions either group can offer the politicians the more influence they gain in the regulation process. (Parkin et al, 1998, p. 456)

3.2 Micro economic variables

3.2.1 Changes in the value chain

A change in the competitive conditions for parties in an industry as for instance a re-regulation normally results in various new strategic opportunities corresponding and responses. The strategic opportunities will be discussed later but first we focus on some of the possible responses or changes in a company's value chain when a re-regulation occurs. Consolidation, mergers and acquisitions are normal actions when new conditions arise on a market, all of which can be categorised into four different forms of integration. These are vertical, horizontal, concentric and conglomerate integration that all have several subcategories.

A *concentric integration* is a merger between firms that have very similar products or distributional technologies. A *conglomerate integration* is a merger between two firms that have no buyer-seller relationship or technical and distributional relationship, neither do they deal with identical products (Barney & Gordon, 1990). However the forms of integration really relevant to our case are vertical and horizontal integration why those terms here will have a more thorough presentation.

Vertical integration is a merger between two firms where a buyer-seller relationship exists or could have existed. The most important characteristic of a vertical integration process is the companies' relationship to each other and how dependent they are of each other in the value chain (Barney & Gordon, 1990). Co-ordination of research and development, common distributions logics and shared image are some advantages with being vertically integrated (Brush, 1996). Porter (1983) discusses additional advantages with vertical integration and

divides the term into forward and backward integration. One advantage of forward integration is increased opportunities to differentiate the product because it is possible to control how the product is distributed or sold. Furthermore it is easier to access market information which increases the company's effectiveness. The possibility of getting a higher price is not to be forgotten since it is easier to adapt the price to the elasticity of product demand. Backward integration on the other hand saves the company from sharing valuable information with their suppliers. The threat of a supplier evolving as a competitor thereby is minimised. Increased differentiation possibilities are also considered an advantage of backward integration. To control the production process of the supplier gives additional opportunities for customising the process and finally developing components that others do not yet have. (Grant, 2002 p. 393) Grant though underlines several disadvantages of being vertically integrated even though transaction costs have been reduced as this brings about new costs of administration. Typical examples are the difficulties of encouraging employees to work for maximising profits when the actual owner is another market actor. Ownership of strategically different businesses requires very different approaches which is very time-consuming to co-ordinate. (Grant, 2002 p. 398)

Horizontal integration – This is a merger between firms that have identical products and are operating in the same or different markets (Barney & Gordon, 1990). The firms consolidate into the same part of the value chain. A horizontal merger normally reduces competition by sinking the number of firms competing in the market. Besides, the prospect of lowering costs by reallocating production can also reinforce the stimulus to merge. Therefore it is important to acknowledge that many economics are sceptic about the positive effects of horizontal mergers (Levin, 1990).

The main reason for integrating both vertically and horizontally is to gain synergy. Ansoff (1987) defines that an effect is called a synergy when the combined return on the firm's resources are greater than the sum of its parts i.e. $2+2 = 5$. Synergies can according to Ansoff be divided into four categories and often more than one of the effects occur after an integration. One is called *sales synergy*, occurring when the companies' products use common distribution channels or common sales administration. Another is *operating synergy* which is when higher utilisation of facilities and personal occurs. Also there is *investment synergy* which results from for instance a common technology base, joint use of a plant or common machinery. Finally there is *management synergy*. When different types of strategic, organisational and operating problems occur a combined management group could provide effective and competent guidance. All synergetic effects can according to Ansoff be categorised into one of three variables. These are; *increased volume of dollar revenue to the firm from sales*, *decreased operating costs*, and *decreased investment requirements*. All three variables must be viewed in the perspective of time. (Ansoff, 1987 p. 79-88) Which synergies that are attainable and which synergy variables a company wants to improve must be evaluated in the strategic discussion before progressing with a possible integration.

3.2.2 Traditional perspective on the value chain

Traditionally it was Ansoff's and the Boston Consulting Group, BCG's differentiating and portfolio business models that were dominating in the business administration research in the 1960's but due to the models age and lack of relevance we will not give them further attention here. In the 1980's when Porter introduced the term value chain a new and still relevant business model was invented. Porter clearly states that a company's position in the value

chain can be threatened by not only competitors but also by parties with alternative technology, the suppliers, the customers and new parties. Together these five forces decide the intensity of the industry’s competitive environment. Profits and those forces with the strongest impact are crucial when the firm’s strategy is to be developed. Basically a value chain is characterised by the flow of physical material moves in one direction through different levels where value is added at every level (Porter, 1983 p. 26, Normann 2001, p. 66). The strengths of the model are that it is very easy to visualise and understand the one-way principle and flow of material. One hitch with the model is that the contemporary business world is quite different on several key areas which makes the model somewhat out of date. For instance dematerialised resources like information and capital are not bound to one specific place where value is added. Information can be almost anywhere at every time and this, in fact means that the traditional view of value chains has been reconfigured. The often very complex and multidimensional modern business systems cannot be captured by this old frame of reference. Today’s market focuses on who can be most creative and positioning themselves through new and exiting solutions (Normann, 2001 p. 67).

3.2.3 Normann’s perspective on the value chain

Normann (2001) establishes an interesting chain of thought based on his value creation system perspective. In times where most research underlines the importance of focusing on a companies core competencies, Normann suggests another approach. A company should not focus on traditional value creating through product or production optimisation but by co-ordinating resources in a value creation system. The key factor is the mobilisation of new competencies and changing one’s focus to an understanding of the customer.

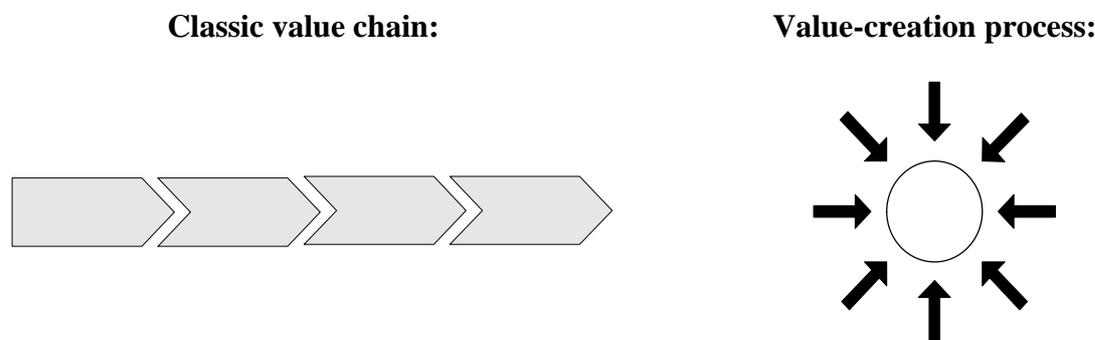


Figure 3.1 – From value chain to value creation (Normann, 2001 p. 94).

The value star shows how different parties contribute to the customer’s value creation process. The essence in Norman’s idea is to realise the vision and understanding of the customer’s network. This means to understand that one company’s product or service is just a part of the customer’s network - the customer’s value creation system. The value creation system is the customer’s entire business system and consists of more than just products and services. It also includes other economic functions in the field of finance and marketing. Therefore it is important to understand that focus should not lie on what one company can gain from trading with another in terms of profit per customer but to improve how much one’s customers gain from the other company’s customers. A focus on the customer’s relationship to their customers will eventually improve the first company’s customer relationship. (Normann, 2001, p. 88-104).

3.2.4 Rethinking traditional roles and identities

Hagel and Singer's (1999) main point is that if there for any reason are changes in the structure of the interaction costs it can cause entire industries to reorganise dramatically. A re-regulation is in our opinion an example of a dramatic change where it might be necessary for the companies to rethink their traditional roles and identities. Hagel and Singer expand the term transactions costs to interaction costs to emphasise how the cost term of money and time is expanded to also include costs deriving from interactions but otherwise the terms are basically the same. Transaction costs are the costs referred to searching for information, reaching an agreement and ensuring that the terms of the agreement are fulfilled (Parkin et al, 1998 p. 56).

The traditional competitive advantages of size, reputation and integration have begun to fade a bit. Individual factors as creativity, speed and flexibility belonging to the specialist on the other hand have begun to rise. Changes have demanded a re-organisation and one way is to rethink the traditional organisation. Hagel and Singer (1999) propose that one company consists of an integration of three core processes:

- *Customer Relationship* – identifying, attracting and building relationships with customers. The customer should be treated as an individual through economies of scope.
- *Product Innovation* – the process of creating innovative and attractive products. Speed is in focus.
- *Infrastructure Management* – building and managing facilities for high-volume, repetitive and operational tasks.

An integrated business has limits. The three core processes conflict with each other in the way that they force management to compromise the performance of each process. An obvious example is the conflict between *Customer Relationship* and *Product Innovation*. To provide customers with a large amount of possibilities - economies of scope, is in contrast with *Product Innovation* which mainly focuses on speed and timing. This contrast often results in outsourcing, enabling the company to meet the broad customer demand but still being able to focus on the core processes in which the company is highly competitive. Instead of outsourcing, Hagel and Singer propose an unbundling of the corporation. This is carried through in different steps. Initially the integrated company should go through a deconstruction process, and thereafter reconstruct into new forms. For instance the *Customer Relationship* and *Infrastructure Management* division should consolidate into one unit and thereby separating from the *Product Innovation* division. (Hagel & Singer, 1999) Then customers would be able to benefit from service innovations, enhanced quality and price reductions (Li & Whalley, 2002). Once the companies rethink their traditional roles and identities they are able to challenge the former assumptions and thereby preparing them from the hard challenges of the future, challenges that in our case mainly come from a re-regulation.

3.2.5 Capability-based structure and organising for adaptability

As the modern business environment gets more and more complex competition also increases. As mentioned above Hagel and Singer (1999) propose the unbundling process as a survival solution. Survival could be achieved in different ways and companies should according to

Grant (2002) narrow their focus on being able to perform at a higher level as well as broaden their repertoire of capabilities. Keywords are for most companies independence of the industry in which they are active, efficiency, adaptation, low costs, innovation, reliability and consistency. These parameters, at first glance, conflict paradoxically because it seems impossible to design an organisation that can focus on all these conflicting variables simultaneously. Still, two trends have developed on the market – the first design is organisational capability and the second is organising for adaptability (Grant, 2002, p.519).

The fact that a person engages in both exploratory - research oriented, and exploitation - operations oriented activities in the same job is a well known a challenge. What is needed is to effectively deal with this fact and one way to do this is to develop different structures for different tasks. Now many companies have what is called a *parallel learning structure*. One structure focuses on operational tasks that require high levels of specialisation and co-ordination through different rules and routines. Another structure focuses on activities that are oriented towards innovation and adaptation which require lower levels of specialisation and co-ordination. In short conventional unitary structures should be abandoned and team-based, project-based and process-based structures should be further developed. One way to do this is by introducing simplicity in formal systems. That in fact has enhanced more complex patterns of co-ordination, teamwork and adaptability than with the formal system. A complex and dynamic environment should be established by guidelines and directions instead of a formal and detailed plan. A strong identity and good network abilities will definitely help the organisation to adapt quickly to internal and external change. (Grant, 2002, p 520-526)

3.3 Strategic management

3.3.1 Seismic-shift

Day (1997) identifies the effect of a deregulation in a stable and mature industry like the Swedish electricity market monopoly as a seismic-shift syndrome. The metaphor describes the feeling of the disruptive movements of the earth's crust when the tectonic plates shift – hence a seismic-shift. Of course other factors like *globalisation*, a *technological discontinuity* or *the emergence of a competence predator* can trigger a seismic-shift but the deregulation aspect is mainly what is relevant in this context. It strikes industries that for years have been very protected – often through no rivalry and very high profit levels. When a deregulation occurs new entries accelerate both from domestic as well as from foreign competitors. (Day, 1997) A change from a public or a natural monopoly to free competition will in our opinion result in a strong strategic reaction for the existing companies that want to survive. Building scenarios based on an internally consistent picture of the future is according to Day (1997) a necessary prerequisite for survival. The scenarios must address four critical questions:

1. How many companies can the market support in the long run?
2. Which trends are likely to trigger a shakeout?
3. Which competitors – present and prospective – have the power to stay and which are vulnerable?
4. Can the company benefit by accelerating the shakeouts arrival?

Day recommends large existing market parties to integrate horizontally through mergers and acquisitions and thereby act as *aggressive amalgamators*. The effect of absorbing smaller rivals and in addition cutting costs and investing in technologies that increase economies of scale would be the backbone of an effective business model. In other words *fast integration, reduction of costs, aggressive debt financing* and *leadership in offering value-added service* are imperative variables that must be evaluated. An effective business model based on the above mentioned parameters can be difficult to attain for some parties. Those parties have severe risk of being shakeout victims. From a small company's perspective it is essential to seriously consider the alternative of consolidation instead of fighting an almost impossible fight. Though it is vital not to sell out too early but to wait for the right time when the large parties trust their consolidation strategies. That gives smaller parties a better bargaining power. Yet another alternative for smaller companies is to expand their relationships through alliances. This opens a possibility to gain access to capabilities or assets that otherwise would have been too expensive. (Day, 1997)

3.3.2 Lock-in theory

The authors Amit and Zott give a few variables that are a good help in the understanding of the market situation of the existing and possible new actors on the district heating market. Amit and Zott (2001) assess that the value creating potential of a business depends on to what extent its customers are motivated to repeat transactions. Higher motivation is presumed to appear in higher transaction volumes. The extent to which there are incentives from strategic partners to maintain relationships is also a significant value-adding factor. An attractive state for most companies is to create a customer lock-in. Value through lock-in is created when it prevents customers and strategic partners from switching to competitors. The lock-in theory is based on a switching cost logic which means that it is too expensive in terms of money or time consumption to switch from the existing relationship to something else. A lock-in could be created in several ways. Amit and Zott mention loyalty programs initially. An appropriate Swedish example is *ICA customer card* which maintain the relationship between customers and business. Secondly a dominant design standard can be developed which makes the company unique or in some way a market leader. Third, trustful relationships with customers can be established in ways that other companies have not yet been able to do, as for instance a safe and reliable payment system over the internet. (Amit & Zott, 2001)

3.3.3 Complementarities

Another discussion about lock-in is made by Hax and Wilde (2001). They propose that the best way to create value innovation is through having the delta model in mind. The Delta model consists of three dimensions that symbolise three different strategic positions. The first strategy is to offer the best product either by a price advantage or unique features. The second strategy is to provide a total customer solution like Sydkraft and Vattenfall have tried by combining the customer bill for electricity, broadband and phone into one. The third strategy is a system lock-in option. A company's product portfolio should be created with respect of the key complementors. A complementor is a firm whose service or product enhances another firm's services or products. The most obvious example is Microsoft's way of co-operating with its complementors who are providing Microsoft's operative system users with programs and games. Hax and Wilde's (2001) perspective differ from Amit and Zott's (2001) as Hax and Wilde focus on complementary products instead of switching costs. On the other hand

Amit and Zott differentiate between lock-in and complementarities. Complementarities are defined as whenever a bundle of goods provides more value than the total value of having each of the goods. Complementary goods can be divided into vertical complementarities (e.g., after-sale services) and horizontal complementarities (e.g., computer hardware and software). (Amit & Zott, 2001). Therefore it is important to keep in mind that both vertical and horizontal complementarities are possible solutions for the exiting parties of the district heating. Nobody knows if district heating is a profitable product in the future. Perhaps third party entrants establish a need for new products as a consequence of the need for more plumbing or pipes.

3.3.4 The defence of the existing parties – the industrial leaders

Unsuccessful revolutions are not being called failed revolutions but are dismissed as rebellions or riots. Then with this definition in mind - it seems like all revolutions have been successful. A revolution according to D'Aveni (2002) can be understood in terms of a radical change in the shape of a new power structure and a new set of rules. We believe it is reasonable to draw a parallel from what D'Aveni's definition of a revolution is in a hyper competitive market - to what a re-regulation can do to a loosely regulated market. Several re-regulations have probably not occurred simply because they in some way were prevented by powerful forces of the market.

The industry's leading companies' strategic way of defending themselves are according to D'Aveni (2002) categorised in five different strategies depending on how far the revolution process has come.

- *Containment strategies* – are used when the risk of re-regulation is spotted early and it is still possible to prevent it from happening. Companies should try to create a lock-in with their existing customers by raising switching costs. Another strategy is lobbying. Being aware of the political equilibrium must definitely be considered as an advantage
- *Shaping strategies* – are used when the re-regulation cannot be stopped. The leading companies should co-exist and co-operate with the revolutionaries and can for instance take the role of their suppliers. This way an insight in the revolutionaries' process is attained.
- *Absorption strategies* – are used when a re-regulation is likely to succeed and the new companies can be modified to complement your business. Let the revolutionaries get the first-mover advantage and thereby the first-mover risk as well. Focusing on economies of scale is considered profitable. Yet the best option is to act as if the re-regulation process was ones own idea from the beginning.
- *Neutralisation strategies* – are used when it is not possible to contain, shape or absorb the re-regulation or the companies entering the market as an effect of it. Giving away the product for free or continuously improving existing products or technologies are possible strategies.
- *Annulment strategies* – are used when neutralisation is impossible. This is a try to side-step the revolution altogether by shifting the basis for competition by focusing on other business areas. (D'Aveni, 2002)

3.3.5 Prime movers

In an industry a re-regulation can have the same effect as a technological breakthrough. What earlier was impossible is now possible which is exemplified by third party access in a former regulated market. Technological breakthroughs or a re-regulation create new strategies for existing as well as for new market actors. After a rhythm disturbing event (technological breakthrough or a re-regulation) Normann (2001) identified the fact that it turned out to be strategies built on simplicity and speed that were the most successful ones – at least on a short term basis. The transparency in a re-regulated market makes it possible for newcomers to exploit the new opportunities but eventually their success will decline. Existing parties will come back with innovative customer based solutions and win back the leading positions (Normann, 2001 p. 77).

There are three possible ways to act identified by Normann:

1. Selling the company before the deregulation occurs.
2. Selling the company to frighten established parties.
3. Consolidating the position when realising that former success variables are not “sustainable” /going to stay – these variables must be replaced with long term strategies that focus on competencies and customer relationships.

Normann (2001) believes that reconfiguring effects are total company systems – not just individual companies or products. Essential for surviving profitably in the modern economy according to Normann is the creative using of the dematerialised resources and flows instead of focusing on the physical resources. A new technology or a re-regulation create opportunities to break up old structures and replace them with new ones and thereby reorganise the whole value creation process. To restructure old business models effectively requires a new vision about the system of value creation. This is a vision that develops continuously. The results from not just focusing on technological innovations and new products are a radical change in the parties’ roles on the market and the development of new game rules. The companies that manage this process and benefit from these opportunities Norman calls “prime movers”. Boundaries are not what they used to be and prime movers use this as an advantage (Normann, 2001 p. 66-69).

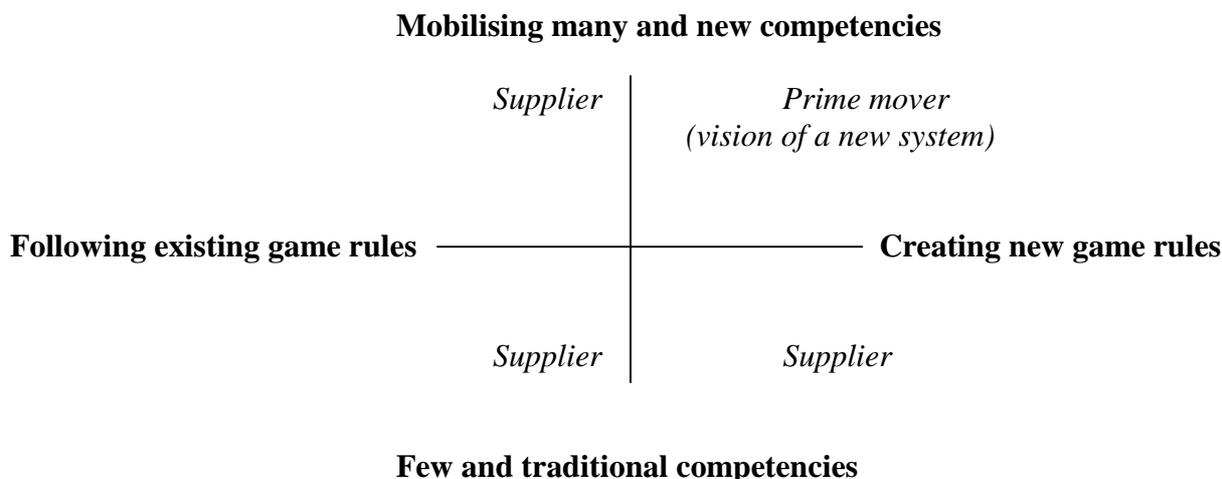


Figure 3.2 – Prime mover. The figure displays how the prime movers are the ones that create new game rules as well as new competencies. (Normann, 2001 p. 88)

3.4 Reflection on the theoretical foundation

The macro theories discussed have provided the reader as well as the thesis' authors with a basic understanding of regulations, market imperfections and political influences. All variables were essential for us to be able to develop future scenarios that are both interesting and plausible. Since the district heating market for the time being is in an imperfect stage and possibly has an upcoming re-regulation on its way we conclude all macro theories chosen as being relevant.

The micro theories discussed have provided the reader and the authors with knowledge concerning a traditional view (Porter, 1983) and a modern view (Normann, 2001) of how a company's value chain could be perceived. The value chain of the companies is a variable discussed in some of the scenarios and an elaboration of the term seemed necessary. To understand the strategic options reflected upon by the authors of the strategic management theories we felt to define vertical and horizontal integration as well as the desired outcome – synergy effects as valuable. The unbundling theory by Hagel and Singer (1999) added an understanding of the advantages of transparency which is an important scenario variable. It is also an analytical tool for identifying strategic options in the scenarios. The capability and adaptability theories mentioned by Grant (2002) could have been placed under the strategic management theories but due to the theories contribution to the understanding of company structures and adaptability we have chosen to keep them in the micro variables section. Capability and adaptability theories have, though, mainly been used for strategic analysis and for developing suggestions in ways to improve companies' value chains.

The strategic management theories provide the reader as well as the thesis' authors with different strategic perspectives and options for competing successfully in the future. Acting aggressively and integrating with new parties according to Day (1997), offering complementary products as a way of keeping the customers in a total customer solution, and lock-in effects according to Hax and Wilde (2001) and Amit and Zott (2001) are good contributions in the strategic management area. D'Aveni (2002) explains what counter-strategies that exist for market leading companies when a market revolution occurs and to understand the prime mover's ways to gain success. These theories are all, in our opinion, bringing relevant strategic perspectives for the actors of the district heating industry describing what to do after a possible re-regulation. We have established several different perspectives on possible ways of responding to an increased competition and all of the above mentioned strategic theories are valuable for us in our final analysis. A thorough understanding of the theoretical strategic management framework is of high importance for the readers' understanding of how we identify competitive options through our analysis of each identified scenario.

– 4 –

The future of district heating

After having spoken to a number of carefully selected individuals, together constituting the thesis' expert group on the subject of district heating we have been able to present a picture of the district heating market of today, the driving forces of an upcoming re-regulation, and important variables shaping the future. There are many factors that need to be taken into consideration and challenging questions to be answered to reach a successful future solution for the society in case of a re-regulation. Here fundamental issues and macro-economic- as well as more market specific variables are discussed in order to present a dynamic view of the future of district heating. Finally the variables are rated and a few are chosen to form a base for the upcoming scenarios.

4.1 The structure of district heating in 2004

4.1.1 Sources for district heating

There are many different sources for district heating. A few of them could be seen as more environmentally sustainable, as they either do not involve combustion, as solar or geothermal heat, or derive from a combustion or nuclear process but are extracted from heat that in other cases would be wasted into surrounding waters or the atmosphere as in the case of waste heat. To get a better picture of the dynamics of district heating in case of a re-regulation we interviewed Dr. Sven Werner at the Chalmers' Institute of Technology. Dr. Werner has many years of experience of district heating and also has a doctorate degree on the very subject. In case of a re-regulation one has to remember that even though there are many different possible sources for district heating, not all sources are to be considered as profitable business choices. Dr. Werner sees five internationally different resources from which money could be generated in a district heating system:

1. *Power heating.* Heat is co-produced with power in power heating plants.
2. *Incineration.* Garbage is incinerated and heat retrieved in the process.
3. *Industrial waste heat.* Heat from industrial processes with high temperatures.
4. *Geothermia.* Geothermal heat is being pumped up from below the ground.
5. *Difficult /rare fuels.* Market actors that burn difficult or rare fuels for example paint or toxic substances. (Interview with Dr. Sven Werner 2004-04-26).

4.1.2 Uneven power positions on the market

Today the power structure on the market of district heating is very uneven. The most powerful companies are the network owners as they are currently the rulers of natural monopolies. The waste heat supplying companies are in a less powerful position as they want to get rid of their waste heat and get a reasonable price. To the new entrants, waste heat is a product of no interest in itself. The final customers also have a quite weak market position.

Göran Lagerstedt, first secretary of the district heating investigation, concludes that regulations are needed to strengthen the customer's position on the market. Other nations already have regulations on this matter and in this sense Sweden is lagging behind. Today the network owner has full rights to set the price. The single buyer system of today is more successful in some places and in others, not so effective. Gothenburg is a good example of where the model has turned out to be efficient. Here, the single buyer system is built up of several heat suppliers from whom the network owner buys heat and sells to the customer. The heat producers are not really that interested in third party access – TPA, rather what they want is just getting a return on all the waste heat they produce (Interview with Mr. Göran Lagerstedt 2004-04-26).

4.1.3 Different forms of ownership

The district heating network in Sweden is built up by many small clusters of district heating networks. In general, these networks are not connected with each other except from in the more densely populated areas such as Stockholm, Gothenburg and the Malmö area. Each network could be seen as a separate system with production, network distribution and end consumers. The systems are individual and have different standards and sizes. There are basically four different forms of ownership and production structure in Sweden in the year of 2004:

1. *Single buyer.* The network owner buys heat from industrial heat suppliers.
2. *Different owners of network and production.* For example in the city of Alingsås the municipality owns the network and Fortum owns the production. The price is set in long term contracts between the parties. When the contracts terminate, the municipality searches for new contracts.
3. *The municipality or a private company owns both production and network.*
4. *Split ownership between the municipality and private companies.* In this form of ownership the municipality and private companies share the ownership of production and network.

4.1.4 The grid owners powerful position

Birgitta Lindblad is the manager of Energy and Environment at “Jernkontoret” – an interest organization of the energy intense industry with member companies of the steel industry. Lindblad characterizes the situation of today as one in which energy intense industries are satisfied with having deals with current energy companies to whom they are selling their waste heat. It is important to note that waste heat is not a high yield product for its suppliers. In cases where individual contracts between waste heat suppliers and the energy industry have been arranged this is due to intense work of eager individuals in each company. Today the

owners of the district heating networks, in many cases large energy industry companies, have a very powerful market position as they are setting the prices on what is definitely to be characterized as a sellers market. A future TPA would radically alter the grid owners' powerful position as this would present more even conditions between a TPA energy producer and the grid owner. Today the energy companies own both production plants and networks and the revenue in case of TPA would for these companies be the network distribution fee. The vacillating energy politics has created unused solutions resulting in overcapacity in many cases. The environmental act of 1999 demands for the waste heat industry to research the possibility of district heating - yet it is not a very attractive product for the industry. (Interview with Mrs. Birgitta Lindblad 2004-04-27)

4.1.5 Customers conditions

Switching costs due to different forms of heating is an important issue to consider if choosing district heating. Cecilia Önnevik at the Private House Owners recommends the customer to keep different heating alternatives open. When a house-owner chooses form of heating there are several possibilities: oil, gas, electricity, district heating etc. If the house owner decides to choose district heating a monopoly is chosen where the network owner is setting the prices. This is in fact reducing the power of the end consumer as compared to other sources of heating as the customer then is stuck with district heating and changing back to another alternative implies high switching costs. For example if an apartment house has invested in a built-in district heating system, changing it is not a realistic option for several reasons. A district heating system does not take up as much space as an oil-burner, no chimney is acquired and probably both the oil-burner and chimney are removed with the installation of the district heating system. Önnevik recommends all customers to keep their chimney in case the house owner of an apartment house chooses to install district heating, if possible even oil tanks and oil furnace, thus keeping oil as an open alternative for the future. The district heating prices are regulated in negotiations and presented in general conditions. Negotiating parts are the Association of District Heating and large organizations as the Private House Owners, HSB, SABO etc. When prices are set the house owner has no possibilities to renegotiate the prices but the energy company can raise the price Önnevik says. (Interview with Mrs. Cecilia Önnevik 2004-04-22)

4.2 Re-regulation – Driving forces

Before discussing the variables shaping the future of district heating in case of a re-regulation we find it interesting to take one step back in the development process and focus on the forces that really are the motors behind the process – the so called *driving forces* of a re-regulation. These are the large issues that all together drive the market towards a re-regulation, as for example the uneven power distribution between the market actors, means of control – taxes and the international political-environmental debate whose very existence in its own is a driving force. So, what are driving forces behind a re-regulation today?

4.2.1 Means of control and prices

It could be argued that the means of control not are to be seen as driving forces on their own but rather as effects of other driving forces as for example a political process. Still we find the means of control as being to important to not be treated as a driving force on its own. Today's means of control in the Swedish energy market are very strong. Dr. Werner points out that the high Swedish taxes on fossil fuel has created good conditions for district heating in Sweden and hence he is very convinced that a harmonization of the energy tax levels within the EU would drastically alter these conditions. (Interview with Dr. Sven Werner 2004-04-26) Mr. Erik Thornström at the Ministry of Industry is also quite positive. He comments on present means of control affecting the development in district heating. He says that earlier on the energy tax discredited power heating but this has changed since the turn of the year of 2004. This should be viewed as a driving force for district heating since it has a positive effect on the power heating industry and thus heating supplies. Still there is some uncertainty regarding upcoming market effects of the system of effluent rights trading and electricity certificates. Today not all rules and regulations are set on these matters and more time is needed to see the market reaction on these new means of control. (Interview with Erik Thornström 2004-04-26) Mr. Göran Ek at the Department of Energy sees the increased efficiency in the use of energy as a strong driving force. Competitive reasons seem to receive lower priority in the debate he says. Yet, from the very beginning he states that TPA was announced as a competitive action. There are different views regarding what price effects a future TPA would bring about, depending on the diverse backgrounds or interests of the experts. Mrs. Birgitta Lindblad at Jernkontoret, as a representative of the energy intense industry, states that TPA would create good conditions for a decrease of the price of district heating due to more actors on the market. (Interview with Mrs. Birgitta Lindblad 2004-04-27) On the contrary, Mr. Ek thinks that a TPA hardly would cause an increased competition for the suppliers. But the waste heat suppliers would gain better negotiation opportunities. (Interview with Mr. Göran Ek 2004-04-27)

Regarding the high taxes on fossil fuel Mr. Ek is not as convinced as Dr. Werner what concerns its positive effects for district heating. Mr. Ek sees the important connection of balancing of one tax against another; the increased taxes on fossil fuels and electricity have a close connection to a higher price on district heating he claims. When electricity becomes more expensive this naturally gives room for raising the price on district heating as well. What is achieved is a natural right to put a tax on district heating as well. The same direct connection between low tax – low price, high tax high price could be noted in other parts of Europe; a low price on district heating results in low tax on fossil fuels and the other way around. For example Denmark has a high tax on fossil fuels and also has the highest price on district heating in Europe, in spite of self cost price and duty to connect to the existing network. Finland on the other hand has low fossil fuel prices and also has the lowest price on district heating of the Nordic countries. This is also due to the fact that the waste heat from power heating plants that burn oil supplies the district heating networks. (Interview with Göran Ek 2004-04-27) Mr Lagerstedt expresses a few possible solutions for a customer price protection in case of TPA. One way to protect the customer would be through price regulations. The price could be tested beforehand or the customers could complain afterwards. Also a regulation could be introduced dependent of company yields.

4.2.2 Technology

In terms of research today Dr. Werner does not see technology as a limiting factor and states that the networks can be steered effectively and the quality margins are known. As stated earlier, district heating is not a high-tech but rather a low-tech industry. This implies that an investment in district heating will not bring about unpleasant surprises with technology becoming old-fashioned. (Interview with Dr. Sven Werner 2004-04-26). Göran Lagerstedt also underlines the fact that there are no technical problems with TPA. Still, he points out that TPA will not have tremendous effects on the small city nets but is more a solution adaptable for the bigger city areas. (Interview with Mr. Göran Lagerstedt 2004-04-26)

4.2.3 Socio-economic factors

Mr. Thornström sees the socio-economic factors as driving forces for TPA. Socio-economic revenues are obtainable from a more cost-effective heat production over the long run in the future district heating systems. Through TPA the society would gain advantages through better use of resources. One important goal is to offer the customers a lower price. (Interview with Mr. Erik Thornström 2004-04-26). In accordance with Mr. Thornström, Mr. Lagerstedt underlines the importance of considering the bigger issues while analyzing a future TPA. The big driving forces are the macro-economic factors as socio-economic and environmental consequences. But he is a little more uncertain than Mr. Thornström regarding the socio-economic gains of a TPA. He says it could also entail socio-economic losses in case the current producers would be forced to exit from the base load segment. (Interview with Mr. Göran Lagerstedt 2004-04-26) Whether a TPA would actually bring about socio-economic gains or losses thus is dependent on the future legislation.

4.2.4 Great potential in TPA

Today many industries are connected as suppliers in the district heating networks, yet there is still more potential to be developed. The main difference between the situation of the single-buyer market of today and a possible future re-regulated district heating market is that TPA would improve the conditions for connecting more waste heat to the existing networks, hence enabling a higher percentage of waste heat to enter the networks. Still, it should be well remembered that waste heat is not a high yield product which probably will have a restraining influence on the level of how many TP waste suppliers that will connect to the networks. Today the level of cooperation between waste heat suppliers and network owners differs widely from place to place. In Gothenburg the level of cooperation is high but still there are many places that would need improvement on this matter. This fact calls for further investigation on access potential Mr. Thornström explains. EU power heating directives propose a deeper examination of further expansion of power heating and the introduction of origin guarantees for power heating produced electricity. (Interview with Mr. Erik Thornström 2004-04-26)

4.2.5 Environmentally sustainable

As discussed earlier, compared to other sources of heating, district heating could be considered as being an environmentally sustainable heating solution. Mrs. Birgitta Lindblad, as a representative of the energy intense industry, naturally presents very clear driving forces for a re-regulation in the district heating market. TPA is no end in itself, heat intense industry basically wants disposal of their waste heat. In the area of incineration the prohibition of disposal of combustible material has forced the municipalities to take care of this material. TPA also has a positive environmental effect as it reduces the emission of combustible fumes. All type of combustion produces nitrogen oxides. TPA would create good conditions for a decrease of the price of district heating due to more actors on the market. Lindblad finds TPA positive from the energy point of view, still economically she is a little bit more hesitant since it requires a back-up system for cold winters. In the short run TPA would demand large reorganizations of energy companies but in the long run the vision is to reuse waste heat from incineration or other heat processes once again in industrial processes. (Interview with Mrs. Birgitta Lindblad 2004-04-27) The Kyoto process is in progress and it is not known what effects the new law of trading of effluent rights will have on prices. Still, Dr. Werner underlines the positive effects of new certificates encouraging power heating. (Interview with Dr. Sven Werner 2004-04-26).

4.3 Future development

In order for a future TPA to be effective there are many challenges and questions to be solved. Here we discuss different variables, on which the future is dependent, all deriving from the interviews with members of the expert group. We have chosen to divide the discussion into fundamental considerations, technical factors, economic factors and legal issues.

4.3.1 Fundamental considerations

4.3.1.1 Fundamental questions

One of the most fundamental questions to solve in case of a re-regulation would be to what degree a re-regulation of the market should control the actions of the market parties. This would be done through new legislation and means of control outlining the competitive industry structure of the market which could be scaled from monopoly to a free market. When this would be set, the market actors could adjust their market strategies to the new market structure. For the district heating market this would mean in what way a TPA would be implemented. There are different interests of the market to be taken into account. The current net owners are very sceptical while the possible TPA entrants are positive. Still the main questions to be considered are *why* it should be done and in that case *how* the TPA process should be carried out.

One of the fundamental questions in the debate is: Who wants TPA? When there is scepticism among the net owners towards TPA, there are market actors very interested in a future TPA. These are the big property-holding companies and the TP industries. These are industries that consume large amounts of heat in their industrial process, as for example companies in the

industrial areas of metal production as steel or aluminium production plants. (Interview with Mr. Anders Ydstedt 2004-04-15) Another important question is: What is the economic outcome of TPA? Dr. Werner points out that an important variable to estimate before deciding on whether to apply to TPA is the possible socio-economic value. This is a question often forgotten in the debate he says. So, what is the economic value of TPA for society, and what is the possible value for different market actors? Dr. Werner is unsure whether or not TPA actually will benefit the customer. For the market actors there is also the question of base-load and peak-load supply contracts to consider. The base-load supply is generally the more attractive segment to belong to for the suppliers. That is because it represents a constant waste heat delivery throughout the year for the supplier as compared to the very short period of peak-load supply which only is needed in very cold winters when the base-load supply is not sufficient to fully meet a higher demand. (Interview with Dr. Sven Werner, 2004-04-26) It is also important to note the powerful position of the production- and network owning companies on the market. Recently some municipals have sold their grid operations and production to private companies. This fact complicates the situation a bit. If all companies and nets today were owned by the municipals a public negotiation would be possible. Or if the nets were separated from the production in the reform, the opportunities for a TPA would be greater. (Interview with Göran Lagerstedt 2004-04-26)

4.3.1.2 Resistance to TPA

There is a big resistance towards TPA among the current network owners. The private network owning companies are not interested in giving TPA industries access to their networks. TPA would alter the network-owners powerful position and bring about many adjustments.

In addition, TPA would shut out current heat suppliers from the net as these often are older industries with weaker pumps. “When transferring water onto the net, the industry with the strongest pumps wins” Dr. Werner comments. (Interview with Dr. Sven Werner, 2004-04-26). This means a balancing function for the water flow and pressure is required in case of a TPA. TPA could also be seen as a risky investment for the net owners. If the district heating industry develops as the electricity and gas industries have done, the net owners will have to pay the expenses for connecting new actors – suppliers and customers. This implies a risk in investing in new suppliers and customers for the net owners. (Interview with Lars-Göran Nilsson 2004-04-27). Another hesitant factor is that it is unclear whether TPA is economically attractive for the customers. Mr. Lagerstedt, has a rather opposite view from Mr. Nilsson as he sees a possible turnout where TPA would only be profitable for the owner of the net. TPA requires investments for the suppliers and often the suppliers will not be that well rewarded. (Interview with Göran Lagerstedt 2004-04-26)

4.3.2 Technical factors

4.3.2.1 Technology - not a critical factor

As compared to other network technologies district heating is a little different in the sense that in district heating technology is not a critical factor. “This is not high-tech, but low-tech” Dr. Werner explains. This fact results in a larger risk for obstruction than in other network systems. Here, the actor with the strongest pumps wins the battle. What is needed is automatization in making deliveries more meagre, still the possible yield is just a few per cent

Dr. Werner verifies. Dr. Werner declares that the critical factors of district heating do not lie in the field of technology but in other areas of interest (Interview with Dr. Sven Werner 2004-04-26).

4.3.2.2 System connection

One critical area of interest is system connection. The important question is to what degree it will be an effective use of resources to connect different systems to each other. A critical factor is the allocation of plants and market actors to a network. To this factor is also linked the distributional aspect of different market actors. Today the real challenge Dr. Werner says lies in deciding how to set up the distribution and allocation of the district heating systems and its applications. Systems need to be integrated and maximized (interview with Dr. Sven Werner 2004-04-27)

4.3.2.3 Backup function

In every system there has to be a back-up function that can guarantee delivery to the customer in cases of very cold weather or during other circumstances when supply for some reason is critical. TPA would require a new model for the back-up function outlining technical support structure and economic responsibility. Also here a cost distribution model is needed that is supported by all parties in a system (interview with Erik Thornström 2004-04-26).

4.3.2.4 Over-capacity

Today the industry is inefficient and there is over-capacity of up to 200% or 250% in production plants today. (Interview with Mr. Anders Ydstedt 2004-04-15). Often it is the nets' capacity that are limited as the supply of the waste heat from the industry by far exceeds the level of what the nets can receive. (Interview with Mrs. Birgitta Lindblad 2004-04-27). "A possible TPA would be negative for the system because it is already optimized – at least that is what I think the net owners are thinking" Mr. Ek says. (Interview with Mr. Göran Ek 2004-04-27)

4.3.2.5 Peak load vs. base load

Another factor to consider in case of TPA is the base load vs. peak load production. Every actor wants to become a base load supplier as this is a much more profitable contract than a peak load contract. If an industrial third party supplier gets access to a net, that company will deliver waste heat which often has a volatile character dependent of the industrial production. (Interview with Göran Lagerstedt 2004-04-26)

4.3.2.6 Reserve heating

The reserve heating nets are present a high over capacity since every net requires its own reserve heating plant. This not only makes every local net very fragile, but also, seen together the networks are not at all an optimized network solution. The electricity system is not as fragile because it is much bigger with many reserve plants on one network. (Interview with Göran Lagerstedt 2004-04-26)

4.3.3 Economic factors

4.3.3.1 New investments

Another critical factor is the new systems. If established market actors are too expensive there is an impetus for building new/alternative systems. The systems built today are more effective and tie up less real investments than in the 1960's, yet the old systems are written off which implies a lower cost. Thus an important question is how to debit the cost of new investments. The construction of district heating pipes is expensive according to Lars-Göran Nilsson. The investment issue is a question that has to be solved in order to accomplish a future extension of district-heating. Market actors have to set up a model describing who is paying for what and to what extent for a smooth realization of new investments (Interview with Lars-Göran Nilsson 2004-04-27).

4.3.3.2 Re-regulation creates cost drivers

The re-regulations in gas and electricity in particular, have demanded higher administration costs for the companies involved. The customer service departments for instance, have more than doubled, in many cases because of mass media's "do not trust your energy company" campaigns. Another cost driver is the measurements that have increased, due to more measurements there are more errors. In the end it is the consumer that pays for it. (Interview with Mr. Lars-Göran Nilsson 2004-04-27).

4.3.3.3 Price is controlled by energy source

The size of the district heat net is not essential for the price level - it is the type of energy source that drives the price. That makes it hard to compare prices between the nets. (Interview with Mr. Lars-Göran Nilsson 2004-04-27)

4.3.3.4 Relative price

The price of district heating relative to the price of substitute products is a very important variable to consider. This variable clearly shows how attractive the commodity is to the customer as it not only shows the price but the price in comparison to other products. After noting the shifting views of future prices on the market and discussing the influence of prices on the development of district heating we came to the conclusion of adding the relative price variable to the empiric chapter as we see it as an extension of the price variable already debated by the experts.

4.3.4 Legal issues

4.3.4.1 Applied legislation

New applied legislation for district heating is needed. An applied model for transaction between parties and that all parties stand behind has to be created. (Interview with Mr. Göran Lagerstedt, 2004-04-26) New investments are needed and as of today there is no existing law application on this matter. (Interview with Dr. Sven Werner 2004-04-26)

4.3.4.2 Transparency

Today there is no legal transparency in the existing systems and the most expensive plants give a negative contribution margin to the enterprise (interview with Dr. Sven Werner 2004-04-27). It is a challenge to get the energy companies to acknowledge that they move earnings from the district heating to areas that are less competitive. “There is a clear risk of cross subsidization in the market today” Mr. Ydstedt says. (Interview with Mr. Anders Ydstedt 2004-04-15) FÄ inspects the reports from the energy companies and they believe the energy companies try to hide profits as much as they can. In the past it has been possible to see the income from capital of heating when the energy companies had separate accounts for the business. Some of the minor companies still have separate accounts (Interview with Mrs. Cecilia Önnévik 2004-04-22).

4.3.4.3 Distribution fee

The distribution fee for transferring hot water on the existing network has to be decided. There are different possible solutions for the setting of fees. One alternative is that the owner of an existing network sets a fee for the service of transporting market actors water on the net. But the fee has to be set at a fair market price. On many networks there are only a few or even a single owner in so called natural monopolies. If new TPA market actors enter the network they have to be able to sell their water at a fair market price. Effective markets with enough market actors to retrieve an effective market price will possibly only be a reality in the bigger cities, if even there, Dr. Werner points out. Therefore an applied legislation on the matter is needed (Interview with Dr. Sven Werner 2004-04-26).

4.3.4.4 Market size

There needs to be drawn a limit between small and big markets. This is to set a limit between effective and not effective markets depending on size or market actors, so that not price effective markets could be regulated. The question is who is to draw that limit. A possibility to increase the number of market actors would be the realization of company splits in order to separate parts of the value chain to different companies. This could be done to separate for example production from distribution. (Interview with Mr. Göran Lagerstedt, 2004-04-26) It will become a big challenge to understand how a TPA would create a vertical separation in the companies’ value chain. The natural monopoly situation could change radically and competition be created. A recent investigation has shown that the technological preconditions (pressure, flow and temperature) for TPA are possible. Mr. Ek concludes that a future TPA is more a question of money and politics than technological issues. (Interview with Mr. Göran Ek 2004-04-27)

4.4 Possible future solutions

Instead of forcing existing plants to exit it might be possible to connect the current nets in order to construct a bigger and more efficient net Mr. Lagerstedt says. He proposes the following market options to reflect upon when designing future scenarios:

- Negotiated access/entry between TP industries and net owners

- Single buyer
- Single buyer with net owner and production in one company that buys heat externally as a complement.
- Single buyer with net owning companies as single buyers. Production is separate.
- Customers with excess heat deliver heat back to the system.
- Sometimes companies sell and sometimes they buy heating.
- New separate net-systems are built up

(Interview with Mr. Göran Lagerstedt 2004-04-26)

Mr Thornström discusses several areas of interest to take into consideration when considering future possibilities. First he reflects about a parallel between the electricity and district heating market. Perhaps it is likely that the market of district heating will develop as the electricity market. A water exchange is not at all an unrealistic solution. But the core question is what the companies and market would gain from this solution. The monopoly positions that exist today will be altered in the future. There will be more municipals that have shared ownership as well as there will be private owners. A big issue in the future will be which parts of the market that need to be regulated and which do not. The single-buyer option is also an alternative as well as a system with final delivery to the customer. (Interview with Mr. Erik Thornström 2004-04-26)

Mrs. Lindblad sees different solutions for the future. One could be that actors competing with existing nets build parallel nets – even though it is very unlikely she says. Another one could be that it would be possible to buy and sell companies in the same way that is done in the electricity market. Nor does she see this solution as a very realistic one. In some cases industrial waste heat must be cooled which costs money for the companies. It is therefore very attractive for those industries to sell their waste heat. The problem is that the buyer is aware of this fact and therefore demands a very low price or even to get the heat for free. The future of the district heating market involves changing conditions for several parties and there is a risk of several price levels and probably the customer trend will go towards changing suppliers more frequently as there are more market actors involved. (Interview with Mrs. Birgitta Lindblad 2004-04-27)

According to Mr. Ek it is possible to imagine a separation between the nets. He also sees a possibility in the nets could becoming juridical persons. Mr. Ek sees different possible TPA solutions but the most possible would be a re-regulation that allows third party actors to get access to the existing networks. This would make it possible for new entrants to take legal actions if denied access to the networks. These solutions could result in two outcomes. Either there would be no separation between production and distribution for the current companies on the market and they could negotiate with the final customer. Or the other solution would be a separation between production and distribution for these companies which would result in a major structural reorganization. It is important to acknowledge that a negotiated entry gives better negotiations opportunities for the producer. The producers sell directly to the customer and distributes through the net. This demands a restructuring of the organization for the producer especially in the sales and service department. For the producers it is more attractive to sell to industrial customers than to private persons as they demand by far larger volumes. (Interview with Mr. Göran Ek 2004-04-27)

The experts we have spoken to mainly suggest the network alternatives of single-buyer or TPA as the main alternatives.

4.5 Choosing the variables

According to Schwartz' theory, the scenario drivers (the two variables defining the scenarios) should be chosen from the driving forces and key forces considering importance and uncertainty. Initially we listed all key factors as well as driving forces that were identified from the empirical study. Whether a factor identified in the interviews was important or not was, in general terms, determined by our interviewees. We on the other hand decided whether to categorise the factor as more or less uncertain. Secondly, we reflected upon our attained knowledge in the field of district heating to identify driving forces and key factors. Then we listed driving forces that could spice the scenarios, and these were selected from contemporary media as well as our imagination. They were placed by us concerning importance and uncertainty in relation to the factors identified through the interviews. Finally, we reflected upon our theory to find variables that could be considered as driving forces or key factors (see figure 4.1).

After having discussed each of the different forces' relative position to each other we were able to place all the factors in the plot. The study of the forces in the industry is structured below in the plot. The axes are not scaled as a result of the difficulty in doing so and a factor should be interpreted and categorised and placed in one of our four categories. The categories are less uncertain and less important, less uncertain and more important, more uncertain and less important, and finally more uncertain and more important.

The last category is where the driving forces with a significant impact are discovered and those are extra carefully evaluated when building each scenario. As seen in the plot there are several variables located in this area. A number of driving forces were important and uncertain but finally we came to the conclusion that competitive industry structure and relative price very well represented a good basis for an upcoming scenario building. The driving force competitive industry structure depends on by to what degree the market might be re-regulated and the other driving force, the relative price, determines the attractiveness of a product in comparison to substitutes. The chosen driving forces are mutually independent which means that they do not correlate with each other.

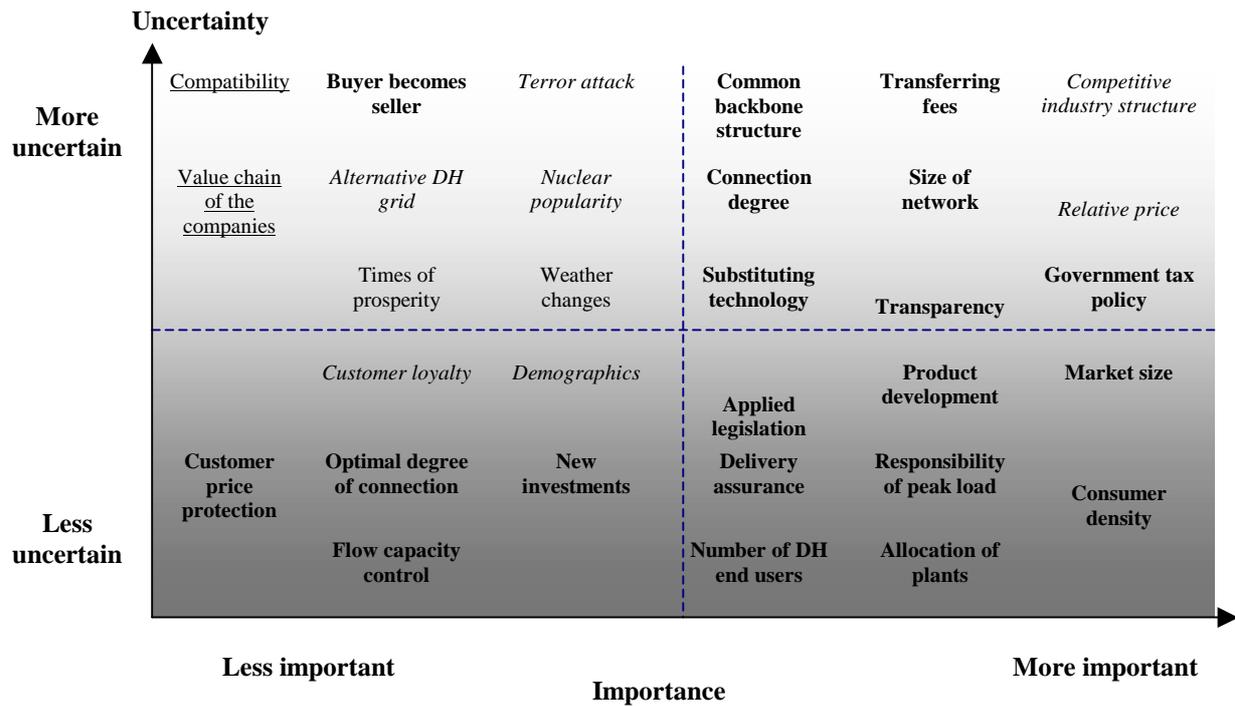


Figure 4.1 – Uncertainty/Importance plot. The factors from the empirical study are typed in bold, the factors from the theory are underlined and the once we have identified through other sources are typed in italic.

The plot (figure 4.1) results in a scenario matrix (figure 4.2) based on the two scenario drivers – the forces chosen to be most important and most uncertain. Hereafter forces were clustered in the analysis based on how we felt they were connected to the main axes. An example is the nuclear society were a high competitive regulatory structure and low price on DH compared to substitutes were clustered with liberal politics, times of prosperity, high transparency and the “spice” driving force which was nuclear popularity.

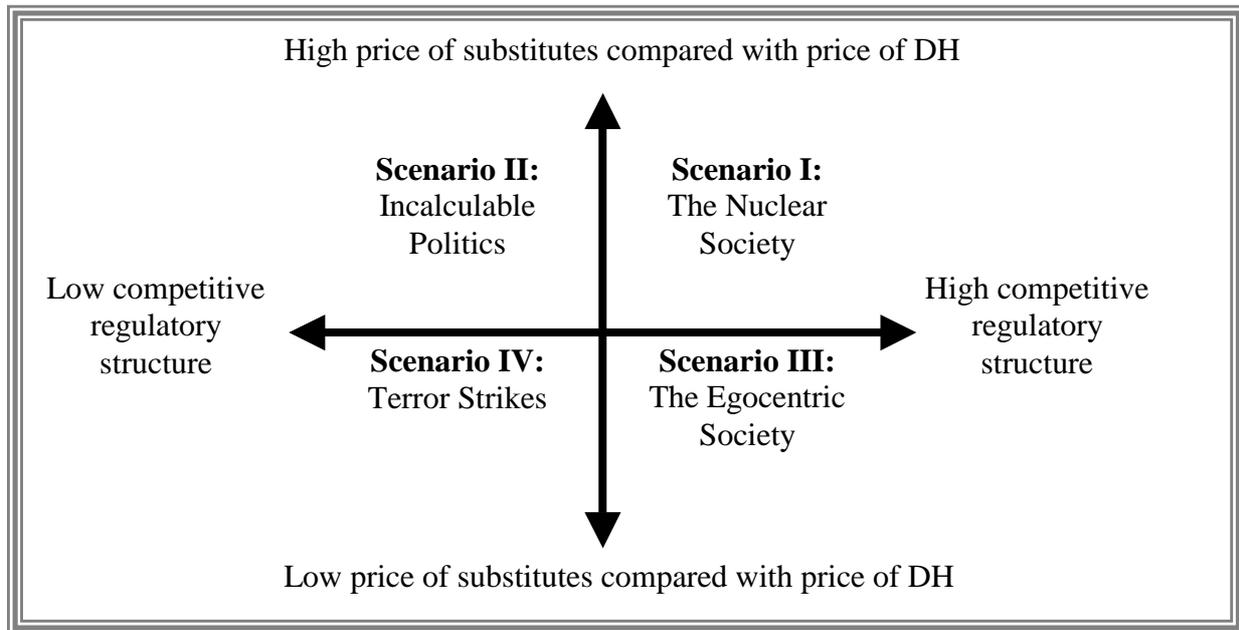


Figure 4.2 – Scenario matrix.

The spice in each scenario does not have a cause and effect relationship with the axes and could theoretically have been inserted in any of the other scenarios. Schwartz emphasises the variation of the themes of the scenarios rather than a variation in the matrix cells. (Schwartz, 1996, p. 244-245) Therefore the nuclear popularity driving force was added to the scenario where the industry was growing as well as the terror attack driving force was added to the scenario where the industry growth was declining. In other words, we keep a logic in the scenarios that is easy to follow for the reader. The scenarios are furthermore named after Schwartz recommendation – that is the names should be easy to remember and in general terms describe what the different scenarios are about.

– 5 –

Scenarios

Scenarios can be understood in the authors' opinion as a music equaliser. Many variables control the sound of the music, some are more important than others and a few are very critical but they all contribute to the big picture. All variables depend on the setting of the equaliser - whether it is set to low, medium or high, provide a change that could be identified as a new scenario in it self. We have therefore chosen to categorise different variables and their different equaliser positions in a way so that they together create a smooth curve. This is done with the intention to structure the causes and effects in the future development, based on our interviews, scientific newspaper articles and attained knowledge of the district heating industry and the economic development. The scenarios are presented in past tense, they have already occurred and we are now at the year of 2015.

5.1 Scenario 1 – The Nuclear Society

A re-regulation in the market of district heating, that earlier had a very low level of regulation created a bright and prospective future for the industry and almost all parties involved including customers, suppliers and buyers. The district heating industry experienced an almost total re-regulation which meant that the energy companies lost their powerful position on the networks. The exception however, were the minority of the networks that only gradually were transformed into a TPA due to long term contracts that run further than 2015. As a result competition rose in the big cities and prices dropped. Still it created some problems (with for instance delivery assurance.) At first, these problems were rapidly solved as new segments were created and the new industry entrants identified the potential of differentiation. Waste heat from nuclear power plants were used optimally since the decision to keep nuclear power plants in a long term perspective was made in 2010 as a result from the political shift in 2006. Margins rose to a high level due to lower costs for involved parties as mainly waste heat was used for heating. New investments were made, demand was higher and the existing and new parties competed and co-operated in a way that benefited to the technology development as well as the customers – receiving a better product and service.

5.1.1 Politics

In 2006 there was a political shift in Sweden in towards a more liberal government that unconditionally reinforced competition in all industries. That gave the district heating industry better terms for a prospective development. The Swedish politicians supported the customer's point of view and their right for better prices. As well as opening up the market for competition - a positive political environmental development progressed. In order to heat the water in district heating mainly waste heat was used which improved the conditions for a more fair pricing since the use of waste heat minimised the use of resources normally used to heat water. Swedish politicians accepted the decline in the revenues of the energy companies to help customers get a better price. An effect of this was lower municipal incomes from district heating which from a public perspective turned out to be the backside of the coin. The political shift also meant a change in the Swedish politicians' attitude towards the use of nuclear waste heat for district heating.

5.1.2 Nuclear waste heat

According to an investigation conducted at the university of Gothenburg (Sydsvenska Dagbladet 2004-24-05) 46 % of the Swedes wanted to keep nuclear power and only 36 % wanted to stop nuclear power in a long term perspective. The safety aspects and the economic advantages were perceived as better for the public. The Kyoto agreement required a lower use of fossil fuels like oil and coal and the only realistic alternative were to keep nuclear power plants because it was not reasonable to assume a lower electricity demand due to extended use of electronic products from both industries and households. It was therefore only natural that the general elections of 2006 had advantages of nuclear power plants on the agenda. A serious power breakdown in Sweden in 2003 was also an important variable. As the discussions developed nuclear power got a stronger and stronger public support. Contemporary research investigations implied that new technology was being developed that would improve the nuclear safety aspects and make it possible to locate power plants near the big cities. Furthermore the new technology would make the nuclear waste products less dangerous for the environment than with the existing technology. This opened for the opportunity to use nuclear waste heat efficiently in the future. When adding the information regarding valuable waste heat, that could be used to provide district heating to Swedes in a way that is environmentally sustainable and the fact that it even was safe - it culminated in a decision to keep nuclear power plants in a long term perspective and even move/rebuild them closer the big cities. The EU countries support to nuclear power plants in the future made the public opinion in Öresund shift. For instance the Danes compromised and accepted the existence of the Barsebäck nuclear power plant. Nuclear power started to expand in Europe and nuclear power and its contribution of waste heat to district heating created a far better environment in terms of the Kyoto agreement than electricity produced from fossil fuel.

5.1.3 Times of prosperity

The time period of the years 2004 to 2015 was characterised by upward economic figures and an optimistic investing atmosphere. This in fact had several positive effects on the imperative parameters in this scenario. A very critical variable that correlated with the times of prosperity was the investor's willingness to invest in future district heating solutions and technology. The positive economic trend created incentives for connecting pipes from waste heat

resources. The investors' optimistic attitude in regard of pay-back time and profitability were the main reason of the heavy investments, which turned out to be a good choice. The grids were gradually connected except where extreme geographical distances did not permit so, resulting in mainly the big customers in the big cities benefiting from the lower prices. The willingness to investing in integrating waste heat sources were very positive in terms of environmental aspects. The optimistic investors in other words provided very good conditions for the development of the industry as their positive investing spirits resulted in a positive snowball effect – more investments (both in new investments and in maintenance) created a higher level of technology and thereby system compatibility raised, the relationship between sellers and buyers improved and demand rose.

5.1.4 Transparency

The value chains of the existing parties changed as a result of the re-regulation. Earlier the value was mainly in the hands of the grid operators due to the unregulated market state but since the re-regulation it was spread more evenly through the entire value chain. Increased transparency in the district heating market became an effect of the organisational structure change from integrated to a divided one. The most important condition for transparency in this case was therefore that the divisions were separated. Accordingly, grid operators and suppliers could no longer remain integrated as was the case in the year of 2004 for some of the large existing parties. Organisations that went through processes of unbundling and reorganisation correctly gained a higher level of efficiency, speed and flexibility as the administrative costs were reduced. That in turn cut their transactional costs and could give higher margins. With separated divisions and reorganised organisational value chains a win-win situation was created where both suppliers and customers became winners. Customers received fair pricing and started to acknowledge the suppliers to a greater extent. As a result a loyal relationship still exists in 2015. Furthermore, the confidence between buyers and sellers also rose significantly. Private companies as well as municipals drastically lowered their cross-subsidisation to a level that was accepted by all parties. Cross-subsidisation did not stop entirely but it became much harder to place costs in other places than where they initially belonged.

5.1.5 New entrant's negotiation position became stronger

The re-regulation opened up for several new parties offering waste heat. More parties created a more competitive environment which resulted in a dynamic market that best could be described as innovative, dynamic and progressive. The market expanded as more parties were involved and as result of lower prices. The positive effects of more competition became mainly were seen in a higher level of creativity. The times of prosperity also, as mentioned earlier, provided good opportunities for new investments. The development of new supporting and improving technology were substantial. As the technological development progressed it gave the market good conditions for the future due to increased efficiency. Furthermore the strong monopolistic positions of the energy companies were removed. This meant that the grid owner's former right to set high distribution fees as well as their right to refuse to make deals with new suppliers of district heating were limited. Even though a kind of natural monopoly remained for the grid operators because it became too costly to build a new system - the grid operator's position were severely weakened. It became possible for new entrants to

go to court if the grid operators did not want to negotiate with them which meant that the suppliers' negotiation position became substantially stronger.

5.2 Scenario 2 – Incalculable Politics

The politicians did not welcome the initial re-regulation idea of letting external suppliers access the grids and instead they settled with protecting the customer by a highest price regulation. A price regulation in the market of district heating that earlier was not properly regulated resulted in low market growth and a modest positive future for the industry and all parties involved. Also high taxes on garbage incineration and low taxes on waste heat were introduced. District heating's popularity increased a little and the upward economical trend made investors optimistic which resulted in the development of a better product. Margins for the former grid owners were minimised but there was no competition to reduce customer prices. No revolutionary technology was on its way and the public opinion remained negative to the exploitation of unorthodox waste heat as for instance nuclear waste heat. The distinction between buyers and sellers blurred. The sellers were not as dependent of a few buyers as before and there was some incitement for product development. The weather turned out to be a bit colder than normal which created a higher demand for heating solutions. This benefited those who believed in district heating from the beginning. There was no change in the degree of transparency but the price regulation created a little extra customer confidence and some loyalty to the product of district heating.

5.2.1 Politics

The politicians did not welcome the initial re-regulation idea of letting an unlimited amount of external suppliers access the grid and instead settled for a price regulation. Plants that produced waste heat were not able to connect to the net unless the grid operators wanted to make a deal with them. Those plants with very good geographical location in other words had better negotiation possibilities but very few new parties were connected.

The price regulations hit the distinctive energy companies differently depending on costs of production. The price regulation was established without any consideration concerning production cost differences. Companies with lower costs benefited as their margins rose. Companies with high costs (like Lunds Energi) had problems initially due to expensive resources for heating the water. Expensive sources might be geothermia as compared to more cheap variants like waste heat. Initially this was a problem for the companies involved but it turned out to be an advantage in times where waste heat supply was low. However, later on the companies adjusted their cost levels to the new conditions and things were reset almost back to normal.

5.2.2 Distinction between buyers and sellers blur

What turned out to be one of the most important factors in this scenario was that in some cases the distinction between buyers and sellers were blurred. Some customers were able to provide the grid with heating in periods of over-capacity. This development turned out to be profitable for both parties. In this way the grid operators were not dependant on a few sources

of input, although the main sources were still important. That was because it bypassed the problem of the grid structure with smaller pipes in the endpoints of the grid. All the suppliers wanted to make deliveries in the base load as that was where a constant and profitable supply could be made. The energy companies selected the suppliers based on costs and delivery assurance. The peak load was as in the year of 2004, produced by expensive fuels – provided by the energy company owning the grid. But with a blurred distinction between sellers and buyers the difference between base and peak load became smaller. The mountains and valleys on the graph were formed into an almost straight line.

5.2.3 Weather changes

What really became positive for the district heating market was the fact that it became colder for the years to come. Temperatures fell below average in Sweden which increased the need for heating. From an environmental point of view little changed due to the price regulation. District heating continued to be a good environmental choice even though nuclear waste heat was not being used. To create a price regulation when there was an upward economic trend turned out to be dangerous because of the threat from alternative technologies entering the market. The cold weather made investors optimistic but they were not 100 per cent confident about the district heating industry due to the still existing monopolistic structures. Thereby good conditions for new alternative and substituting technologies were created. The development of solar cells for instance turned out to be a threat but other technologies are on their way. A continued unregulated market could become the reason that makes solar cells or another alternative technology a big threat to the survival of district heating.

5.2.4 Transparency

The transparency increased only a little but the problem of cross-subsidisation remained but to a lower extent than before. The problem did not create any serious reactions from the customers as the price-regulation protected them against abusive pricing. Besides, there was already a limited amount of money transferring within the companies and the companies decided in some cases to reduce subsidisation in exchange of positive customer attitude. The grid operators maintained the control of the grids and as a result the district heating value chain did not change in any way. In other words the organisations stayed intact and did not benefit from any of the strategic advantages that could have been attained from unbundling and reorganising the company.

5.2.5 Product development

Even though there was an upward economic trend and the weather turned colder there was only a marginal product development. Willingness from investors was sometimes high and occasionally new investments were made, especially when trying to develop a system that could benefit from some of the customers' surplus of heat. However, investors demanded short pay-back times which were too difficult to predict and therefore investments were rather low. In addition, the distributors had had their margins reduced because of the price-regulation and therefore several companies experienced tighter budgets which resulted in too much maximising of incomes and haul-out in order to get a steady cash flow. Furthermore, the development in the district heating product totally stagnated in the summertime.

Fortunately the industry gradually started to grow because of a larger demand caused by the demographic growth of the population, colder weather, better customer price protection and stability in delivering what was promised. Another factor that influenced the demand positively was the urban trend of the population moving to the cities where the district heating grids were situated. Therefore investments were done in areas of high demand which were in the big cities but all together the product development was slim.

5.3 Scenario 3 – The Egocentric Society

A re-regulation in the market of district heating resulted in a chaotic and difficult future for the industry and the parties involved. The popularity of district heating as well as demand decreased substantially. Margins were lower for the involved parties, new investments were not being made and the existing and new parties competed over fewer customers. Recession contributed to a low technological level and compatibility development and eventually the customers got tired of higher prices and a worse product. The recession, problems with delivering peak load and the fact that mass media was constantly complaining about too high prices became a negative snowball effect. Customer density fell as people started to move to the countryside making it difficult to supply customers with district heating. In other words very difficult conditions for both exiting but also new entrants existed – and as a result the market declined.

5.3.1 Low compatibility

When the re-regulation occurred, at the beginning several external parties tried to connect themselves to the grid in order to sell their waste heat. However, only a few of them were able to compete successfully. The re-regulation improved the supplier's negotiation power for existing parties and also made it possible for all new parties to connect to the grid – at least legally. In fact connectivity and compatibility of the networks were very low. The allocation of plants that had waste heat to offer became critical because limited technology made it impossible to connect plants more than 30-40 km away. If the geographical distances became too big more resources were spent than gained on keeping the water at the preferred temperature. The problems were furthermore reinforced by the fact that the common backbone structure never became fully developed – that is the structure where one main pipe connects most district heating networks with a standard technology. Even though district heating was and is low-tech there were still a variety of existing different low-tech solutions that disrupted the creation of a common district heating backbone structure. The optimum option would have been a network where the entrants with waste heat could connect smoothly. Therefore the attractiveness of the industry was perceived as rather low by entrants and investors. The number of suppliers did not increase significantly and therefore the government's attempt to increase competition failed. A determined technology development could have fixed the compatibility issues but due to the recession there was a poor willingness from investors to invest in district heating and as a result the prices did not fall.

Besides, the re-regulation disrupted something that was perceived as an optimised system by the existing parties which resulted in higher costs and thus higher prices for the customers. Customers started to change between suppliers more frequently as they were able to. The initially larger selection of suppliers turned out to create negative conditions for all suppliers.

It became impossible to convince investors that district heating would become profitable in the future. Combined with a political disagreement on whether the district heating re-regulation really was necessary – the technology development ended abruptly.

5.3.2 Inflexible value chains

Several of the parties failed when it came to reorganising their organisations after the re-regulation. The needed flexibility, innovation and fastness that were required in order to survive profitably in a re-regulation were not attained and all small changes in the market resulted in big adaptation difficulties for both existing and new parties. Problems with adapting to the new conditions resulted in bad service for customers as for instance when peak load were to be delivered. Therefore, lack of confidence arose from the customers with lower demand as a consequence.

5.3.3 Transparency

The re-regulation created a more transparent market than before. But in this case it did not turn out to be a positive development. The increased amount of transparency catapulted media's knowledge about the existing cross-subsidisation and it became costly for the industry parties. Media created a reaction that threw the district heating development in a negative direction. More and more measurements were done because of the increased transparency. This naturally meant that more errors occurred and a negative snowball effect was created. Mass media blew the cross-subsidisation aspect out of proportion and companies became forced to hire a large number of people to their service-departments (a parallel to the electricity market where administration costs four-doubled after the de-regulation).

5.3.4 Demographics

Even though the Swedish population grew consumer density changed dramatically since the trend of moving to the countrysides started about 6-7 years ago. Life quality was seen as living in peace and harmony, near the golf course and with an outdoor garden. The trend resulted in fewer people in the cities, and fewer customers for the existing district heating grids.

5.4 Scenario 4 – Terror Strikes

No regulation what so ever occurred and it became a very dark period for the district heating market. The popularity of district heating decreased dramatically as well as the demand. Margins are high for grid operators but they set their distribution fees too high. Alternative systems for using factories' waste heat were built but it never became successful. Investors' willingness to investing in district heating was low due to the recession and the markets unregulated status. Substituting technology, political instability, the risk of terrorist attacks and shut downs of nuclear power plants were critical variables for how the past 10 years turned out. The district heating product development stagnated as substituting technologies rose and conquered the market. Now the outlook for the district heating market seems worse than ever.

5.4.1 Politics

Besides the recession the political situation in Sweden changed due to the progress of the European Union. The influence of the EU continued to increase substantially. Swedish politicians started to protect their popularity by reinforcing the environmental policies of the EU. Unfortunately the EU received an unexpected report that provided a substantial amount of relevant negative criticism towards the district heating solution from an environmental point of view. An environmental incorrect image for district heating resulted in a dramatic decline in demand and all new technology developments and complementary products ceased to exist immediately.

5.4.2 Risk of terror attacks

The biggest disruption in the past 10 years was the political troubles between the west and Middle East countries. The emerging risk of a terror attack against the western society and for instance its nuclear power plants were taken very seriously and in fact a decision to close down nuclear power all over Europe was taken. The risk of terror attacks reinforced the downward economic trend and resulted in fewer funds for district heating research and development and fewer investments in maintaining and expanding the district heating system. The terror risk alone caused several nuclear power plants to shut down and that severely lowered the supply of electricity with higher electricity prices as an effect. Costs increased for the electricity companies and the fact that customers started use less electricity as prices became too high resulted in even higher prices. Subsidisation occurred because the electricity companies wanted to lower their electricity prices. Cross-subsidisation can only be identified and prevented through a regulated and transparent market. Because there was no regulation that legally encouraged transparent accounting systems, district heating prices went up. No customer knew what a fair price for district heating was and the critical variables in the surroundings of the existing parties made surviving very difficult. As a result of that both district heating demand and supply decreased. Besides, the strongest supporters of district heating vanished when realising that a big amount of possible waste heat were lost due to the nuclear power plants shut down. Waste heat from nuclear power plants would have been a great possibility for district heating but the risk of terror attacks made the option obsolete.

5.4.3 Loyalty decreases

As a consequence of the un-regulated status for grid operators they continued to perceive the competition from other heating alternatives as rather high. That resulted in a decrease in suppliers' compensation of heat delivered to the grids. Besides, the question of peak load vs. base load contracts was not solved properly. In several cases the market did not deliver the product to its customers in times of peak load and gradually the customers lost their confidence in the suppliers and the whole industry suffered.

5.4.4 Alternative system

The public opinion about district heating as being environmentally correct vanished as waste heat merely was used to a minimal degree for district heating. A lot of resources were subsequently spent on heating the water which made this heating solution costly in comparison to the use of waste heat. When the distribution fees became too high it turned out to be more profitable to build alternative systems than dealing with the grid operators. Waste heat companies tried this option based on the no co-operation attitude of the grid operators. Low transparency and low compatibility resulted in alternative system parties trying to compete aggressively with the existing network owners, all with the intent to take over the district heating market. Still, in the end it turned out that the customers had to pay for the alternative systems' extra costs. Prices became too high and since the product had not improved substantially on a technological level the demand decreased.

5.4.5 Stagnated value chains

The value chain development of the existing and new companies stagnated. As before, the value remained to be highest for the grid owners who eventually exploited their position. The existing suppliers were not able to change this since nothing was regulated. The organisations were not able to reorganise and were characterized by a low flexibility and adaptation capability which eventually killed their competitive capability against parties with substituting technologies.

5.4.6 Substitutes

Although there was a recession, there was a development in new technologies – however not in district heating. Existing parties were outperformed by better substitutes as the existing technology became obsolete. A few parties initially co-operated with the substituting technology actors but eventually the district heating parties backed out and accepted their defeat. The heating of houses were done with alternative technology, better suited for housewarming, both faster and cheaper and more environmentally correct now that nuclear waste heat was out of the question. A good example was the emerging success of instruments and pipes that optimally used geothermal heat. The alternative substituting technologies were in the beginning characterised as a serious threat to the whole industry but it turned out to be much worse than that. Substitutes gained a more extensive market share and now, in the year of 2015 nothing implies that district heating as an industry would survive another decade.

– 6 –

Strategic analysis

Our analytical strategic management focus consists of identifying possible strategic options for companies currently existing on the market, mainly the ones in the production division. Furthermore we will also analyse the strategic options for the new entrants. Therefore, our focus is from the producer's perspective, rather than that of the consumer or the grid operator. Throughout the analysis we have integrated normative suggestions to what we believe are profitable strategies.

6.1 Scenario 1 – The Nuclear Society

6.1.1 Existing companies

Existing companies like Sydkraft and Vattenfall, as well as municipals in the production division, will experience the political shift and re-regulation as a seismic shift as Day (1997) would describe it. A total re-regulation results in a separation between grid owners and production companies which had earlier been integrated. The grid owners will have fewer rights due to the increased regulative pressure and they do not have several strategic options to choose from. Their position and profit will remain at a reasonably high regulated level. An increased district heating demand and a larger integrated network will benefit them in the long run and is therefore what the grid owners should try to achieve. Grid owners will also be able to make a profit on balance responsibility, measurements and similar values.

The other part of the separated existing company is the production division. It is the part that mainly experiences a risk of a shakeout. But instead of initially acting as Day (1997) recommends – like *aggressive amalgamators* – it might be a good idea to let the new entrants bring some positive inspiration to the market. That is because the existing parties are experienced in the market. They know the market driving forces, critical variables and customer's needs – in short, they have superior information. This is an advantage which gives the existing companies the control of the situation initially because they are more than one step ahead from the beginning. They clearly only have to perceive the new entrants as a minor threat. The fact that a small threat exists will actually become nothing more than a positive challenge if dealt with correctly. Existing companies will be forced to re-evaluate their own systems and search for possible optimisation opportunities in order to increase their effectiveness. They are furthermore forced to invest more reasonably. Investing should be

made even more thoroughly than earlier as the competition is higher now than before TPA. If existing companies optimise their systems and invest even smarter the threat from new parties should be considered as minimal.

Day (1997) clearly states that the backbone of an effective business model for existing companies is to absorb smaller rivals through horizontal integration and in addition cut costs and invest in technologies which increase economies of scale. This strategy has many advantages for the existing companies. If they have the needed capital (which the large companies definitely have) for acting this way they will continue to control the supply and be able to keep the price level on heat in general at a higher level than if many competitors existed. Letting the new entrants invest in technology and the construction of connecting pipe lines before acquiring them would give the existing companies the opportunity to evaluate if these new entrants really will become serious rivals. On the other hand – the longer time before acquiring a successful company the more expensive it gets. But this scenario builds on more than just a re-regulated market; it also includes the use of nuclear waste heat. Keeping that option in mind further reinforces the idea that it might not be necessary to act like Day's aggressive amalgamator. The existing companies on the electricity market who own the nuclear plants are also the biggest providers of district heating and are therefore those who will benefit the most if the use of nuclear waste heat becomes possible. To let other suppliers with waste heat exist could significantly reduce the need for producing heat with expensive fossil fuels that are environmentally incorrect. Of course that signifies a lower demand for existing companies' production of heat through e.g. incineration but a more and more environmentally correct product would increase customer value and demand, as long as the prices for district heating also get cheaper. It is imperative to evaluate the companies that have power potential to survive and which ones that are vulnerable from the beginning. The ones with staying power are the ones that are attractive to build a relationship with. Staying power could be evaluated in terms of waste heat resources, geographical location and the ability to keep a low price over a long term perspective as well as a high delivery assurance. Still it is important to acknowledge how many companies the market can support in the long run. With nuclear waste heat, lower prices and a higher demand, the market will be able to support an increasing number of parties. The need to develop technology is therefore essential and should be encouraged by all existing parties because an integrated and compatible system would actually create more advantages than disadvantages.

6.1.2 Strategies for new entrants

With a TPA the new entrants get the possibility of entering the market but this should not be done without thorough reflections. What we believe the new entrants should do initially is to get an overview of the market. They need to identify which district heating systems that are, and which are not effective, have flexibility, possibility for development and a geographical location close to waste heat resources. Also it is important to identify which ones that can be connected to nearby located district heating networks and which can not. These are essential questions for strategists at the new entrant companies. The primary objective is a system which can be easily developed for a standardised and flexible technology. A good strategy would be to identify these systems at an early phase in the TPA process and thereby having achieved an advantage at the time the system should be adjusted and optimised. After identifying the un-optimised systems a waste heat portfolio should be created. This signifies making deals with factories or other companies which at the moment have waste heat they do not have any use for. Deals should also be made with house property owners that want to buy

district heating from a new and cheaper supplier which also is environmentally correct. In that way the possible new entrant is one step ahead of the other entrant competitors and could become an alternative to existing suppliers. It is very essential though, that the industry works towards a standardised system to achieve compatibility in terms of standardised water pressure, temperature and an integrated network of grids.

Furthermore a good strategy that was not mentioned earlier is to identify new clusters of houses and cities with waste heat factories etc. that are not already connected to a district heating grid and therefore being heated with alternative technology. District heating is spread all over Sweden but there are still locations where no grids exist. Naturally, not all of the clusters are suited for district heating but with a more standardised technology and an integrated network, it might be easier to connect new locations to an existing supply pipe and expand the demand and to oust substituting technologies. An alternative way of positioning oneself as a new entrant could be to only deliver heat in times of peak load demand. Of course it would not be possible to deliver a continuous flow of heat to the system because that is what base load suppliers do. But when the demand exists, prices are high, which could make the idea profitable. Furthermore contracts could be made between base load suppliers and those top load providers that lack the possibility of supplying base load, so they get paid for being able to offer reserve heat also in times when demand is low. In that way it would be economically possible for the peak load suppliers to survive. We suggest such new entrants who are insecure about how to position themselves should consider having a boiler that can switch from the normal product production to a production of pure heat for district heating.

6.2 Scenario 2 – Incalculable Politics

6.2.1 Existing companies

6.2.1.1 A few large reserve suppliers

When presuming a price-regulation that sets the highest price for what the customers can be charged for it is essential for existing companies to lower their costs to reach a higher profit. It is a fact that the stability and trustworthiness of district heating depend on delivery assurance. Therefore a large amount of district heating's capacity is always on hold as a backup solution in case the original supply fails for some reason. No common backbone structure and low compatibility between grids that geographically lie close to each other mean that all local systems must have spare capacity on hold. It is obvious from a theoretical point of view that having that many resources on hold in all the grids, just in case, is ineffective. A larger and integrated network could have one or several large amounts of district heating reserve resources on hold that could supply all grids nearby if problems should occur. Customers would only be dissatisfied if several suppliers in different grids would be unable to fully supply the nets at the same time and the reserve resources could not supply them all. However, in our opinion there is only a small risk that this would happen. That is because the district heating grid is not fundamentally sensitive to shorter lacks of supply as there already is a lot of energy in the grids. Therefore it takes some time for the grids to become completely emptied and we believe that our reflections about district heating reserve supply should be seriously considered by the industry. Restructuring, compatibility and an integrated network

could in other words be ways to create lower costs and create profits for existing parties even though a price-regulation exists.

6.2.1.2 Incineration decreases

The rules of EU demand that the level of incineration should be decreased. Garbage should be recycled instead of burned, an opinion existing parties must take seriously. In our opinion, today's system in Sweden contradicts with the EU perspective and we predict that incineration in the future might get much lower due to rising taxes on incineration. This will cause a substantially increased demand on waste heat, a factor important to recognise for existing parties. Early in the strategic phase when planning for the future, a minimisation of incineration should be suggested. Several of the existing parties in the district heating market will be stricken very hard if this scenario becomes a reality since a main part of their heat production consists of incineration and very little on waste heat. Therefore we suggest that it would be wise to reflect upon international environmental policies when deciding which strategic alternatives should be chosen for the future. We think it is reasonable to assume that higher taxes on incineration would be regulated with lower taxes on something else, possibly industrial waste heat. The consequence will be that incitement arises for taking advantage of the waste heat which becomes positive for the environment as well as for those district heating companies who in an early phase acknowledged this trend.

6.2.2 New entrants

6.2.2.1 Alternative systems and new markets

New entrants in this scenario consist of more than just new optimistic companies, but also customers, because in the future the distinction between sellers and buyers will blur. A grid with more distributors is less vulnerable than a grid with only a few distributors. Some problems regarding peak load delivery could be reduced since customers now have some of the reserve capacity themselves. In fact the advantages become bigger for those customers who live far away from the district heating suppliers and in small non-integrated networks. In this case, the house property owners should be able to deliver any heat that they did not use for the own properties.

We think complementary products, like Hax and Wilde (2001) suggest, to create value innovation could be developed. We believe it would be a wise strategy for possible new parties in the district heating market to do provide more than just district heating for their customers. The district heating technology and product development is rather poor in this scenario and therefore complementary products might be something to focus on. For instance a central digital thermostat for apartments, dormitories and houses could be an attractive product. For instance, the traditional radiator with its one to seven levels that do not make sense to anyone and rarely give the expected effect could be replaced with a digital thermostat like the ones in the air conditioning systems of cars. This kind of solution exists in new houses with modern technology but we believe there would be a market for complementary products if these are developed through creative and innovative thinking. To increase comfort is one way to use the thermostat but it could also be used with the heating reserve in the building. In that way customers would be able to realise quickly and accurately when they would have extra spare heat which they could sell profitable to those in need. Furthermore the market for proper heat isolation of houses will rise since customers can save and earn money

by keeping as much heat in the house as possible. Perhaps new entrants should consider this market as well and provide isolation products as complementary products.

6.2.2.2 More ways to use heat

New entrants with waste heat that fail to make a deal with the grid owners could also try to search for and invent alternative use of waste heat. Perhaps waste heat could be used to keep football stadiums, golf courses etc. free of snow in the winter. Other potential customers could perhaps be industries like laundries, bakeries etc. that could use more cheap heat than what they normally consume through district heating and therefore would be willing to make a deal. The possibilities exist for those with their eyes open for new alternatives. A controversial idea would be to build a pipe in the sea close to where the nuclear waste heat runs out and use that water for some kind of heating solution. That should theoretically be possible because it is water from the sea and not nuclear waste heat that is being used. An extra advantage for both possible new parties and existing companies with identifying alternative use of heat is that it prepares companies with competitive strategic options in case the energy prices would fall. Competition amongst parties or alternative heating solutions could result in a price decrease and perhaps more profit could be made in other ways than through being a traditional waste heat supplier to the district heating grid.

6.3 Scenario 3 – The egocentric society

6.3.1 Existing companies

Existing companies in the district heating market like Sydkraft and Vattenfall are representatives of what D’Aveni (2002) would call industrial leaders. When a market becomes re-regulated in the context of this scenario the industrial leaders must adjust quickly to the development because acting passively, hoping that the changing surroundings would not become a threat, could be catastrophic.

The issue of compatibility must be addressed by the existing parties. Whatever strategy is chosen both advantages and disadvantages exist. To choose to reinforce a positive compatibility development would be an advantage when thinking in a long term perspective. A compatible system would reduce the problems of delivery assurance especially in times of peak load. More waste heat resources could be used which benefit the environment and therefore positively affect the customers’ view of district heating. Furthermore it would definitely enhance the attractiveness of the industry with higher demand and investments as a result. But on the other hand a very high compatibility between different district heating systems might also become a disadvantage – at least for the existing companies. New entrant companies could too easily connect their waste heat to the system and then become a threat to the existing supply companies. If the co-operation between new and existing parties turned into a competitive environment which the re-regulated status of the market reinforces, then a low compatibility would benefit the existing parties in many ways, at least in a short term perspective. New entrant’s connecting costs would become very high. In fact it becomes, in most cases, impossible and the new entrants do not become a threat. The customers stay with existing companies because few alternative competitors exist. So how to deal with the issue of compatibility is a matter of balance whether focusing on a short or a long time perspective.

6.3.2 Defence for the industrial leaders

D’Aveni (2002) emphasises several defence strategies for industrial leaders in hyper-competitive markets. A *containment* strategy encourages stopping the technological development and raising switching costs for existing customers. In that way you stop the revolutionaries in the short time perspective, but the question is whether the strategy really benefits the existing actors or limits the development of the industry viewed in a longer perspective. On the other hand a *shaping* strategy that encourages co-existence and co-operation could actually turn out to be profitable for both existing and new parties. A progressive and attractive industry is not created with limited and ego-centric strategies. In fact a *shaping* strategy clearly provides future options which should not be overlooked. Giving the new entrants the opportunity to enhance the industry’s attractiveness for all parties and providing them with a first-mover effect, initially give the competitors an advantage and that is what the *absorption* strategy suggests should be done. Nevertheless this might become too risky if the existing companies do not have the capital to take over the new entrants if they should succeed too well. To buy the successful competitors after they have proved that they can succeed is actually a strategy worth reflecting about – especially when considering that capital hardly is a problem for the large existing parties. To horizontally integrate, according to Barney and Gordon (1990), does not only have to be about gaining sales-, operating-, investment-, and management synergy effects as Ansoff (1987) defines it. It can also be done to strategically keep one’s territory. To reduce the amount of rivals after letting them improve the industry by building compatible pipes, should be considered as an alternative.

Changing the attitude against compatibility solutions is not enough, because in this scenario the demographic population trend shift radically. People’s idea of life quality being highly correlated with peace and quietness must be reflected upon. As many as all participants in the industry could acknowledge that if this trend continues to grow as rapidly as in the coming ten years then it requires some kind of strategic reaction. New technology, better service and compatibility are needed if these country-side customers should be able to benefit from district heating. On the other hand a wise strategic move might be to accept that trends occur and disappear frequently and even though consumer density is declining, in a long time perspective it will return back to normal again. What should be taken seriously, on the other hand, is the media’s negative view on district heating due to the increased transparency. These allegations, whether true or false, must be counter-attacked. The decreasing confidence that occurred in the Swedish electricity market after the re-regulation has given some of the existing parties experience about how to handle a similar situation. Preventing media’s hysteria from evolving could be done as of today by gradually reducing all kinds of cross-subsidisation so when the re-regulation occurs the prices do not have to fall dramatically in order to reflect the true district heating price.

For the new entrants, the conditions are very difficult in this scenario. Parties that had not had any connection to the district heating market get a chance to connect to the grid – but it is the parties that already are providing services or supplying heat that get greater opportunities. What these companies could do is to create their own production and supply. Some district heating service companies are already being hired by large existing suppliers and grid owners to increase effectiveness due to their knowledge and competencies in the field.

Recession is considered to be an advantage for such companies because a recession demands lower costs and in that way encourages companies to outsource more, which benefits the service companies. We believe it is reasonable to assume that the amount of service companies would increase substantially in a short term perspective due to the recession. Those who survive will be the ones with the highest customer value. Customer value mainly consists of offering quality service to the lowest price. Only the companies that succeed with this will be the ones that survive, because eventually the competition will result in a few companies growing bigger while other companies disappear. Economies of scale is the main reason why smaller companies should try to grow bigger in an industry where low prices are what customers value the most. One could also chose to improve the other aspects of customer value such as specialisation and providing the right service to the right customers.

The increased transparency has gained a higher attention to where costs are being placed and prices set. Therefore much focus on costs exists in the market and a good strategy might be to use outsource more. Waste heat companies can pressure costs and set prices correctly when they outsource the distribution of waste heat. Clearly, according to Hagel and Singer (1999), an integrated business has its limit, but outsourcing should not always be used and sometimes it is actually an unbundling of the organisation that is necessary. Deconstructing the organisation and building it up again with focus on what the future business model should look like is theoretically recommended. In our opinion one should reflect thoroughly about what to anticipate from the future before engaging in an unbundling process. To know what the best business model would be is very difficult when one recently have entered a new market. A suggestion is a capability-based organisational structure with a high level of performance as well as a broad repertoire of capabilities, as Grant (2002) recommends. Another suggestion is focusing on Hagel and Singer's (1999) keywords which are lowering interaction costs and increasing creativity, flexibility and fastness in adapting to the changing surroundings. Which we believe is required for all new entrants as well as for the existing companies. Problems of peak load must be dealt with properly and increased compatibility and integration of networks are required if district heating as a product should succeed in the future of a TPA with such hard conditions as described in this scenario.

6.4 Scenario 4 – Terror strikes

6.4.1 Existing companies

Existing companies continue to earn money the way they always have done and no re-regulation encourages any other behaviour. The real threats come from terror risks, high electricity prices, the alternative systems and substituting products.

In our opinion existing companies should change their strategy even though no re-regulation occurs. Since new technologies are on their way, competitors are trying to build alternative systems and customers loyalty is decreasing as well as the environmental aspects of district heating are being questioned - something needs to be done - become a prime mover! Normann (2001) identifies prime movers as those with a new vision about value creation. Developing that vision means setting new game rules and benefiting from the changing rules in the industry. A prime mover also sees opportunities in understanding the customer from a new perspective – the value star. It suggests a development from a traditional value chain

perspective to an understanding of how the product of the company is a part of the customer's value creation system. Being a prime mover in the district heating industry could create the competitive advantage that determines which of the existing companies that will survive the difficult and almost impossible future described in this scenario. Since macro factors cannot be affected significantly but micro variables like the value chain can, this is what we recommend:

First of all, the companies' relationships with its customers can definitely be developed better. Even though a re-regulation does not exist, existing companies should still increase their transparency substantially. The companies that are not divided into separate divisions should clearly state which costs are connected to district heating and which costs are not. Customers will then benefit from lower prices. This will definitely cause problems initially, because it becomes impossible for the existing companies to charge high heating prices for customers who initially were willing to pay more for it. But the companies will benefit from the customer's fair pricing perception in a long term perspective.

Going one step further would be to acknowledge that a re-organisation brings about additional advantages. Instead of waiting for something as revolting as a terror attack, a possible re-regulation, higher taxes or a competing alternative system - the company should break up old structures and replace them with new ones. For instance, a separate grid operation with a separate supply division would decrease the centralisation of a big company, and hence increase its flexibility. With increased flexibility comes increased organisational adaptability to changes in the macro environment, which there are lots of in this scenario. The company should not be locked into the traditional thinking and accept where the boundaries of the market are today. Rethinking roles and identities and finding new possibilities before it becomes necessary we believe is a winning strategy. Realising in an early stage when the environmental credibility of district heating becomes questioned might create opportunities to prepare strategically for how to tackle the situation with counter-evidence, thus maintaining the customers' loyalty, which may otherwise decrease dramatically.

Geothermal heat's success will increase, but whether it will completely conquer the district heating market's customers is up to the existing parties' strategic choices. An efficient way to prevent new entrants and alternative technologies from getting a breakthrough is to keep customers locked-in, as suggested by Amit & Zott (2001) and Hax and Wilde (2001). The superiority of a technology in several historic cases turned out to be the least important aspect compared with timing and complementarities (Amit & Zott, 2001). Lock-in creates value because it prevents customers from switching to competitors. This is done by having total customer solutions, e.g. providing telephone, broadband, district heating, etc in addition to the electricity service from the same company, creates strong relationships between a company and its customers. The bundle of goods provides more value than the total value of each of the goods alone. Thereby complementarities are created and customers are locked-in. Nevertheless, trustworthy relationships also depended on delivery assurance, transparency and a fair pricing perception from the customers.

The terror scenario of district heating's future must result in changes in the value chain for those companies who want to survive. The district heating grids are already written off and can be categorised as a sunk cost. Therefore the grids can be retired and profit must be earned in some other way. If the companies are capable of changing their businesses' models and possibly search for alternative use of the heating that could be successful. Examples that we

have mentioned earlier are also relevant here e.g. considering heating of industries, heating of sports arenas etc.

6.4.2 New entrants

If the market is not re-regulated, there will be limited opportunities for possible new entrants because their access to the grid is controlled by grid owners only. To offer a low price on their waste heat or only offering waste heat in times of peak load are plausible strategic choices but they are not really that attractive.

It is still too difficult to compete with the superior information of existing companies and building an extra grid to compete with the existing grid is not recommended. Strategic focus for parties with waste heat should therefore be on geographical areas that do not already have a district heating system. Here it might be interesting to invest especially if waste heat opportunities are available. Co-operation with alternative substituting technologies might also be a profitable strategy and developing complementary products. Realising new ways to use waste heat, as for instance in sport arenas as mentioned earlier, is also an idea but to discover new geographical areas for district heating is the best offer available.

– 7 –

Conclusions

In this section the conclusions are presented. Firstly, the purpose is presented to remind the reader of what the thesis is about to answer. Secondly the scenarios are summarised as well as the different strategic options for each scenario. Thirdly we reflect upon the applicability of our chosen theory and about the use of scenarios as a method. Finally we reflect upon the process of our method and present our final remarks and suggestions for further studies on the subject.

7.1 Emerging insights

The purpose of the thesis is to describe a few possible future scenarios of the Swedish district heating market of 2015 providing, for each scenario, different competitive contexts for existing and new market actors. In each scenario future strategies for the parties involved will be identified.

Our study leads us to the following conclusions:

We have created four scenarios of how the future of the district heating market of 2015 might turn out. Each scenario is described from the time perspective of the year 2015. To construct the scenarios we have used the degree of competitive regulatory structure on one axis and the price on district heating compared to the price of substitutes on the other. The four scenarios have turned out to be as follows:

1. *The nuclear society* – A high competitive regulatory structure and a low price for district heating compared with substitutes. Nuclear waste heat is accepted as a source for district heating due to a political shift on the issue in Sweden. New technology development has increased the security of nuclear power plants that will continue to exist in the future.
2. *Incalculable politics* – A low competitive regulatory structure and a low price for district heating compared with substitutes. Although the regulatory structure is low concerning competitive aspects the state controls the district heating development through high taxes on incineration, and encourages waste heat with low taxes. At the same time the state protects the customers with a highest-price regulation for district heating.
3. *The egocentric society* – A high competitive regulatory structure and a high price for district heating compared with substitutes. The low-tech of district heating is not as

compatible as first assumed and parties do not co-operate in order to improve the compatibility. Negative aspects of a TPA become the driving forces of the development.

4. *Terror strikes* – A low competitive regulatory structure and a high price for district heating compared with substitutes. The environmental policies of the EU and the disturbance and political turmoil in the world change the conditions for district heating in unanticipated ways. Due to the risk of terror attacks the development of district heating halts. No TPA also adds to the low development. Substituting technologies finally become more than a serious threat.

In each scenario several strategic options were identified combining our empirical study, the theoretical study and our own strategic suggestions. In order to limit the study mainly strategies for the existing suppliers and possible new entrants were discussed.

There has been made a separation of theoretical options and the strategic options identified by us. However, there is no separation between the latter and the information obtained during the interviews. We have chosen to integrate the chapters since strategic options are internal business secrets and some of the respondents wanted to be left unquoted in the thesis. We conclude that there exist different strategic business options for the future, all dependent on variable future expectations.

7.1.1 Anticipating a nuclear society

If the scenario of a nuclear society and full TPA is anticipated, a few precautions must be taken into account. For an existing party in the market, Day (1997) recommends to adapt to an aggressive behavioural strategy, through vertical and horizontal integration when a stable and mature industry experiences something as revolting as a seismic shift created by a re-regulation. We, on the other hand believe, that a slightly different strategy is appropriate. Due to the superior information of the existing companies and strong capital there is no need to buy companies initially before they actually become a threat. In fact only those companies with real staying power should be dealt with and we actually believe that the competition would merely help the existing companies to optimise their own internal systems.

New entrants, we believe, should instead of connecting to the existing grids, just because it becomes possible, try to find locations where ineffective systems exist. Another option is to find locations where there are no networks developed and make deals with local waste heat suppliers and house property owners. Existing companies have too much experience and knowledge to become threatened by newcomers. If connecting to the grid, a new entrant could possibly be successful if co-operating and positioning the company as a supplier of heat in times of peak load demand. The key to success might be to install a boiler that can switch from the normal industry production to a production of pure heat when demand rises.

7.1.2 Anticipating incalculable politics

Existing companies should reflect upon international environmental policies as these will become a guide for the future development in Sweden. Anticipating that taxes increase on incineration and decrease on waste heat clearly show what heating fuel that should be used in the future. The price regulation encourages existing companies to lower their costs if they

want their profits to increase. We have identified an over-capacity in the grid due to delivery assurance in times of peak demand. The reserve capacity should be minimised which can be done through an integrated network which is something that existing companies should try to attain.

New entrants are in this scenario mainly identified as customers because the distinction between sellers and buyers will blur. Co-operation between existing companies and customers could result in lower costs for the companies but also for the customers that can make profits in times of peak load. What we believe could be an interesting development for new companies that want to enter the market, would be to create complementary products that reinforce this new buyer and seller relationship. For instance a central digital thermostat could increase the value of district heating customers and make it easier to identify when someone has extra heat capacity that could be sold. Customers with profit in district heating opportunities could create a larger demand for house isolation products.

7.1.3 Anticipating an incompatible society

For the currently active companies it is a matter of balance whether focusing on a short or a long time perspective when it comes to the developing compatibility or not. We believe it would be best for all parties, including the customers, if compatibility was increased even though a low compatibility would reduce the amount of rivals that succeed due to TPA. Therefore the compatibility issues become a high priority and a combination of D'Aveni's options is appropriate under such conditions. Both a *shaping strategy* initially and later an *absorbing strategy* will in our opinion become suitable.

For some of the new entrants recession turns out to be profitable because it requires companies to outsource more in order to keep decreasing costs. Demand for service companies with production competencies will increase. Companies currently active as service companies should not ignore the possibilities of creating an own district heating production based on the experience and competencies they have. In order to succeed they need flexibility, innovation and fastness for survival in these changing surroundings with low compatibility. A primary strategy for both new and currently active service companies is to hold a low cost strategy as low prices are of major importance to the customers.

7.1.4 Anticipating terror in Europe

From our point of view currently active parties should slightly change their strategy even though no re-regulation exists and try to become what Normann defines as a prime mover. Initiating an increased transparency opens up for customers' confidence and a more flexible and decentralised company. A true prime mover finds new possibilities without being locked in the traditional thinking. We suggest finding and taking advantage of new possibilities before it actually becomes necessary. Harsh conditions require something extraordinary from a company in order to survive in the district heating market. Preparing oneself for a difficult future could be done by reconfiguring the value chain re-evaluating what value is and how it is created. Lock-in of customers is furthermore recommended according to Hax and Wilde and we could not agree more – especially with substituting technologies emerging a loyal relationship and high switching costs are of utmost importance.

New entrants with waste heat opportunities are limited due to no re-regulation but the earlier identified option in a low competitive regulatory structure is to find geographical areas where district heating do not already exist. Another alternative is to co-operate with alternative substituting products that develop very fast, and if this is not possible, trying to find new ways to use district heating as an alternative. Sport arenas or industries with need of extra heat are some of our suggestions.

7.2 Applicable theory

Our theoretical foundation turned out to be valuable during the scenario building process but mainly during the strategic analysis. All the chosen theories were applicable for providing us with new and more elaborated perspectives than our interviewees and we ourselves initially had thought of. Our macro and micro theories all contributed to understanding driving forces in the scenarios as well as providing an understanding of the basics in the strategic management theories. The contemporary choice of strategic management theory gave us new and exiting parameters to work with. Even though the theories mainly have been developed in studies of ICT industries we found the theories to be useful in the context of district heating and believe that the critical elements of each theory can be applied on low-tech industries with a slower pace. Still, we will not exclude the fact that a more traditional analysis of the district heating industry also might have provided interesting and valuable results.

7.3 Scenario method

Using scenarios as a method had both positive and negative aspects. What we really enjoyed about the method was the final product - the understanding of the big picture that we had attained over a short period of time due to the valuable contact with the expert group. At the same time we hope we have created interesting reading that make people stop up and reflect a little due to the unorthodox results of the method. We believe that Schwartz' method that we chose was a good tool for our study but we cannot be sure of whether another scenario method would have been more appropriate. This is the greatest setback of the method. Even though we, the authors, and tutors as well as other involved parties were pleased with the results it is impossible to know if our research method has been the ultimate one. As even Schwartz describes the method as an art where the author during the process do not know what the outcome would turn out to be before you totally finish. Constantly we were faced with alternatives without knowing whether the road not taken would have been the right one. Good examples are the choosing of the time horizon of ten years, the setting of the number of scenarios and the driving forces that are the foundation of the scenario axes. Furthermore the process is time consuming. Perhaps too time consuming for a company to use it in a short time perspective. In a long term time perspective, though, it could become valuable for companies that wish to optimise the strategic decision process faced upon a large investment or a desire for a faster adaptability capability to changing surroundings.

7.4 The method process

Our approach of dividing the method into three stages turned out to be successful. We do not see how a better result could have been attained given the existing premises with no prior knowledge about scenarios as a method or the district heating industry. What we have acknowledged, though, are a few adjustments that would improve the process for scenario inexperienced persons who wish to participate in a scenario creating process. The preparation for the interviews must be supported by knowledge about the categorisation of the driving forces and key factors as the degree of importance for the focal issue or decision and the degree of uncertainty. Verbal guidance from someone who has used a similar scenario method before is also recommended. It is also important to be aware of the fact that a scenario building process is not meant to be scientific and therefore consists of unstructured and confusing elements. This knowledge would have caused the authors less headache during the past ten weeks.

7.5 Final remarks

To summarise - what is the reason for carrying out all these scenarios? It is meant to create an alternative way of thinking about the future and to identify possibilities and threats that earlier papers have not been reflecting upon. Events are easier to deal with when they happen if someone has reflected upon the fact that they might occur. What you gain from strategically reflecting about these scenarios is time since it takes less time to realise and accept when some of the events described actually do occur.

Strategies that work almost across all scenarios are connected to the driving forces initially identified. Currently active parties could benefit from a more transparent organisation. The amount of reserve capacity could be reduced independent of how the macro-environment will develop. The strategies mentioned for new entrants as identifying new geographic areas, building a grid and to find alternative use for heating could also be relevant for existing parties. In terms of lock-in effects - creating switching costs for customers is always considered a competitive advantage and should be initiated as soon as possible. What mainly comes to mind when reflecting about the district heating market is the perception of the low compatibility that exists in several companies. However, our readings indicate that a higher compatibility is not that far away in time and that new opportunities with an integrated network exist. If only involved parties work together it could be a benefit to them all.

We believe that we through this thesis have answered the questions we initially defined as important to us. Conclusively we identified a number of scenarios for the future as the purpose acquired an analyse of many dynamic variables and not just considering whether a full TPA would occur or not. Also, we have been able to present several perspectives on how strategies of both currently existing and new market actors could and should be changed in case of a re-regulation. We have also presented several alternative outcomes for the price of district heating dependent of the competitive structure of the district heating industry. We have also reflected upon alternative technologies as representing a possible future threat.

7.6 Suggestions for future research

There are areas that we have neglected due to limited time as for instance:

- Municipals position in the past, present and future
- Grid owners position in the past and present and future
- One single company's perspective on a specific issue

However, for us, the most interesting study would be a follow up study on our research. Possible questions to consider could for example be: What turned out to be correct in our estimations and what did not? Where the driving forces the right ones? Why did or did not different events or scenarios occur? Did any of the district heating companies implement our strategies, and in that case, how successfully did they turn out?

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- 2004-04-16 Tom Lindberg, Dalkia, Head of Energy Management (telephone)
- 2004-04-16 Sverker Andersson, Sydkraft, Mergers and Acquisitions (telephone)
- 2004-04-16 Pontus Angland, Sydkraft, strategic sourcing, supply chain analyst (telephone)
- 2004-04-19 Lars Vestergren, Vattenfall, Head of Markets, Värme Norden (telephone)
- 2004-04-21 Cecilia Önnevik, Fastighetsägarna, Head of inquiry (telephone)
- 2004-04-23 Rogert Läckström, Svekom, (telephone)
- 2004-04-26 Jonas Ek, Sysav, Head of Energy Department (telephone)
- 2004-04-26 Erik Thornström, Näringsdepartementet, secretary (telephone)
- 2004-04-26 Sven Werner, Chalmers Institute of Tech., Dr. of D.H. (telephone)
- 2004-04-26 Göran Lagerstedt, Näringsdepartementet, secretary (telephone)
- 2004-04-27 Lars-Göran Nilsson, Lunds Energi AB, Head of D.H. (visit)

- 2004-04-27 Göran Ek, Statens Energimyndighet, analyst, Department of Energy (telephone)
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- 2004-05-24 Gunnar Käck, Fortum (Birka), Strategic Unit (telephone)
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2004-05-26 Lars Vestergren, Vattenfall, Head of Markets, Värme Norden (telephone)
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