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2002

ISRN LUTMDN/TMHP--02/5015--SE

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Thesis for degree of Master of Science in Engineering

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LOAD DEMAND TARIFF

INDIRECT METHOD TO CONTROL SYSTEM LOAD DEMAND

TWO CASE STUDIES

by

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December 2002

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This publication is part of the project called Direct and Indirect Load Control in Buildings at the Division of Energy Economics and Planning, Department of Heat and Power Engineering, Lund University, Sweden.

Victoriano Pérez Mies, exchange student from the Valladolid University, Spain, carried out this study during one term 2002 as his thesis for the degree of Master of Science in Engineering.

Associate Professor Jurek Pyrko from the Division of Energy Economics and Planning, Department of Heat and Power Engineering at Lund University, has been the project leader and supervisor.

The project was financed by the Swedish Electrical Utilities Research and Development Company (Elforsk), project number 4184-LTH and FORMAS, project number 2001-1846.

ABSTRACT

This study was carried out at the Division of Energy Economics and Planning, Department of Heat and Power Engineering at Lund University, Sweden, as the Thesis for degree of Master of Science in Mechanical Engineering. Associate Professor Jurek Pyrko from the Department of Heat and Power Engineering at Lund University has been the project leader and supervisor of this thesis.

The main objective of this project is to investigate how a Load Demand Component, included in electricity tariffs, can modify patterns of electricity consumption in Swedish residential buildings and what the economic benefits (or disadvantages) are for the end-user and the utility.

In the first part of this report, a study of the electricity context in Sweden is made, in order to easily understand the problems associated with load capacity and how to solve them. The second and third part describe the effects of including a Load Demand Component in the electricity tariff, for different types of typical groups of residential customers, in comparison to previous tariffs.

Two different cases are investigated. In the first case Sollentuna Energy, which is a utility that operates in the Stockholm area, is analysed, using data stored in its databases from 2000 (when the ordinary tariff was still applied) and 2001 (after a load component had been incorporated in the tariff). This analysis includes a study about the economic effects associated with the new load tariff and a discussion about the changes in customers' consumption patterns. In the second case, the economic effects of applying Sollentuna Energy's tariff to Skånska Energy's (another Swedish utility operating in southern Sweden) customers are discussed. In order to consider as many factors as possible, a study of climate conditions and their influence on load consumption is also carried out.

The results highlight the fact that Sollentuna Energy's new load tariff has not worked efficiently (for the utility itself) since all analysed customers have gained

economic benefits even when they have not improved their electricity consumption patterns.

The conclusions drawn from this research project are that a Load Demand Component in electricity tariffs can constitute an advantageous solution to load demand problems if the tariff is correctly constructed, resulting in financial benefits for both customers and utility. Nevertheless, the change of customers' consumption patterns is an objective, which is difficult to achieve and as such more knowledge and research on appropriate incentives is needed.

Keywords: Load demand, electricity tariffs, Sweden, residential customers, peak load, patterns of consumption.

REPORT'S CONTENTS:

ACKNOWLEDGMENTS

I would like to express my gratitude to the supervisor of my thesis - Associate Professor Jurek Pyrko, for his continuous helpful comments, criticism and assistance of my work. I also would like to thank the colleagues in the Department of Heat and Power Engineering, with especial mention of Juozas Abaravicius and Kerstin Sernhed for their advises and moral support.

I would like to thank the Swedish institutions Formas and Elforsk and the Valladolid University for the support of my thesis work.

My sincere appreciations come to a great number of people in various Swedish and Spanish institutions, for providing me with information and devoting their time for personal interviews.

I express my gratitude to my family and friends in Spain. Their moral support and encouragement always followed me during my stay far from home.

Finally, my sincere thanks come to all my friends in Lund. I will never forget our marvellous adventures and experiences. “A las ocho en el AF”.

1. INTRODUCTION

1.1 BACKGROUND

After the liberalisation of the Swedish electricity market in 1999, many things have changed in the marketplace. The liberalisation has kept the prices at the same level as in 1996 and has made customers able to choose the electricity supplier that best fits. However, not all consequences of the re-regulation have been positive, some problems have appeared too.

Due to predominantly economic and political reasons, the load reserves have dwindled while the load demand keeps increasing every year. In Sweden, the problem of load capacity is getting more serious as is the necessity for solutions.

How can the margin between load demand and load capacity be managed, so that it is large enough to ensure that the risk of electricity shortages is kept at a minimum? This is a very difficult question to answer, as some of the proposed solutions cannot be implemented – such as the construction of problematic power plants (nuclear), or the use of some power reserves that are detrimental for the environment.

Over the last few years, one of the investigated solutions has been the use of “negawatts”. This concept makes references to the fact that if load generation cannot be increased, but load demand can be dropped, the final effect will be the same.

There are many directions to produce "negawatts". In this report the relationship between negawatts and a load component in tariffs will be discussed as well as the effects of this relationship on the end-user.

1.2 OBJECTIVE

The objective of this study is to investigate how tariffs can change the habits of electricity consumption in different groups of residential customers. The goal is to lower load demand and avoid load peaks. This way, the risk of electricity shortages will decrease.

1.3 METHOD

In order to achieve lower load demand and avoid load peaks, a Swedish electricity utility (Sollentuna Energi) introduced a new component into the electricity tariff, with different charges depending on the average value of three load peaks obtained every month.

This report studies the influence that this new load component is likely to have, not only on the use of electricity and the load demand, but also on the cost of electricity for the customer.

In order to carry out this work, a general picture of the Swedish electricity market is given. This will be the first section of the report. Secondly, data compiled by Sollentuna Energi over year 2000 and 2001 will be analysed. These data will provide information regarding changes in electricity use for three different groups of customers, when a load demand component is added to their electricity bill. Finally, an extrapolation of the Sollentuna case will be carried out with customers of Skånska Energi, another Swedish electric utility.

2. ELECTRICITY MARKET IN SWEDEN

In order to study the influence of a new load component on the use of electricity and the load demand, it is necessary to study the electricity situation in Sweden. This investigation must focus on energy resources as well as the cost of electricity for the end-user. This way, the problem will be easy to understand, and can also enable the generation of solutions.

Firstly, a general study about the generation and demand of electricity will be conducted. Following on from this, a description of what the residential electricity consumer has to pay for will be given. Finally, a more extensive description of the problem will be made.

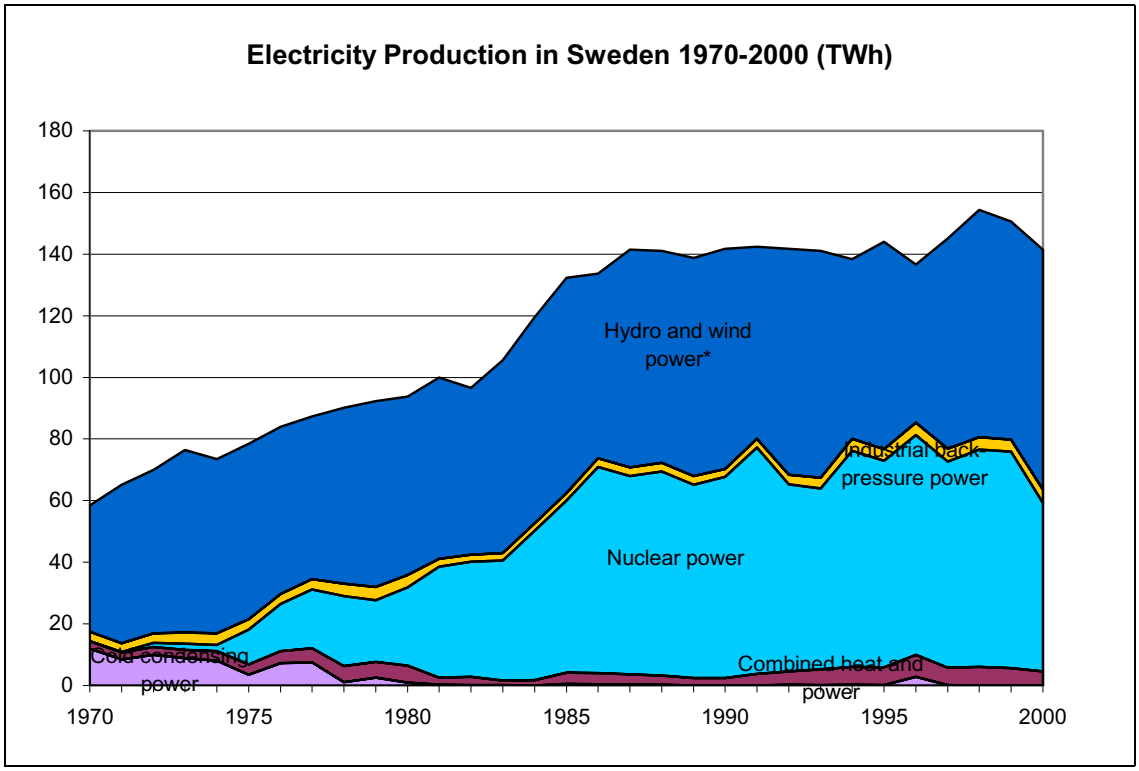
2.1 ELECTRICITY SUPPLY

Electricity supply is extremely important to all industrialised countries, being at the same time an indicator of the country's social and industrial development.

At the beginning of the 1970s, electricity was generated in Sweden by means of thermal power plants and hydropower. Due to the oil crisis and environmental laws, the construction of nuclear power plants commenced. Since 1975, more electricity is produced by nuclear power plants than by conventional power plants. [3]

Nowadays, electricity is produced in Sweden by means of hydropower and nuclear power. The wind power contribution is increasing but still constitutes a very small part, amounting to 0.3% in 2000. Conventional power plants are used as well, but today they represent no more than 6% of the total electricity production, being used as a reserve capacity. Nevertheless, many of them are being closed due to the reformation of the electricity market - for economic reasons. [3]

In Sweden, the total installed capacity is over 30,000 MW. However, this load capacity cannot be continuously available at a 100% level. Furthermore, there are problems with the transmission of energy between the north and south of Sweden. [3]



*Wind power since 1997

Figure 2.1: Electricity production in Sweden. [3]

2.2 ELECTRICITY USE

Over the past thirty years, electricity consumption in Sweden has constantly been increasing at a rate of about 1-2% per year and nowadays the demand is close to 150 TWh. This equals approximately 16.52 MWh/a per capita, which is one of the highest electricity consumption levels per capita in the world. [2]

The most important increase is to be found in the residential sector, due to the change from oil to electricity for heating. This is why there is a strong relationship between ambient temperature and electricity consumption. [3]

Electricity use in the Swedish industry has increased too. In this case, consumption is linked to the evolution of a small number of important industries such as pulp and paper, which consume about 40% of the total electricity used in the industry. [4]

The industry and the residential sectors are the two major sectors in terms of electricity demand. However, there are others, like the transport sector and district heating plants. The total electricity demand also takes into consideration losses associated with the transmission of electricity. [3]

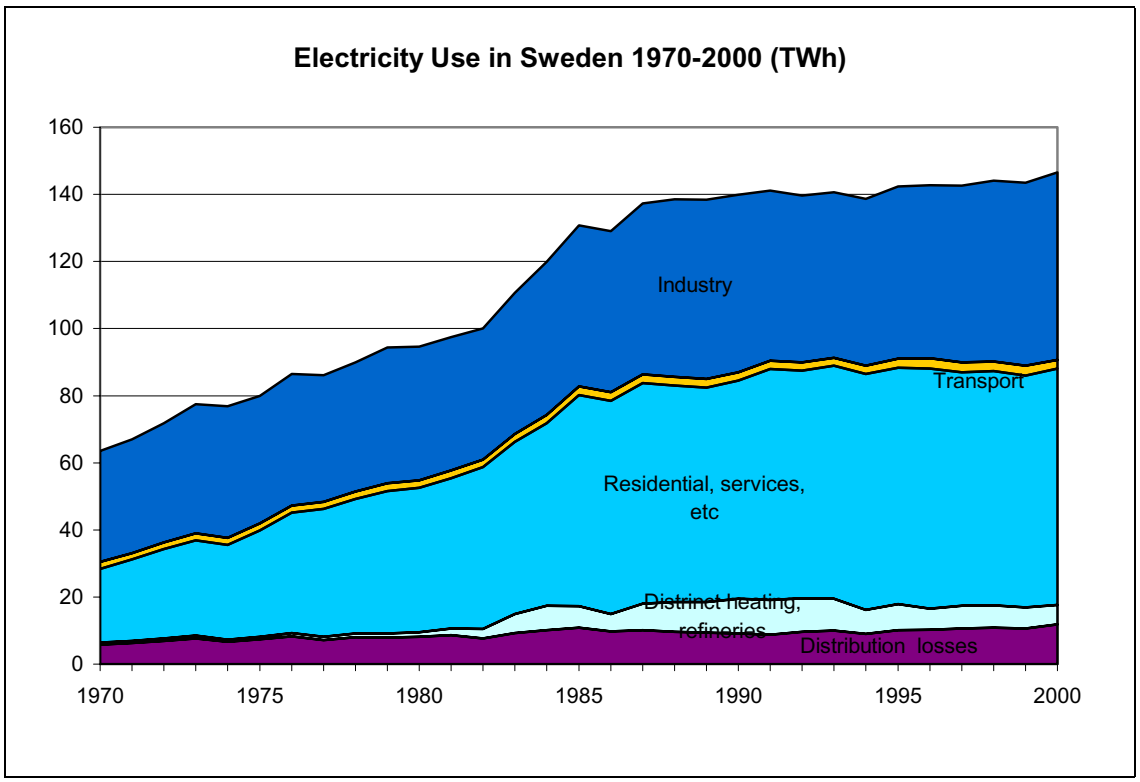


Figure 2.2: Electricity use in Sweden by sectors. [3]

Table 2.1: Electrical energy generated and consumed in Sweden in 1990, 1995-2001 and forecasts for 2010, TWh. [1]

	1990	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2010**
Generation	142.2	143.9	136.0	145.2	154.6	150.9	140.1	157.8	149.4
Hydro power	71.5	67.0	51.0	68.2	73.8	70.7	76.4	78.5	67.0
Wind power	0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	2.0
Nuclear power	65.3	67.0	71.4	66.9	70.5	70.2	54.7	69.2	68.3
Other thermal power	5.6	-	13.5	9.9	9.9	9.6	8.6	9.7	12.1
CHP in industry	3.1	3.8	4.5	4.2	4.0	4.5	4.2	4.4	4.9
CHP in district heating networks	2.1	5.5	5.4	5.3	5.7	4.9	4.2	5.2	7.0
Condensing power	0.3	0.4	3.6	0.4	0.2	0.2	0.2	0.1	0.2
Gas turbines	0.1	0.1	0	0	0	0	0	0	0
Consumption	139.7	142.2	142.2	142,5	143.9	143.4	144.8	150.5	154.6
Network losses	10.7	8.3	9.4	11.6	12.7	11.4	10.7	12.1	11.3
Imports-exports	-2.5	-1.7	6.1	-2.7	-10.7	-7.5	4.7	-7.3	5.2

2.3 TARIFFS, Electricity Price and Taxes

In the actual Swedish electricity market, post re-regulation, customers can choose the company they wish to buy electricity from. Once the customers are connected to the network, they are free to look for the supplier who is best suited [3]. The liberalisation of the electricity market is not yet complete as the network supply is still a monopoly. [4]

Electricity charges vary between different customer groups. This is due to the structure of the electricity market, differences in taxation, and varying distribution costs. The final price is determined by the equilibrium between supply and demand.

On average, the cost of electricity for the end-user is the same today as in 1996. Post liberalisation, electricity prices were dropping until the end of 2000 when energy production was reduced with the objective of increasing prices again. Since the beginning of 2001, the cost of electricity has been increasing, and this trend seems to be stable. [2]

Table 2.2: Typical Liberalisation Effects on Residential Electricity Prices in Sweden. [4]

	Villa Customers	**Apartment Customers**
Before de-regulation	0,959 SEK/kWh	0.780 SEK/kWh
After de-regulation: non negotiated contract	1.025 SEK/kWh	0.799 SEK/kWh
After de-regulation: new or re-negotiated contract	0.940 SEK/kWh	0.705 SEK/kWh

Trade takes place through the electricity exchange, which is regulated by the Nordic Power Exchange, called "Nord Pool". This organisation was the first electricity marketplace in the world and has been operating since 1993. The benefit of trading through Nord Pool is that transactional costs are lower than those for bilateral agreements. In fact, it is typically cheaper to import electricity than to generate it domestically. [1]

THE END-USER'S BILLS

Typical end-users receive two bills, one from their electricity supplier and a second one from their electricity network owner. The total electricity charge consists of:

- The Price of electrical energy.
- A network tariff.
- Taxes.

The price of actual electrical energy is about 25% of the total electricity price to Swedish domestic customers. The network tariff accounts for 35%, and taxes represent about 40%. As can be seen, taxation is the most expensive part of the bill. This is the

main reason why the total price which end-users have to pay, has not changed significantly since 1996 and will rise next year too[3]. The composition of the total electricity price is summarised in Figure 2.3.

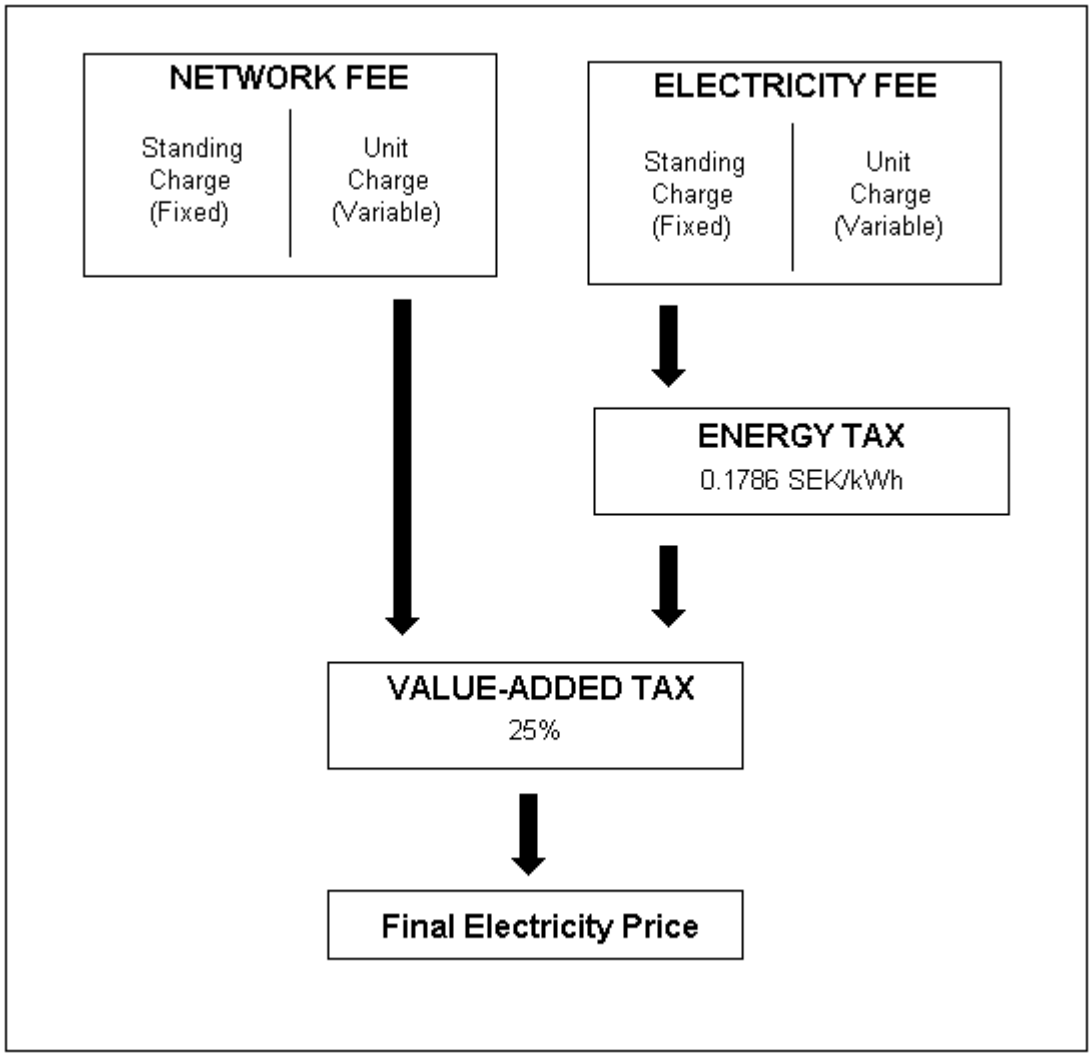


Figure 2.3: Composition of the total electricity price in 2001. [4]

As is shown in Figure 2.3, within each of these two bills (network fee and electricity fee) charges are divided into two parts. The first part is a variable fee, dependent on the amount of electricity (kWh) used. The second part is fixed, independent from the consumption.

The fixed part of the network fee is based on the value of the main fuse used in the household, and the variable part is the charge for transmission and service of the network.

The fixed part of the electricity fee is due to a subscription fee, which is charged by the electricity supplier.

THE PRICE OF ELECTRICITY TO THE CUSTOMER

Due to increased competition, electricity-trading companies have been forced to adjust their prices. This happened until the beginning of 2001 when prices started to rise again. In fact, the price of electricity for customers living in single-family houses without electric heating increased by 3.4% and for customers with electric heating, by an average of 3.2%. [3]

The rise in price was the most important reason why, in February 2001, about 15% of Swedish households had changed their electricity suppliers. This represented a big difference from February 2000 when only 7% of the households had changed their suppliers.

The change of supplier was easier to carry out because of the regulation introduced in November 1999, which allowed customers to choose their electricity suppliers for free, on the first day of any month. [3]

THE NETWORK TARIFF

The network tariff represents the charge for the transport of the electricity and for making the connection to a power line or to a power line network.

Customers cannot choose their network, so network tariffs must be reasonable and non-discriminatory. In order to reach this objective, network tariffs have to be published and supervised by the National Energy Administration. [3]

Customers are classified into groups according to their main characteristics - depending on whether they have electric heating or not, and whether they have a time

tariff or not. Furthermore, customers in the same group have to be charged from the same network tariff and the tariff must not be different depending on the area in which a customer lives. Since 1996, the network tariff has increased by on average 3%, as can be seen in Table 2.3. [3]

Table 2.3: Network charges on 1 January 1997 and 1 January 2001, öre/kWh, and percentage changes. [3]

	Upper quartile			**Median**			**Lower quartile**		
	1997	**2001**	**%**	**1997**	**2001**	**%**	**1997**	**2001**	**%**
Apartment	47.2	48.2	2	41.3	42.4	3	33.1	34.8	5
Single-family dwelling without electric heating.	42.0	43.4	3	36.0	37.2	3.	29.7	31.1	5
Single-family dwelling with electric heating.	24.6	23.4	-5	21.3	20.7	-3	18.6	18.2	-2

Viewed overall, the network tariff has increased for customers whose electricity consumption is low. For customers with high electricity demand, the network tariff has dropped.

THE TAXATION SYSTEM

In Sweden, the consumption of electricity is taxed. The end-customer has to pay two different taxes, the energy tax and the VAT (Value Added Tax) that is applied to the total price of electricity, including the energy tax. Nevertheless, the increase of the carbon dioxide tax makes electricity cheaper in relation to other energy sources.
The energy tax value is not the same in all of Sweden, varying between 14.8 öre/kWh in northern Sweden and 18.1 öre/kWh in the rest of the country. [3]

Electrical energy is taxed at the generation level too. All fuels used for the generation of electricity are exempt from energy taxes. However, a part of this fuel is considered as in-house used and is therefore taxed. This is why every fuel used for electricity generation is subject to environmental taxes, such as Nitrogen tax and Sulphur tax.

The generation of electricity in nuclear power plants is taxed on the thermal power reactor, at a rate of 5 514 SEK/MW. [3]

2.4 LOAD PROBLEMS - GENERAL OVERVIEW

The most common term used when talking about energy is “energy use”, expressed in kWh or MWh. This term represents a certain amount of energy, but is not sufficient when it comes to understanding the behaviour of electricity demand. In order to see how electricity consumption varies, it is appropriate to talk about load demand, expressed in kW or MW. The Swedish network is dimensioned on total energy need, which is not useful if load demand cannot be delivered on a momentary level. This is the most important reason for system blackouts. [4]

A further consequence of the liberalisation of the energy market is that many energy generation plants have been decommissioned or preserved for economic reasons. As a consequence, the amount of reserve capacity plants has dropped, resulting in the margin between maximum load capacity and maximum load demand decreasing, as shown in Figure 2.4. [2]

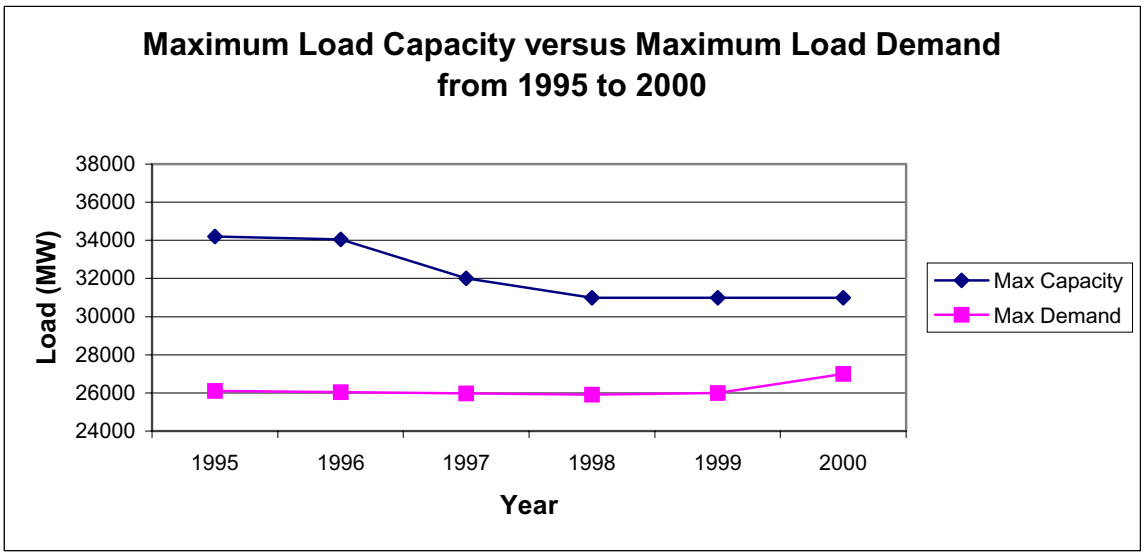


Figure 2.4: Sweden’s installed load capacity and demand. [4]

The margin between load capacity and load demand has dropped from 23.0% in 1996 to 12.6% in 2001. If this trend continues the Swedish network will not be able to supply the load demand and Sweden may experience serious power shortages.

This problem seems to be more impending if we study the main areas of production and consumption of electricity in Sweden. The highest demand is located in southern Sweden, where the majority of Sweden's population resides. However, the most important areas for energy generation are located in the north of Sweden. This means that it is necessary to transfer electricity from the north to the south and even to buy electricity from other countries. As is shown in Table 2.4, the south of Sweden is highly dependent on load imports. [4]

Table 2.4: Regional Balance in Sweden for Winter 2000/2001. [4]

	Southern Sweden	**Northern Sweden**
Total Available Load Capacity	16238 MW	12502 MW
Expected Load Demand	23220 MW	4880 MW
Regional Load Balance	-8182 MW	7018 MW
Load Transfers		
From within Sweden	6500 MW	-6500 MW
From the rest of Scandinavia	1550 MW	0 MW
Other Transfers	570 MW	0 MW
Load transfer Balance	8620 MW	-6500 MW
Final Load Balance	**438 MW**	**518 MW**

This problem is even more serious since the shutdown of one of the nuclear power reactors, Barsebäck 1, which involved the loss of 600 MW in southern Sweden. [2]

The solutions to this problem cannot easily be found. Firstly, the reserves of load generation are dropping for political reasons (the decommissioning of nuclear power plants) and for economic reasons (the decommissioning of conventional power plants). On the other hand the load demand is increasing due to the use of electric heating, especially on the coldest days of winter. It is known that the inverse relationship between load demand and temperature in Sweden is approximately 350MW/°C in total. [4]

The conclusion to this section is that if Sweden does not increase its load capacity or compensate for the low production with "negawatts", it is obvious that Sweden will not be able to supply the load demand. This would increase the dependency on neighbouring countries, increasing the price of electricity and the possibility of power shortages.

2.5 DIFFERENT SOLUTIONS TO THE LOAD PROBLEM

Obviously, there are two ways to solve the problem of load capacity. One is on the supplier side, and the other one is on the demand side. On the supply side the most popular solution so far has been to produce more electricity, building more power plants and increasing the electricity generation. Since the re-regulation, this solution is not economically viable. This is because the electricity market is more competitive and as such production has to be dropped as much as possible as the fixed cost of electricity production is too high. This is the reason why many power plants have been decommissioned.

The supply-side nowadays includes energy storage technologies, such as Pumped hydro, or Waste-to-energy generation, Cogeneration and Reduction of energy transmission losses. [5]

On the demand side the goal is to level out the consumption of electricity, in order to reduce the peak load demand and to keep the margin of load capacity big enough to ensure supply of electricity at all times.

There are several ways to reach this objective, such as:

- Direct Load Control (DLC): This type of control programs activities that can interrupt the electricity supply to a customer's individual appliances or equipment. DLC can be used on equipment that can be switched off with short notice. DLC usually involves residential customers. [5]

- Time-Of-Use Tariff (TOU): This strategy of management uses different types of tariffs to encourage customers to eliminate consumption during peak periods. TOU is designed to reflect the utility cost structure where rates are higher during peak periods and lower during off-peak periods. [7]
  TOU tariffs based on peak load pricing have been introduced in recent years, having proved to be one of the most efficient strategies in load management.
  Both the supplier and the end-user benefits from successfully designed TOU rates. [5]

- Interruptible Load Tariffs: This type of tariff consists of incentives, which are given to customers for interrupting or reducing the power consumption during peak periods or in emergency conditions. When customers sign an interruptible load contract they have to reduce their electricity consumption as and when requested by the utility. [5]

3. CASE 1 - SOLLENTUNA ENERGY

In this part of the report, two different practical cases will be analysed. The aim of this part will be to highlight the influence of the changes in electricity tariffs on electricity consumption, through differences in data from 2000 and 2001. This is the most important part for the electrical utility.

Furthermore, since the electricity price is the most important factor in the change of the tariff on the customer side, an economic study will be included.

3.1 TOTAL DEMAND DATA

3.1.1 INTRODUCTION

Sollentuna Energy is a Swedish energy utility which operates in the Stockholm area supplying electricity to about 24 000 customers: 12 000 flats, 8 000 villas and 4000 terraced houses. Sollentuna is also one of the Swedish energy utilities, which have recently installed remote metering/billing systems based on 1-hour measurements, stored in databases. The system is fully implemented and is used for both data collection and billing. [2]

Since January 1st 2001, Sollentuna Energy is the first energy utility in Sweden to have incorporated a load component into its grid tariff. This load charge depends on an average load value of three load peaks during one month. [2]

The utility's maximum contracted load capacity is 106 MW. The contracted load was exceeded on February 5th 2001, between 8:00 and 9:00 am by a maximum peak-load with a value of 112 MWh/h. This peak of consumption took place during a particularly cold period in Sweden. It is obvious that load demand is influenced by the climate; in fact about 40% of the total demand is climate dependent [4, 2]. As the previous example shows, Sollentuna has a problem of load capacity that becomes even more serious during cold periods.

The main objective of the load component in tariffs was to make the end-users more conscious of load capacity problems. The long-term aim is to reduce the load demand in the whole service area in order to decrease the level and the price of load contracted from the electricity supplier and secondly, to avoid expensive investments necessary to strengthen the grid. [2]

3.1.2 TOTAL DEMAND DATA ANALYSIS

First of all, it is necessary to be conscious of the fact that the climatic conditions were different in 2000 and 2001 and as such so was the total energy consumption. Weather data from Stockholm during the studied period is available in Appendix A. The analysis has to be carried out from a general point of view because there are many other influencing factors that will not be considered in this study.

a) Maximum and minimum 1-hour total load demand for every month during 2000 and 2001

The extreme load demand values in 2000 and 2001 expressed in kWh/h were:

Table 3.1: Maximum and Minimum 1-hour Total Load during 2000 and 2001.

MONTH	2000		2001	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
January	**104 400**	49 100	99 180	50 400
February	93 110	47 730	**112 000**	54 400
March	84 060	44 190	97 530	47 620
April	75 890	27 580	74 880	37 030
May	62 270	26 910	60 530	28 750
June	57 650	22 910	52 680	23 790
July	46 400	**22 340**	44 970	**22 370**
August	50 420	23 450	50 950	23 440
September	62 380	27 850	65 860	26 800
October	74 660	31 260	80 250	33 870
November	82 180	38 250	92 150	43 420
December	92 620	42 990	111 900	52 100

The same information is presented as a diagram below.

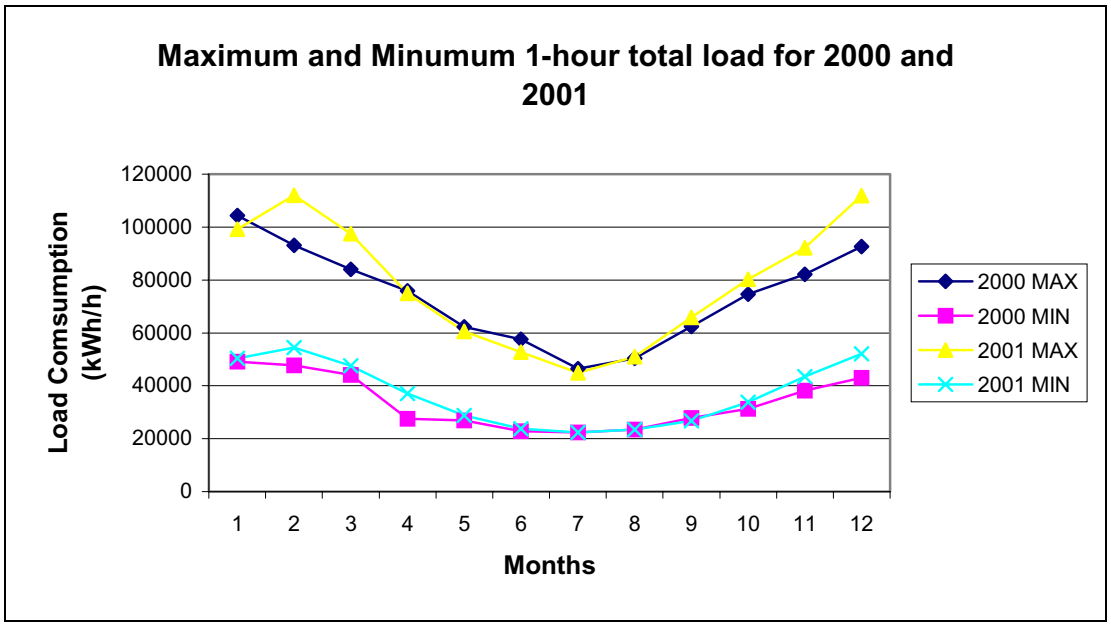


Figure 3.1: Maximum and minimum 1-hour total load during 2000 and 2001.

Despite the values being quite similar in 2000 and 2001 there are differences and some interesting aspects to emphasise. Firstly, in February, March and December, the maximum values of load demand were significantly higher in 2001 than in 2000. Secondly, during the warmest period of the year, between April and September, the maximum values of load demand were very close for both years. During the winter period from November to March, every month apart from January were colder in 2001 as shown in Table A.1 through the Degree Days values. These facts highlight the relationship between climatic conditions and electricity consumption in Sweden.

It is also interesting to look at the margin of load capacity (MLC) for every month. This factor is calculated as, and is expressed as a percentage, where $P_{h,\max}$ is the maximum 1-hour load demand value for each month, and 106 000 is the utility's maximum contracted load capacity. These values are shown in the diagram below.

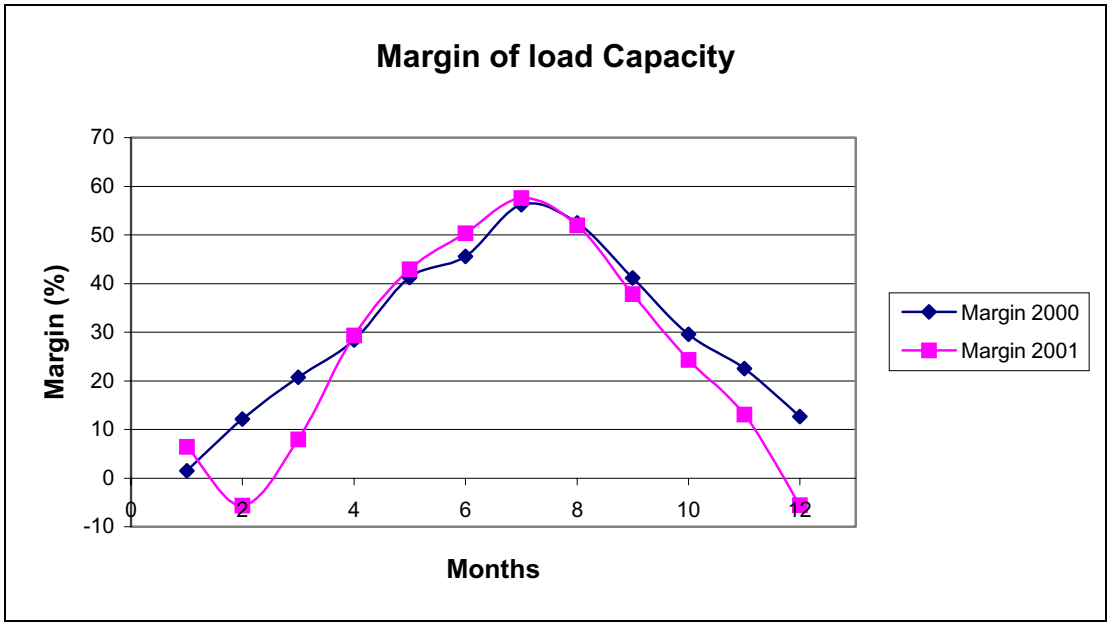


Figure 3.2: Margin of load capacity of Sollentuna Energy in 2000 and 2001.

This figure contains the same information as the previous one, but represented in a different way. It shows Sollentuna's problem with load capacity, which was particularly serious during very cold periods like January 2000, February 2001 and December 2001. In fact, when the Degree Day value is higher than a certain value (approximately 560), the margin of load capacity is not large enough to secure the supply of electricity.

b) Duration curve from a 1-hour load demand for the years 2000 and 2001

This curve shows the values of 1-hour load demand during one year. These values have been placed in decreasing order so that it is possible to establish the number of hours when the consumption has been higher than a certain value. The highest values represent the peaks of load demand during the studied year. The lowest values represent the base load of the utility.

The total energy consumption during a year is also shown; it is the area below the curve. A greater amount of important information is available from these curves than from the 1-hour average load demand in a year, from the total energy consumption and the number of hours of the year.

Also, the shape of these curves is interesting because it reflects the values of load demand which are more common as well as those that are not frequent. The flatter the slope of the curve, the more frequently the load demand value occurs.

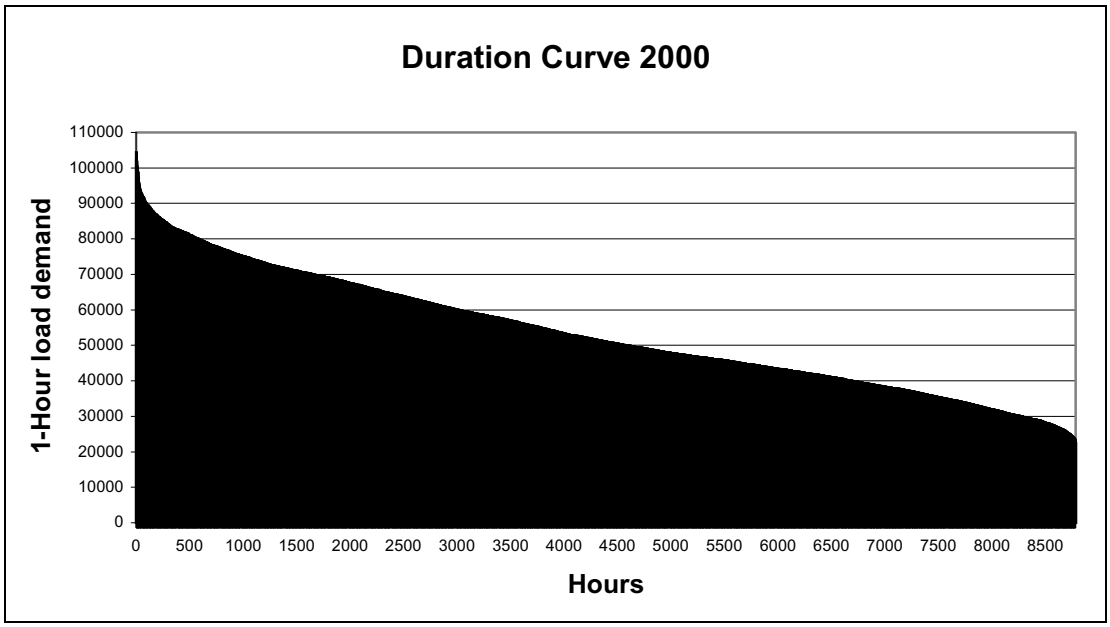


Figure 3.3: Duration curve from 1-hour total load curve for 2000.

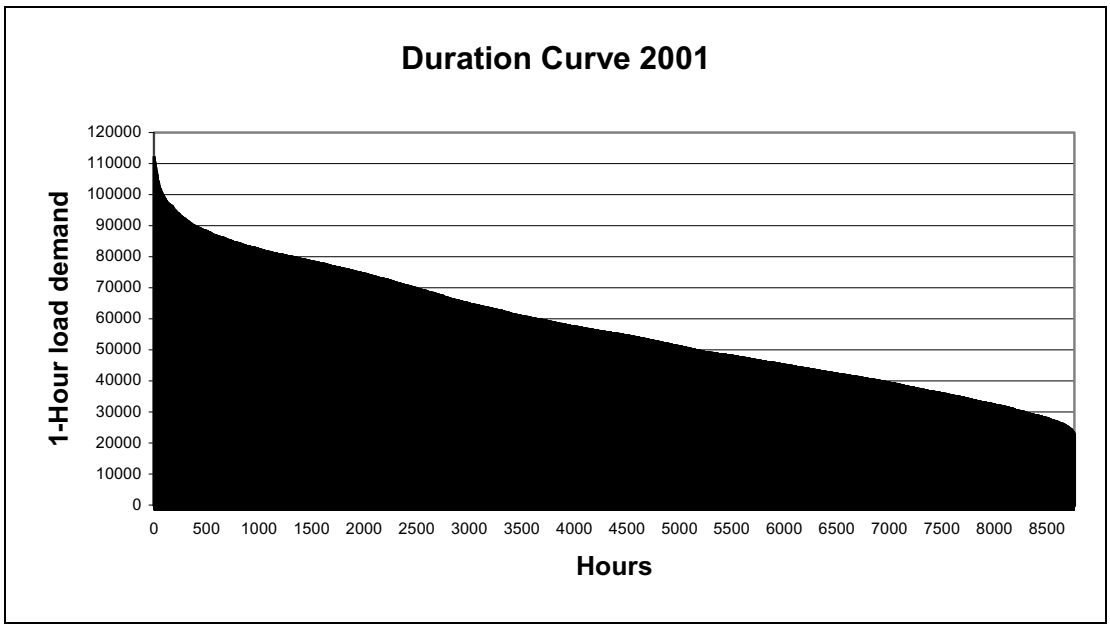


Figure 3.4: Duration curve from 1-hour total load curve for 2001.

From the source data of these curves the following information is available:

Table 3.2: Number of Hours with Consumption Higher than a Certain Value, Total Electricity Consumption and Average of Load Demand.

Number of hours per year with a load consumption higher than a certain value		
Higher than:	**2000**	**2001**
+110 000 kW	0	8
+100 000 kW	8	78
+90 000 kW	90	378
+80 000 kW	577	1 298
+70 000 kW	1 644	2 471
+60 000 kW	3 002	3 618
+50 000 kW	4 567	5 140
+40 000 kW	6 675	6 890
+30 000 kW	8 260	8 266
Total number of hours	24*366	24*365
Total energy consumed (MWh)	468 265.3	500 753.63
Average load consumption (kW)	53 308.891	57 163.656

As is shown in Table 3.2, the consumption in 2001 was higher than in 2000. On the other hand, the shapes of the curves are similar, with approximately 400 hours per year when the consumption is much higher than the values expected, considering the trend of the curve.

c) Monthly Load Factor (LF_m) for each month during 2000 and 2001

This factor is calculated as $LF_m = P_{h,av} / P_{h,\max}$ and expresses the relative value of the highest peak load in relation to the average load consumption during one month. Values close to 1 indicate that the highest peak is not significant, which is the desired objective. The values of LF_m in 2000 and 2001 are shown in Figure 3.5.

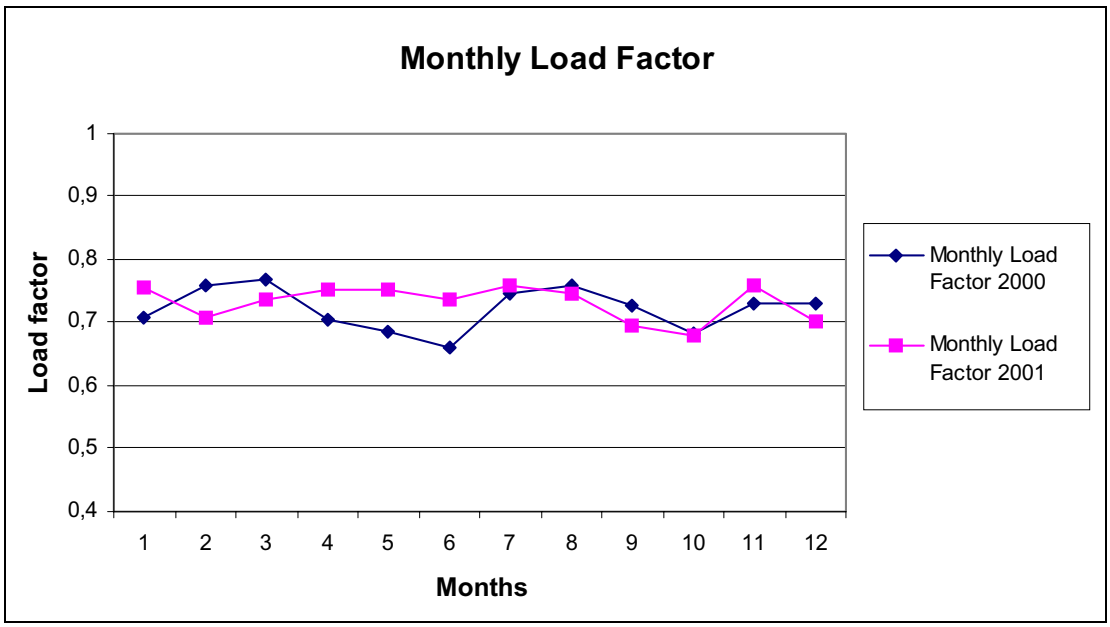


Figure 3.5: Monthly load factor for each month during 2000 and 2001.

The average of this factor was **0.72** in 2000 and **0.73** in 2001. In addition, the values of LF_m were more uniform in 2001. Notwithstanding this, the differences are not as large as expected. The most considerable improvement occurs during January, April, May and June.

d) Monthly Average Load Deviation for each month during 2000 and 2001

This factor is calculated as $ALD_m = \sum (P_{d,\max} - P_{d,\min}) / n$. High values indicate that the consumption has been very irregular during a particular month, with big differences between maximum and minimum values of daily load demand. This factor took the following values during 2000 and 2001:

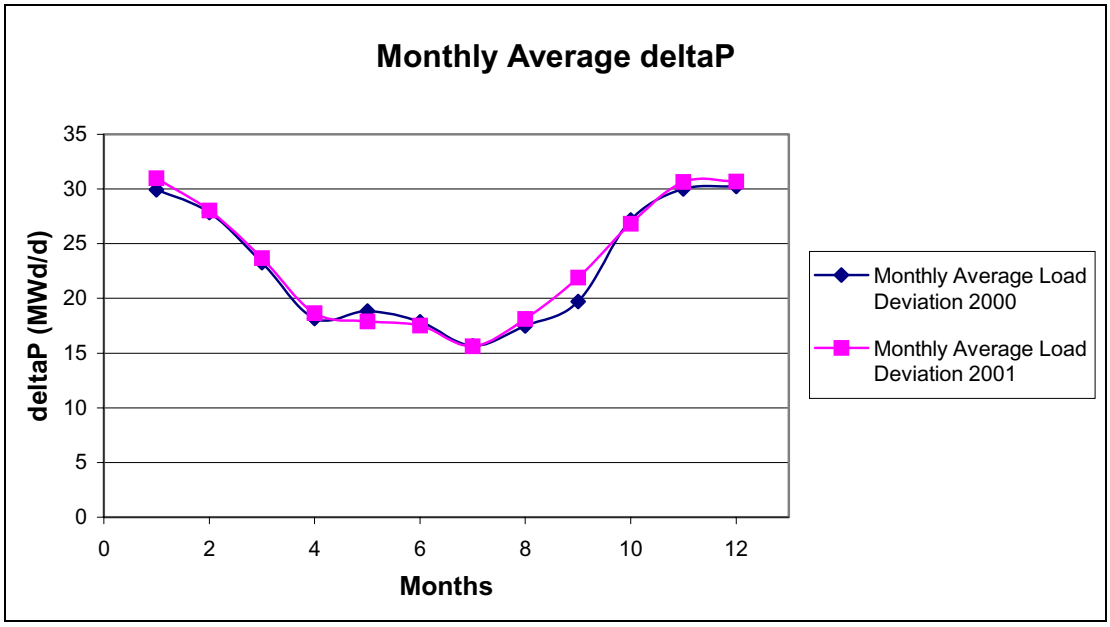


Figure 3.6: Monthly average load deviation for each month during 2000 and 2001.

As is shown in Figure 3.6, this factor takes higher values during the coldest months of the year. Notwithstanding this, there are no significant changes from 2000 to 2001. The trend is virtually the same for both years, and as such no relevant information or conclusion could be extracted from the study of this factor.

3.2 CUSTOMER ANALYSIS

3.2.1 INTRODUCTION

In the following section, fifteen of Sollentuna Energy's customers will be analysed. These customers are grouped into three different categories: flats, villas and semi-detached houses. The analysis will focus on two different approaches. Firstly, an economic study will be conducted, in order to establish the changes in electrical expenses for customers due to the new tariff. Secondly, changes in consumption patterns will be discussed. This part of the analysis will be made from the utility point of view, in order to establish whether the objectives have been reached.

3.2.2 FLATS (with district heating)

Five customers in flats will be analysed. They are all district heating users, so the values of electrical consumption are not climate dependent. Furthermore, their fuse level is 16A, which is the lowest fuse level of all the customers studied.

There were some problems with the meters for two of the customers, Flat D and Flat E, so some data is unavailable.

In the economic study and comparison between the ordinary tariff and the load tariff, the cost of electricity has been calculated using the following formulas:

<u>*Ordinary Tariff*</u>: $Cost(SEK) = (Energy * 0{,}08 + 127) * 1{,}25 + Energy * 0{,}555$.

This expression has two different parts, **the grid fee** "$(Energy * 0{,}08 + 127) * 1{,}25$" and **the energy fee** "$Energy * 0{,}555$". Taxes are included in both expressions.

Where:

- *Energy* is the electricity consumption during one month.
- 0,08 (SEK/ kWh) is the Unit Charge of the network fee. Value-Added Tax is not included. (See Figure 2.3)
- 127 is the Standing Charge of the grid fee. It is also called fuse level fee. Value-Added Tax is not included.
- The two previous values are multiplied by 1,25 because of the Value-Added Tax.
- 0,555 is the electricity fee, including taxes.

<u>*Load Tariff*</u>: $Cost(SEK) = (\overline{P} * C + 55) * 1{,}25 + Energy * K$.

This tariff also has two different parts, which are separated as in the ordinary tariff, **the grid fee** "$(\overline{P} * C + 55) * 1{,}25$", and **the energy fee** "$Energy * K$".

Where:

- $\overline{P}$ is the average of the three highest peaks of load consumption every month on different days.

- C is a constant and takes the value of 21 from April to October and 42 from November to March.
- $\overline{P} * C$ is the Unit Charge of the network fee.
- 55 is the Standing Charge or fuse level fee of the network tariff.
- The two previous values are multiplied by 1,25, because of the Value-Added Tax.
- Finally, K is the energy fee and takes the following values: 0,499 from January to April, and 0,555 from May to December. Taxes are included.

This study has considered the electricity consumption in 2001, comparing the real cost of the new load tariff with the cost of electricity that the customer would have paid with the old tariff, called "ordinary tariff". Therefore, for the economic study, data from 2000 has not been used.

Changes in consumption patterns have also been studied using two indicators: the Monthly Load Factor and the 10 highest values of load demand in each month, during 2000 and 2001. The graphs obtained for each customer are shown in Appendix B.

These factors will show whether the main objective of the new tariff - making the highest peaks lower - has been achieved. Despite the use of district heating, an over-view of climatic conditions is interesting, because electrical consumption does not depend on the weather but is related to the climate.

The most relevant information in Appendix B is summarised in main points as follows:

- Money saved. The amount of money saved.
- Saving (%). Amount of money saved expressed in percent.
- Highest peak. Highest value of load demand during one year.
- Monthly Load Factor (average). Average of this factor during one year.
- Also expressed is the relative load factor change (%), which is calculated as: $(LF_{m2001}-LF_{m2000})/ LF_{m2000}*100$

- **Most Relevant Data and General Overview**

The most relevant information from the flat customers is shown in Table 3.3.

Table 3.3: Summary of the most important data from flats.

	Money saved (SEK)	Saving (%)	Highest peak (kWh/h)		Monthly Load Factor (average)		
			2000	2001	2000	2001	%
Flat A	555	18,0	2,3	3,2	0,108	0,114	5,1
Flat B	515	11,0	4,0	3,0	0,201	0,195	-3,0
Flat C	335	10,5	4,0	4,0	0,083	0,091	9,7
Flat D*	577	20,5	2,6	3,1	0,166	0,147	-11,0
Flat E*	403	11,5	3,0	3,0	0,181	0,172	-5,1

*Considering data available 10 months.

It is of interest to emphasise that the meters of customers B, C and D work with integer values only, and as such the results are not as exact as preferred. Despite the fact that the final result does not change that much, the margin of error becomes bigger when the consumption is low – as in the case with flats.

ECONOMIC STUDY

As shown in Table 3.3, the new tariff is very profitable for customers in flats. All of them are now paying less than they did with the ordinary tariff.

The amount of money saved is not really significant, (savings vary from 335 to 577 SEK per customer per year), however this amount is very important considering the price of electricity for these customers. In fact, their expenses are now between 10 and 20 percent lower.

During the summer period the cost of electricity is considerably lower, sometimes up to 30 percent. This enables customers to consume electricity as they wish during the winter period and still save money considering the whole year.

For the utility, the profit is not as obvious as for the customers. In fact, the Monthly Load Factor is lower for four out of five customers, and just one customer has reduced the highest load peak.

Some customers have reduced the number of hours with consumption higher than a certain value, as can be seen in Appendix B, but this finding is not obvious enough to conclude that the new tariff has improved the habits of electrical consumption for this group of customers.

3.2.3 ONE-FAMILY VILLAS (electric heating)

The next five customers are villas with electric heating. Their fuse level is 25 A, the highest of all the studied customers. As they use electric heating, a study of climatic conditions is obviously necessary. However, the economic study is made only with data from 2001, comparing real cost with the new tariff versus hypothetical cost with the old (ordinary) tariff, so the economic part of the study does not include climate dependency.

The cost of electricity has been calculated using following formulas:

Ordinary Tariff: $Cost(SEK) = (Energy * 0{,}08 + 265) * 1{,}25 + Energy * 0{,}555$.

Load Tariff: $Cost(SEK) = (\overline{P} * C + 110) * 1{,}25 + Energy * K$.

These formulas have the same parts constituents as the formulas used for customers in flats (see chapter 3.2.2); the only difference is the cost of the fuse level. Every constant has the same value as in the previous case.

The meters of two of the customers work only with integer values. This reduces data precision but is not as important as in the case with the flats, because the overall electricity consumption of customers in villas is much higher, as and such the impact of integer values is lower.

- **Most Relevant Data and General Overview**

The most important information from five villas is summarised in Table 3.4.

Table 3.4: Summary of the most important data from villas.

	Money saved (SEK)	**Saving (%)**	**Highest peak (kWh/h)**		**Monthly Load Factor (average)**		
			2000	**2001**	**2000**	**2001**	**%**
Villa A	3632	10,0	14,9	14,6	0,508	0,510	0,54
Villa B	1857	10,5	8,7	9,6	0,279	0,305	9,33
Villa C	855	3,0	17,0	17,0	0,259	0,294	13,40
Villa D	1555	7,0	13,0	15,0	0,286	0,313	9,33
Villa E	1649	8,2	13,2	13,1	0,271	0,337	24,50

ECONOMIC STUDY

As before, the new tariff is also very profitable for villa customers. The percent of money saved is lower than in the previous case, but the amount of money is much more significant. The price differences are more significant during the summer period; in fact the grid fee is cheaper for each customer from April to October.

These customers are the users of electric heating so their energy consumption is much higher during the winter period. This has to be considered, as the energy fee was lower during the first four months of the year. With the actual energy price (valid since May the 1st) the cost of electricity with the new tariff will be higher for weather dependent customers during the period January to March. These customers are Villas

C, D and E. In fact, all of them are paying more with the new tariff during the two last months of the year, except Villa E in November.

The relationship between temperature and load consumption is presented in Table A.2 (Appendix A).

BEHAVIOURAL STUDY OF ELECTRICITY CONSUMPTION

All customers have improved their Monthly Load Factor, which is beneficial for the electrical utility. Despite this, the highest peak is lower for just two customers out of five.

Moreover, it is interesting that the customer who saved the greatest amount of money has the lowest improvement in the Monthly Load Factor. On the other hand, this customer is one of those who have reduced the highest peak of consumption, which means that the benefit, in terms of money saved, to the customer is more dependent on the highest value of load demand than on the LF_m.

Although 2001 was much colder than 2000, the top values of load demand are not higher. The number of hours that the load demands of Villas A and C were higher than a certain value, are significantly lower in 2001 than in 2000.

The conclusion from the analysis of these customers is that there has been a slight improvement in their consumption habits. However, from the utility point of view this improvement does not seem to be sufficient to compensate for revenue losses.

3.2.4 SEMI-DETACHED HOUSES

The last five customers live in semi-detached houses. The power consumption among them should differ, since three of them use electric heating (with a fuse level of 20 A) and two have district heating (with a fuse level of 16 A).

The study of these customers is very interesting because it enables the observation of the influence of climate conditions on power consumption. The household electricity consumption should be very similar in all these houses, so the differences should basically occur due to the electric heating, which is obviously extremely dependent on climate conditions.

The cost of electricity has been calculated using the same formulas as in the previous cases, changing the value of the fuse level charge. The resulting formulas are:

- Customers with district heating (16 A fuse level):

Ordinary Tariff: $Cost(SEK) = (Energy * 0{,}08 + 127) * 1{,}25 + Energy * 0{,}555$.

Load Tariff: $Cost(SEK) = (\overline{P} * C + 55) * 1{,}25 + Energy * K$.

- Customers with electric heating (20 A fuse level):

Ordinary Tariff: $Cost(SEK) = (Energy * 0{,}08 + 202) * 1{,}25 + Energy * 0{,}555$.

Load Tariff: $Cost(SEK) = (\overline{P} * C + 85) * 1{,}25 + Energy * K$.

$\overline{P}$, C and K take the same values as in the two previous cases.

- **Most Relevant Data and General Overview**

The most important information from the analysed customers is summarised in Table 3.5.

Table 3.5: Summary of the most important data from semi-detached houses.

	Money saved (SEK)	Saving (%)	Highest peak (kWh/h)		Monthly Load Factor (average)		
			2000	2001	2000	2001	%
Semi-detached A	1254	10,0	6,6	7,3	0,296	0,298	0,7
Semi-detached B	912	9,9	6,3	7,3	0,209	0,219	5,0
Semi-detached C	783	7,8	6,3	7,0	0,206	0,228	10,6
Semi-detached D	367	4,6	5,6	5,1	0,249	0,241	-3,0
Semi-detached E	349	3,7	5,5	6,0	0,236	0,262	11,1

ECONOMIC ANALYSIS

The economic analysis conclusions for this group of customers are broadly the same as for the previous customers. All of them are saving money, especially during the summer period. This saving (together with the fact that the energy price was lower during the first four months of the year) allows the customers to save money despite their load consumption during the winter period. With the load tariff, the expenses were higher for Semi-detached C, D and E during every month in the winter period from November to March, due to the grid fee. However the yearly cost of electricity was lower for all of them.

BEHAVIOURAL STUDY OF ELECTRICITY CONSUMPTION

The Monthly Load Factor has become higher for four of the customers, which means that the habits of electricity consumption have been improved. However, just one customer out of five has reduced the highest peak of consumption, so for the utility the profit from the change of tariff is negligible.

Semi-detached houses D and E are district-heating users, so they are not as weather dependent as the other customers. Nevertheless, their electricity consumption habits have not improved as expected.

3.3 CASE 1 - GENERAL CONCLUSIONS

A general overview of the fifteen customers, highlighting the most relevant relationships among them will be carried out in this section.

a) Relationship between Energy Consumption and Money Saved.

As the study has shown, all the customers have saved money with the load tariff. The amount saved varied between 3% and 20%. Customers with the lowest consumption (flats) experience the highest benefits. Villas, with the highest electricity consumption saved the greatest amount of money, but not in percent.

The relationship between energy consumption and money saved for the different customers is presented in Figure 3.7.

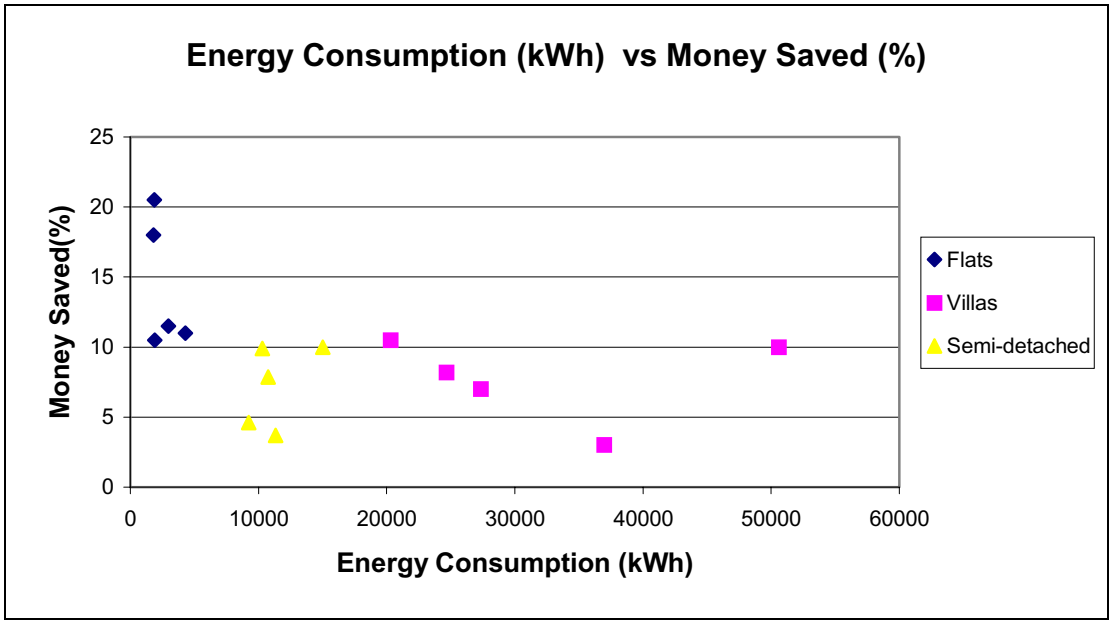


Figure 3.7: Energy consumption during 2001 versus amount of money saved with the load tariff expressed in percent.

Although there are some data points that do not follow the general trend, the figure above shows an inverse relationship between energy consumption and percent of money saved.

b) Relationship between Sum-Factor and Money Saved

The main objective of the new tariff is to lower the highest peaks of the year. In order to know whether this goal has been achieved, a new factor will be defined. This factor is called Sum-Factor and is calculated as follows:

$$Sum - Factor = \frac{\sum(\text{The 20 highest peaks in 2000})}{\sum(\text{The 20 highest peaks in 2001})}$$

If this factor results in values higher than 1 it means that the new tariff has worked for that customer, since the sum of the highest values of the year has been reduced.

Theoretically, customers with a Sum-Factor higher than 1 should be rewarded by the electrical utility. In fact, the higher the Sum Factor the greater the reward provided should be. Actually, this does not occur as is shown in the following Figure (3.8).

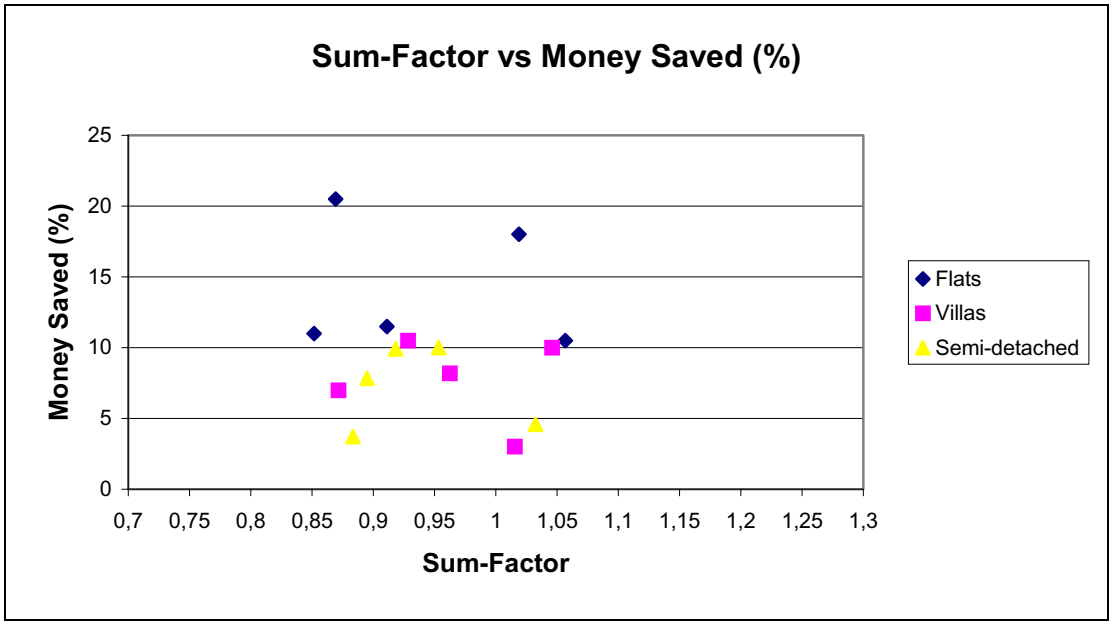


Figure 3.8: Sum-Factor versus money saved expressed in percent.

No relationships can be observed in Figure 3.8. This means that the new tariff does not work efficiently because it does not sufficiently reward those customers who have reduced their maximum peaks of consumption. Furthermore, all customers have

achieved a reduction in their electrical expenses, but just 6 out of 15 have reduced their peaks of load demand.

c) Relationship between the Increase of the Monthly Load Factor and Money Saved.

The meaning of this relationship is very similar to the previous one, but is considering the consumption during every month.

The increase of the Monthly Load Factor will be expressed as a percentage and is calculated as:

$$\Delta LF_m(\%) = \frac{Average(LF_m 2001) - Average(LF_m 2000)}{Average(LF_m 2000)} * 100$$

Values higher than zero indicate that the consumption habits have improved. The improvement is greater the greater the percentage. Simultaneously, the economic benefit for the customer should be higher. The real relationship between these two factors is shown in the figure below.

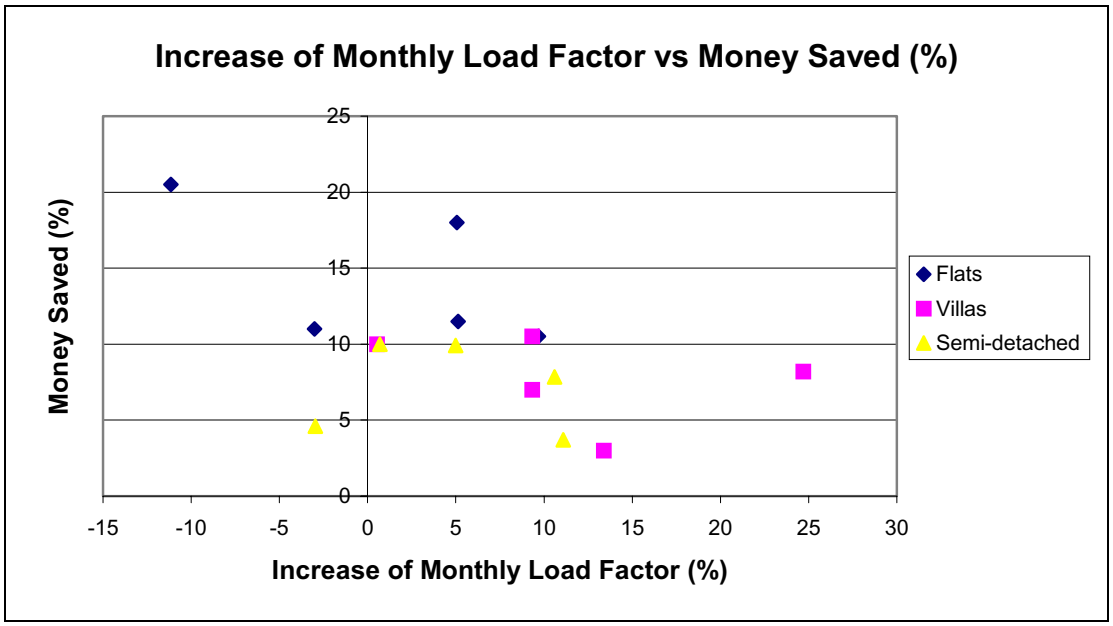


Figure 3.9: Relationship between the variation of LF_m and money saved.

As Figure 3.9 shows there is no correlation between these two factors. On the other hand, almost every customer has improved the Monthly Load Factor.

d) Conclusions

The observations extracted from the analysis of Sollentuna Energy were:

- The main objective of the utility has not been achieved. The highest peaks of load demand in 2001 were actually higher than in 2000. This is due to the fact that 2001 was significantly colder than 2000, as is shown in Appendix A. The electrical consumption in Sweden is extremely weather dependent because of the use of electrical heating.
- The energy consumption in 2001 was higher than in 2000.
- The customers received lower energy bills with the new tariff.

The final conclusion is that the new tariff has not worked efficiently. It has not been able to control the load demand and furthermore has not financially punished those customers who have not improved their consumption habits. The influence of the weather had a greater impact on consumption habits than the economic benefits provided by the new tariff.

The reason why this occurred has to be related to the motivation of the customers. With the introduction of the new tariff their electrical expenses are much lower during the summer season. This enables them to use electricity according to their old consumption habits during the winter period and still receive benefits in terms of money saved on an annual basis.

4 CASE 2 - SKÅNSKA ENERGY

This chapter compiles the economic effects of applying Sollentuna's load tariff to Skånska's customers. In order to carry out this study, a general description of Skånska will be presented. Following on from this, both tariffs will be applied to different groups of customers: flats, villas and bigger users. This economic analysis will be developed based on load demand data stored from 2001. Obviously, this load demand data does not reflect possible changes in customers' consumption habits expected due to the new tariff.

4.1 TOTAL DEMAND DATA

4.1.1 INTRODUCTION

Skånska Energy AB (SENAB) is an electrical utility that operates in the southern-most county of Sweden, Scania, supplying electricity to about 16 000 customers. The vast majority of these customers (about 99%) are residential consumers, but there are also industrial companies, agricultural properties, commercial and public buildings in the customer base. [4]

Moreover, this utility is the owner of a network containing a 20 kV net with about 350 km of overhead electrical cables and 200 km of underground cable as well as a 400 V grid covering close to 1,000 km. SENAB consumes around 350 GWh per year. The load level contracted from the supplier during the studied period (2000 and 2001) was 78 MW. [4], [10]

In order to improve their revenue Skånska Energi is investigating the possibility of including a load charge in their electricity tariff. The objective of this load charge is to make customers conscious of the fact that by changing their electricity consumption habits, they as well as the utility will gain financially

4.1.2 TOTAL DEMAND DATA ANALYSIS

In this section, general data from Skånska will be analysed. The study compiles information from 2001. No significant changes from 2000 to 2001 were expected since the tariff applied to the customers was the same in both years. The differences between these two years had to be caused by different weather conditions because all other influencing factors failed to display relevant variations. This is the reason why this study compiles only one-year data.

a) Maximum and minimum 1-hour total load demand for every month during 2001

Table 4.1: Maximum and minimum 1-hour total load during 2001.

MONTH	2001	
	MAXIMUM	MINIMUM
January	68 166	36 793
February	73 149	36 131
March	68 321	35 607
April	59 572	30 171
May	46 825	20 508
June	42 474	17 458
July	35 768	15 925
August	39 123	17 509
September	48 985	19 230
October	54 234	**12 519**
November	63 617	28 639
December	**80 023**	40 857

The same information is presented as a diagram in Figure 4.1.

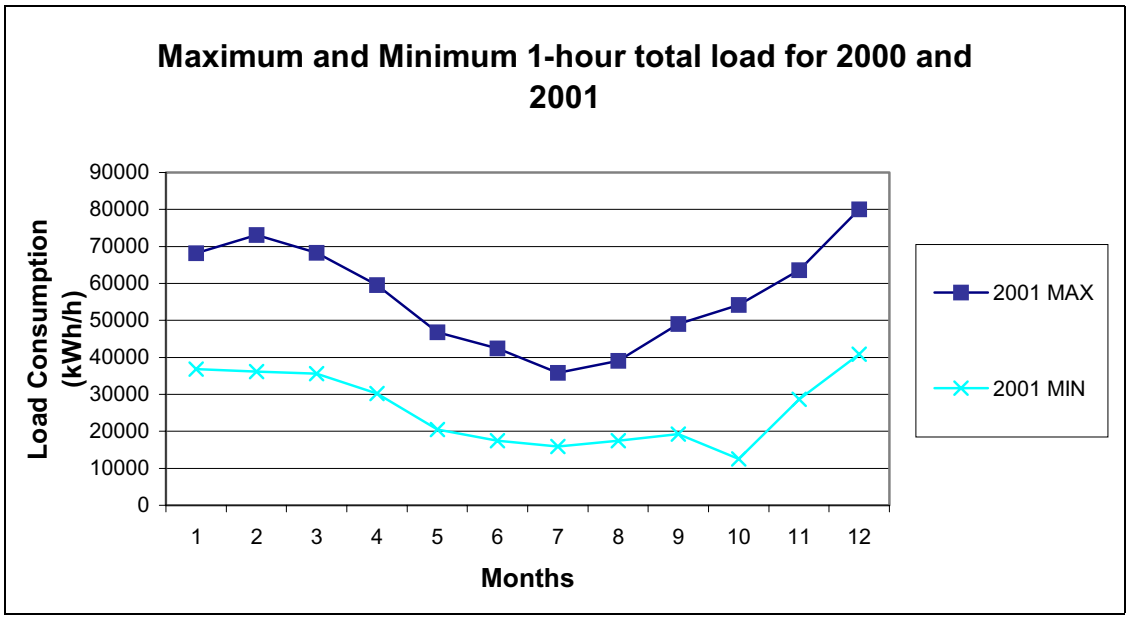


Figure 4.1: Maximum and minimum 1-hour total load during 2001.

The trend shown by these values can easily be understood with the help of the Degree Days values shown in appendix A. Because of the use of electric heating the utility is extremely weather dependent. This is the reason why the highest values of load demand were reached during the coldest months of 2001. The Skånska dependency on weather conditions is shown in figure A.17 (appendix A).

There is another point worth emphasising: the minimum value occurs in October. During the period between the hours of 4:00 and 5:00 am on October 7th the load demand fell from 26,065 MW to 12,519 MW and rose again to 25,836 MW during the next hour. This variation over such a short period of time had to be caused by a blackout, or a programmed repair.

The load level contracted by Skånska from their suppliers during 2001 was 78 MW. Figure 4.2 shows the margin of load capacity of this utility during the analysed period.

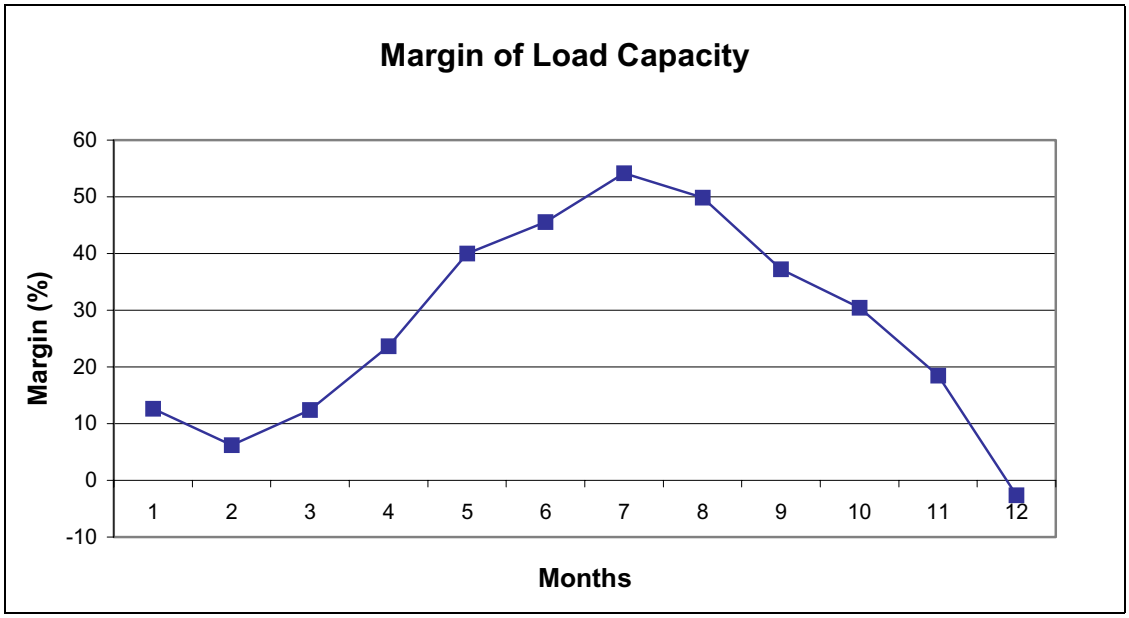


Figure 4.2: Margin of load capacity of Skånska Energi in 2001.

On December 31st, the coldest day of 2001, the margin was below zero from 17:00 to 18:00. There were no negative economic effects caused by this, as December 31st is a holiday. If the utility's objective is to reduce its contracted load level, it is necessary to modify either the customers' consumption habits or the utility's dependency on climatic conditions.

b) Duration curve from a 1-hour load demand for 2001

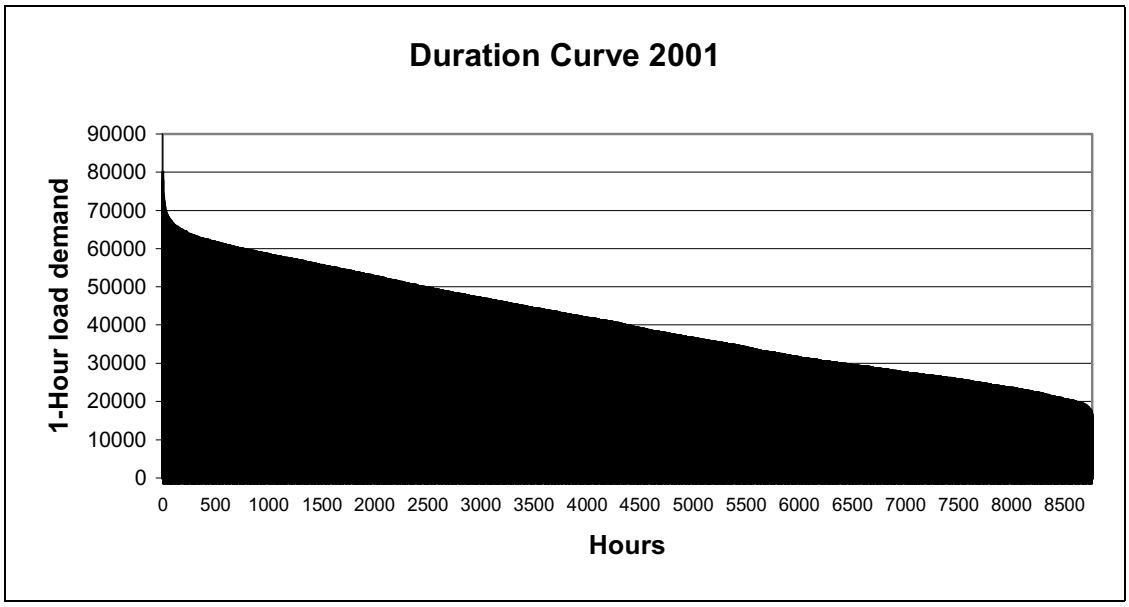


Figure 4.3: Duration curve from 1-hour total load curve for 2001

From the source data of these curves the following information is available:

Table 4.2: Number of Hours with Consumption Higher than a Certain Value, Total Electricity Consumption and Average of Load Demand.

Number of hours per year with a load consumption higher than a certain value	
Higher than:	**2001**
+80000	1
+70000	23
+60000	731
+50000	2 436
+40000	4 350
+30000	6 353
+20000	8 588
+10000	8 760
Total number of hours	24*365
Total energy consumed (MWh)	356 163 498
Average load consumption (kW)	40 657 933,56

c) Monthly Load Factor (LF_m) during 2001

The values of LF_m 2001 were:

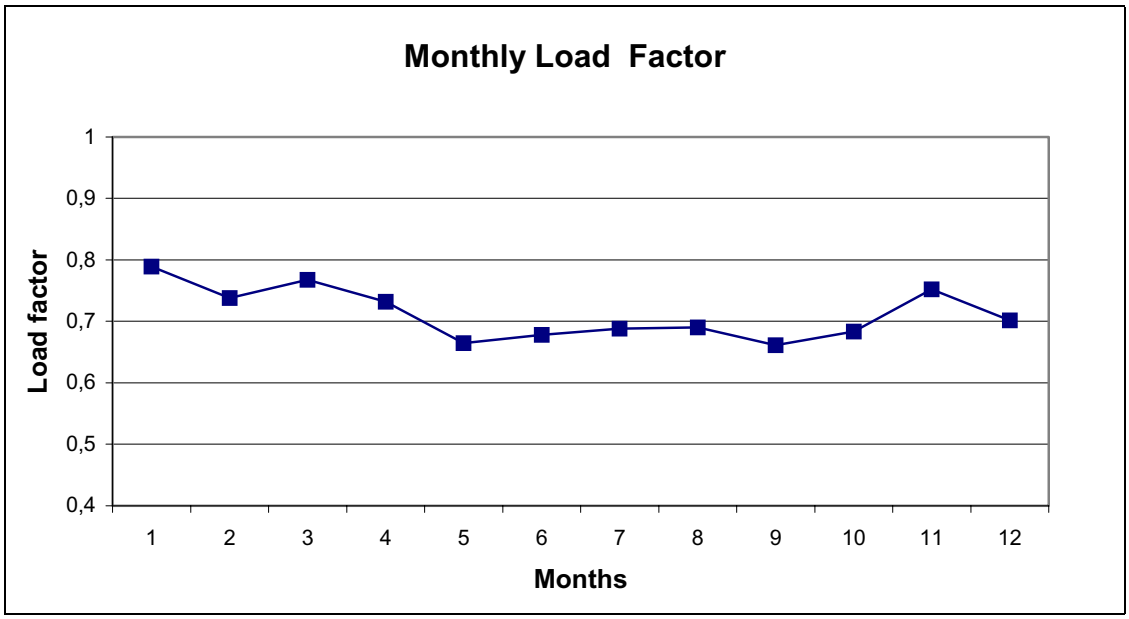


Figure 4.4: Monthly load factor for each month during 2001

The average of this factor in 2001 was **0,71**.

d) Monthly Average Load Deviation for each month during 2001

This factor took the following values during 2001.

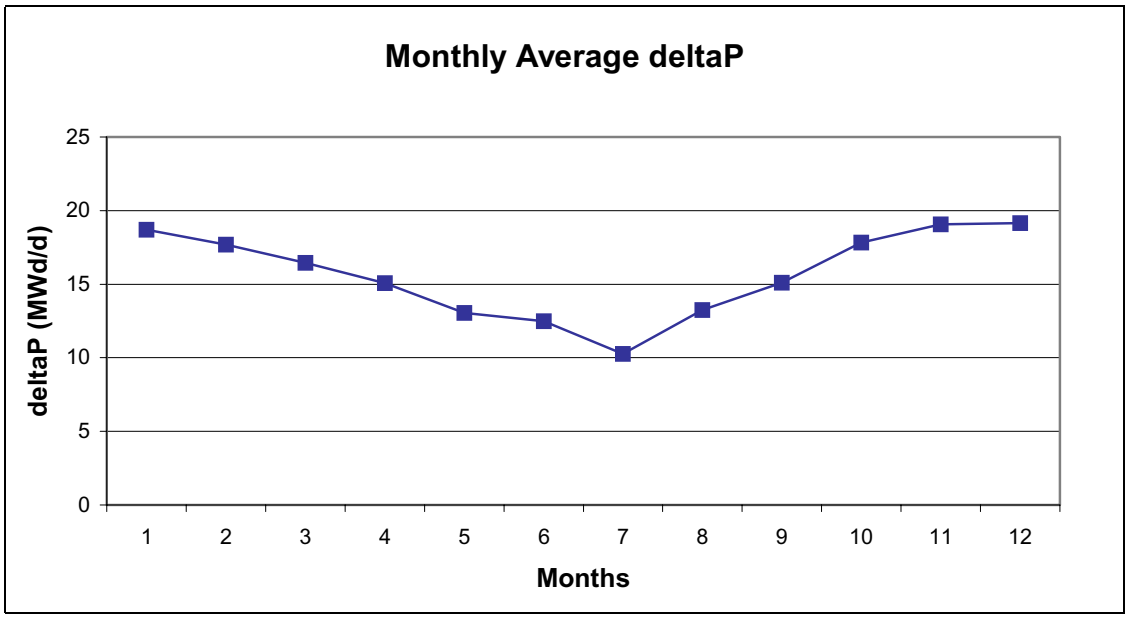


Figure 4.5: Monthly average load deviation for each month in 2001.

4.2 CUSTOMER ANALYSIS

4.2.1 INTRODUCTION

The aim of this section is to investigate the financial benefits for customers if the utility decides to change its actual tariff. This is also of interest for the utility, as this section shows "the cost" of changing the actual tariff. It should be noted that possible changes in the patterns of electricity consumption have not been considered. As such, for the utility, this study represents the worst load demand data possible, excluding improvements in consumption habits.

The methodology used in this section was as follows: to calculate the electricity cost applying two different tariffs, Skånska Energy's ordinary tariff and Sollentuna

Energy's load tariff, using the electrical load demand of Skånska Energy's customers during 2001 as the base. Following the calculation of the electricity expenses, an analysis and comparison between these two tariffs will be made.

4.2.2 FLATS (with district heating)

The cost of electricity has been calculated using the following formulas:

<u>*Skånska Tariff*</u>: $Cost(SEK) = Fuse + Taxes + Energy * 0{,}186 + 8 + Energy * 0{,}615$. This expression has two different parts: **the grid fee** "$Fuse + Taxes + Energy * 0{,}186$" and **the energy fee** "$8 + Energy * 0{,}615$". Taxes are included in both expressions.

Where:

- *Energy* is the energy consumption during one month.
- 0,186 (SEK/ kWh) is the Unit Charge of the network fee. (See Figure 2.3 in page number 8)
- *Fuse* is the Standing Charge of the grid fee. It is also called fuse level fee.
- *Taxes* is the value of various taxes.
- 8 is the Standing Charge of the electricity fee
- 0,615 is the Unit Charge of the electricity fee, including taxes.

Applying the values of these constants to this customer gives the resulting formula:

$$Cost(SEK) = 145 + 4{,}562 + Energy * 0{,}186 + 8 + Energy * 0{,}615$$

<u>*Load Tariff*</u>: $Cost(SEK) = \left(\overline{P} * C + 55\right) * 1{,}25 + Energy * 0{,}555$. The different parts of this formula are already explained in chapter 3. (See pages 23 and 24)

- **<u>Most Relevant Data and General Overview</u>**

Table 4.3 compiles the most relevant information from the analysed customers.

Table 4.3: Summary of the most important economic data for Flats.

	Energy consumption (2001)	Difference in Prices (Skånska Energy – Sollentuna Energy)			
	(kWh)	Grid	Energy	Total	%
Flat A	3583	507,44	310,98	818,42	17,19
Flat B	3599	396,66	311,94	708,60	14,84
Flat C	3584	481,37	311,04	792,41	16,64
Flat D	2331	589,57	235,86	825,43	21,97
Flat E	1643	829,10	194,58	1023,68	31,92

As is shown in Table 4.3 all these customers will make significant savings with Sollentuna's tariff. This saving is divided into two parts. The first part is linearly dependent on the energy consumption, since the energy fee is cheaper in Sollentuna (0,555 SEK/ kWh) than in Skånska (0,615 SEK/ kWh). Secondly, expenses based on the grid fee are also lower for all of "Sollentuna's customers". This saving is only dependent on consumption behaviour, which means that even without any change in customers' consumption habits they are still saving money. It is obvious that this new tariff is very profitable for the customers but not for the utility.

4.2.3 VILLAS (electric heating)

The cost of electricity has been calculated using the following formulas:

<u>*Skånska Tariff*</u>: $Cost(SEK) = Fuse + 4{,}562 + Energy * 0{,}186 + 8 + Energy * 0{,}615$.

"*Fuse"* takes the value of 178,5 for villas with the 16 A fuse level (Villas A and B) and 188,67 for villas with 20 A (Villas C, D and E).

The parts of this formula are the same as those explained in point 4.2.2.

<u>*Load Tariff*</u>: $Cost(SEK) = \left(\overline{P} * C + 110\right) * 1{,}25 + Energy * 0{,}555$.

These formulas have the same structure as those that have been used for flats. All constants also use the same values.

- **Most Relevant Data and General Overview**

The most important information from the five villas is summarised in Table 4.4.

Table 4.4: Summary of the most important data for Villas.

	Energy Consumption (2001)	Difference in Prices (Skånka - Sollentuna)			
	(kWh)	Grid	Energy	Total	%
Villa A	19862	1466,08	1287,72	2753,80	15,13
Villa B	24078	1987,47	1540,70	3528,16	16,35
Villa C	25784	3317,07	1643,04	4960,11	21,14
Villa D	24077	3192,07	1540,62	4732,69	21,41
Villa E	14657	1692,48	975,42	2667,90	18,33

In this case, exactly as in the previous one, the benefits for the customers using Sollentuna's tariff are obvious. All of them will make significant savings with the new tariff. As shown in Appendix D, the most important saving (in percent) occurs during the summer period. However, the amount of money saved (in SEK) is higher during the winter period. The conclusion that can be drawn from the analysis of these customers is the same as for the flats. The new tariff is not profitable for the utility because even without changes in their consumption habits, the customers are still paying less money.

4.2.4 BIGGER USERS

In order to calculate the price of electricity for these customers, the following formulas have been used:

Skånska Tariff: $Cost(SEK) = Fuse + 4{,}562 + Energy * 0{,}186 + 8 + Energy * 0{,}615$.

This formula has the same structure as those used in sections 4.2.2 and 4.2.3.

Fuse takes a different value depending on the value of the fuse level of the customer.

- Customers A, B and D (50 A)…..*Fuse* = 539,5
- Customer C (100 A)…….*Fuse* = 1061,42
- Customer D (160 A)…….*Fuse* = 1693,67

Load Tariff: $Cost(SEK) = \left(\overline{P} * C + 55\right) * 1{,}25 + Energy * 0{,}555$.

$\overline{P}$, C and K take the same values as in the two previous cases.

- **Most Relevant Data and General Overview**

The most relevant information from bigger users is summarised in the Table 4.5.

Table 4.5: Summary of the most important data for bigger users.

	Energy Consumption (2001)	**Difference in Prices (Skånka - Sollentuna)**			
	(kWh)	**Grid**	**Energy**	**Total**	**%**
Bigger User A	79934	8006,47	4892,04	12898,51	18,26
Bigger User B	93370	12439,32	5698,20	18137,52	22,28
Bigger User C	258460	31852,81	15603,60	47456,41	21,58
Bigger User D	88605	10021,78	5412,30	15434,08	16,88
Bigger User E	55890	2283,04	3449,40	5732,44	11,15

The economic analysis of these customers uncovers the same behavior as for the previous consumers. The most relevant difference is related to the energy consumption, much higher in this case, which means that the amount of money that can be saved is particularly significant. It is necessary to mention the case of Bigger User C who is saving up to 47,456 SEK per year. (21,6%)

4.3 CASE 2 - GENERAL CONCLUSIONS

Changing Skånska's actual tariff to include a load charge could be a way to control load demand, but Sollentuna's tariff is not a good example of how to do this . In chapter 3 it was demonstrated that this tariff does not motivate the customers enough to change their consumption patterns. In this chapter, it has been demonstrated in the financial analysis of 15 different customers, that even without any improvement in consumption patterns, their electrical expenses have been significantly reduced.

In the next section of this chapter some ideas regarding the construction of a tariff incorporating a load charge will be discussed.

4.4 LOAD CONTROL CAPACITY

4.4.1 GENERAL OVERVIEW

In this report, the relation between load demand and temperature is the most difficult problem to solve. It is obvious that load demand is highly temperature dependent, but there are also many other influencing factors not dependent on the weather, but related to it.

From the study of the relationship between weather conditions (temperature) and load demand, it is possible to extract some general conclusions about how to construct a new tariff incorporating a load charge.

The relationship between temperature and load demand for Skånska Energi is presented in the next figure.

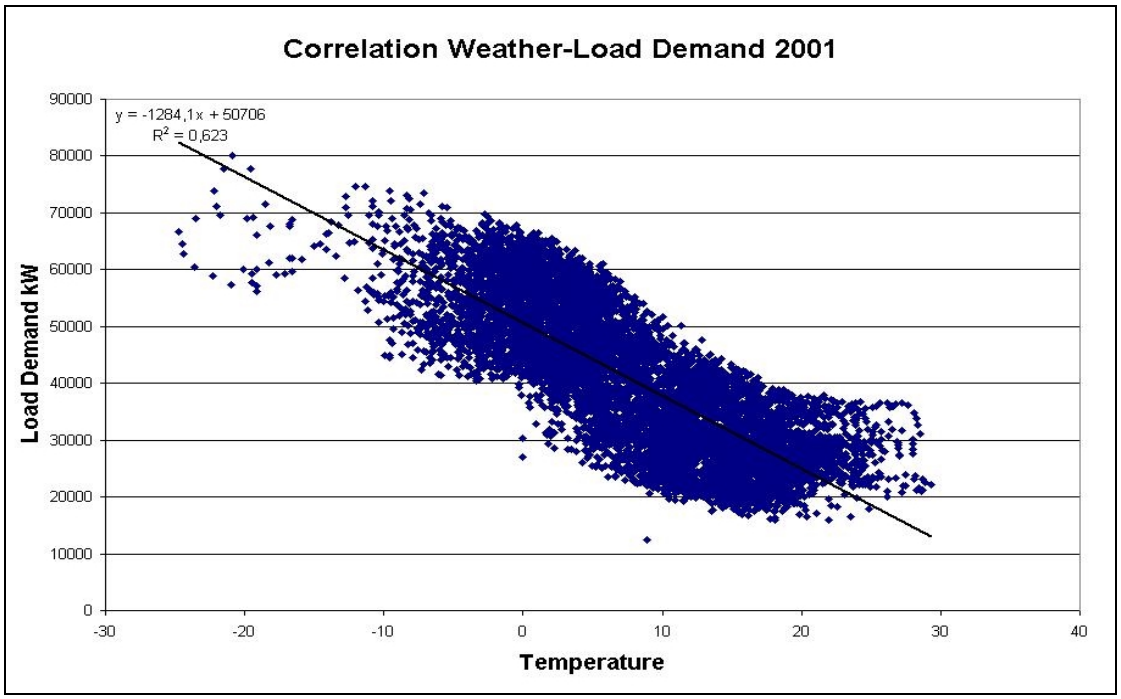


Figure 4.6: Relationship between load demand and temperature.

A great amount of information can be extracted from the analysis of this graph. The relationship between temperature and load demand is about 1,3 MW/°C but despite the linear relationship being quite strong, for every temperature point the differences in the load demand are close to 30 MW, which is almost half the load demand contracted. This linear relationship does not work so well at extreme temperatures, lower than -10°C or higher than 20°C.

There is just one point where the load demand is higher than the level contracted (78 MW). This point occurred during an unusually cold period on December 31st, which is always a problematic day, since it is a holiday and the consumption patterns are very similar for everybody.

The question to be answered is how much Skånska Energi can reduce its contracted load level, and how great is the risk of doing so. Obviously, there will be a break-even point when the calculated risk of exceeding the contracted load, in financial terms, equals the savings of the lowered contract. But there is a further problem: if the utility chooses to lower the contracted load a great deal, it will become more difficult

to predict the peak loads since the peak loads exceeding the contract limit will appear more often and at varying temperatures.

The contracted load level could easily be reduced to 75 MW. In 2001, the load demand exceeded 75 MW for only three hours. Since this year was a particularly cold year, the risk of exceeding this limit was not very great. Furthermore, these 3 hours belong to the same peak of consumption as December 31st. The amount of load controlled should be at least 5 MW. Of course, this value is just an approximation, using 2001 as the base.

If Skånska Energy wants to reduce the contracted load yet more, a significant change in consumption habits is needed.

4.4.2 GENERAL IDEAS ABOUT THE NEW TARIFF

In order to change customers' consumption patterns, a load charge should be added to the tariff. This charge has to be constructed so that the price of electricity is a little bit higher if there are no changes in the consumption behaviour and more expensive if the highest peak of consumption grows more than the energy consumption. Of course, customers' electrical expenses have to be considerably reduced if they are to significantly improve their consumption patterns.

It is very important to emphasise two aspects of the new tariff. The electricity price should not vary during the summer, since the utility has no problems then. Neither the saving nor the highest expenses should focus on the summer period. On Sollentuna Energi's tariff, one of the problems was that customers made such great savings during the summer period that they had more money to spend during the winter, thus neglecting the improvement of their electricity consumption habits.

The second point worth emphasising is that it would be very useful for the utility if the new tariff included some tools of Direct Load Management. These tools would

allow the utility to switch off either the customer's electrical heating or their boilers if the load demand is dangerously close to the limit contracted. That would be a powerful weapon for the utility, especially as it would not cost anything if it were not used. The more customers accept this part of the new tariff the better for the utility, since it would give greater load control without any additional cost. However, Direct Load Management is a different strategy and is not the objective of this report.

5. CONCLUSIONS

The most important conclusions drawn from this study are as follows:

- The Swedish electricity market is extremely weather dependent, due to the use of electric heating.
- The electricity demand is also influenced by other factors than the climate, so different levels of load demand can occur at exactly the same out-door temperature.
- A change in customers' consumption patterns is an objective, which is not easy to achieve. Many customers do not care about their electricity tariffs and bills. Nevertheless, with increased information and appropriate incentives, it is possible to improve the patterns of electricity use.
- The incorporation of a load component in tariffs can be a good solution to load demand problems, but this load tariff has to be correctly constructed. The load component has to maintain prices at the same level if there are no changes in consumption patterns. It also has to provide financial benefits to those customers who improve the way they use electricity (higher consumption, lower peaks), and of course, it has to adversely affect customers if their electrical consumption pattern becomes disadvantageous.
- Some tools of load control should be added to the tariff, such as Interruptible Load Tariff or Direct Load Control. This way, the utility will always be in control of the load demand, and the risk of exceeding the contracted load level will be diminished.

6. REFERENCES

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APPENDIX LIST

Appendix A: Temperature data

Temperature data shown in Appendix A, or used to calculate different values of this Appendix have been taken from the Swedish Meteorological and Hydrological Institute. [8]

In Table A.1 the Degree Days are shown from Stockholm and Malmö during years 2000 and 2001. Those values are calculated from the following formulas:

$$Degree - Days_{month} = \sum \left| \overline{T}_{out-day} - 17 \right|$$

$$\text{if } \overline{T}_{out-day} < \text{X}$$

April	X=12 °C
May-July	X=10 °C
August	X=11 °C
September	X=12 °C
October	X=13 °C

Equations in Table A.2, are calculated as linear regressions for the values from the graphs Temperature-Load Demand as the figures shown at the end of this Appendix.

Table A.1: Degree Days in Stockholm and Malmö during 2000 and 2001

	STOCKHOLM		MALMO	
Month	**2000**	**2001**	**2000**	**2001**
January	563,44	526,72	459,39	468,77
February	496,75	573,23	397,65	461,74
March	483,58	541,57	415,52	490,68
April	309,24	338,70	228,83	329,85
May	66,78	95,58	0,00	23,42
June	7,79	0	16,63	0
July	0	0	0	0
August	0	0	0	0
September	158,57	73,63	59,04	90,15
October	196,88	207,15	148,05	204,00
November	329,13	418,94	282,75	468,95
December	447,79	573,95	418,65	624,97

Table A.2: Relation between load demand and temperature

	2000		2001	
	Equation	**R^2**	**Equation**	**R^2**
Sollentuna	Y=-1631,4*X+662730	0,511	Y=-1790,3*X + 70499	0,651
Villa A	Y=-0,1284*X + 7,1	0,238	Y=-0,1679*X + 7	0,475
Villa B	Y=-0,1098*X + 2,9	0,452	Y=-0,1336*X + 3,3	0,627
Villa C	Y=-0,2797*X + 6	0,236	Y=-0,2896*X + 6,4	0,328
Villa D	Y=-0,2248*X + 4,5	0,587	Y=-0,2347*X + 4,9	0,670
Villa E	Y=-0,1896*X + 3,9	0,409	Y=-0,1790*X + 4,2	0,476
Flat A	Y=-0,0014*X + 0,21	0,0028	Y=-0,0012*X + 0,22	0,0029
Flat B	Y=-0,0019*X + 0,49	0,0006	Y=-0,0023*X + 0,51	0,0013
Flat C	Y=-0,0014*X + 0,24	0,0005	Y=-0,008*X + 0,22	0,0003
Flat D	Y=-0,0053*X + 0,34	0,0022	Y=-0,0067*X + 0,31	0,0477
Flat E	Y=-0,0033*X + 0,41	0,0021	Y=-0,0084*X +0,46	0,0219
Semi-detached A	Y=-0,0913*X + 2,34	0,433	Y=-0,1005*X + 2,46	0,594
Semi-detached B	Y=-0,0736*X + 1,59	0,444	Y=-0,0751*X + 1,74	0,545
Semi-detached C	Y=-0,0571*X + 1,49	0,251	Y=-0,0636*X + 1,70	0,347
Semi-detached D	Y=-0,0278*X + 1,34	0,064	Y=-0,0276*X + 1,26	0,097
Semi-detached E	Y=-0,0298*X + 1,25	0,091	Y=-0,0309*X + 1,52	0,107

- **Load Demand versus Temperature**.

A) Sollentuna-Energi

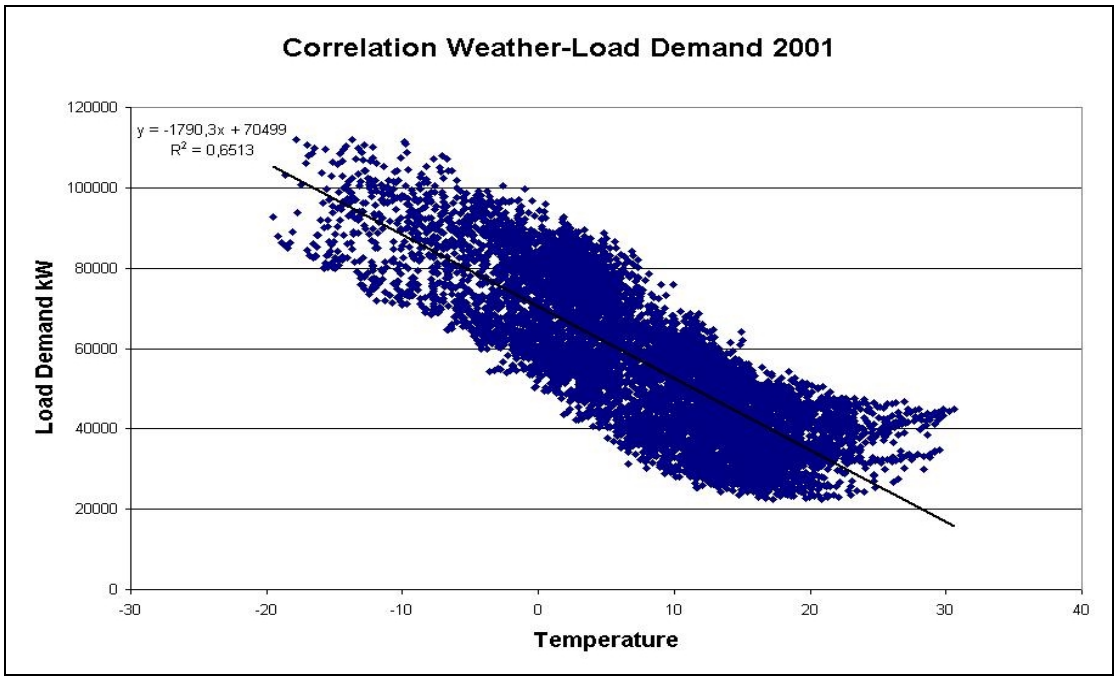

Figure A.1: Relationship between load demand and temperature.

B1) Villa A

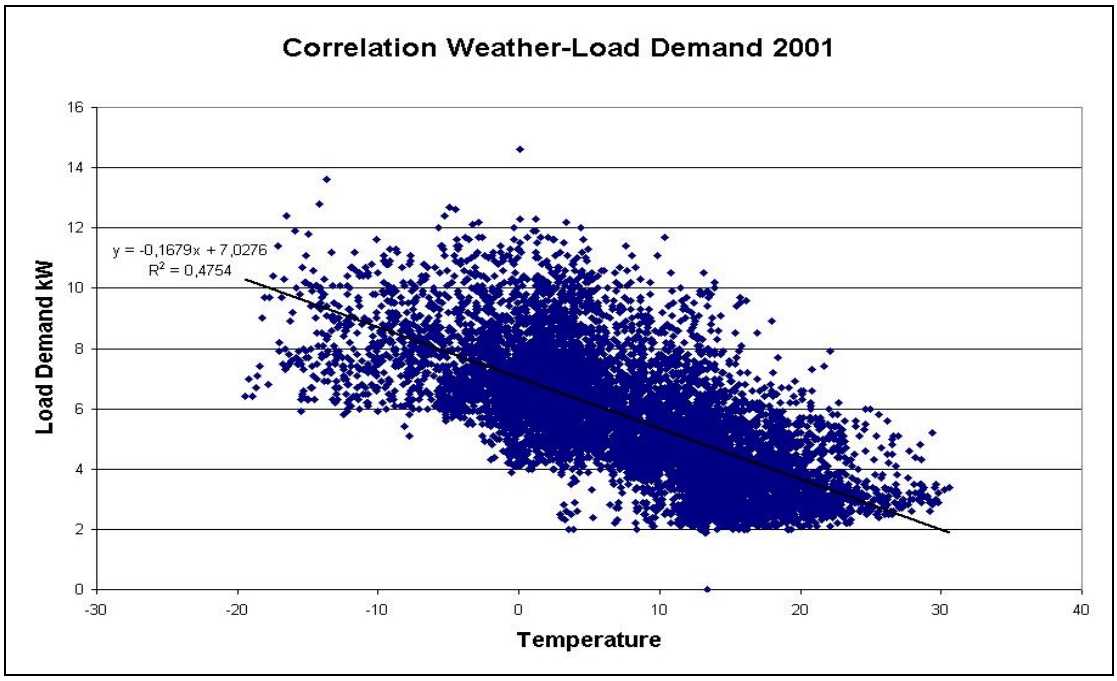

Figure A.2: Relationship between load demand and temperature.

B2) Villa B

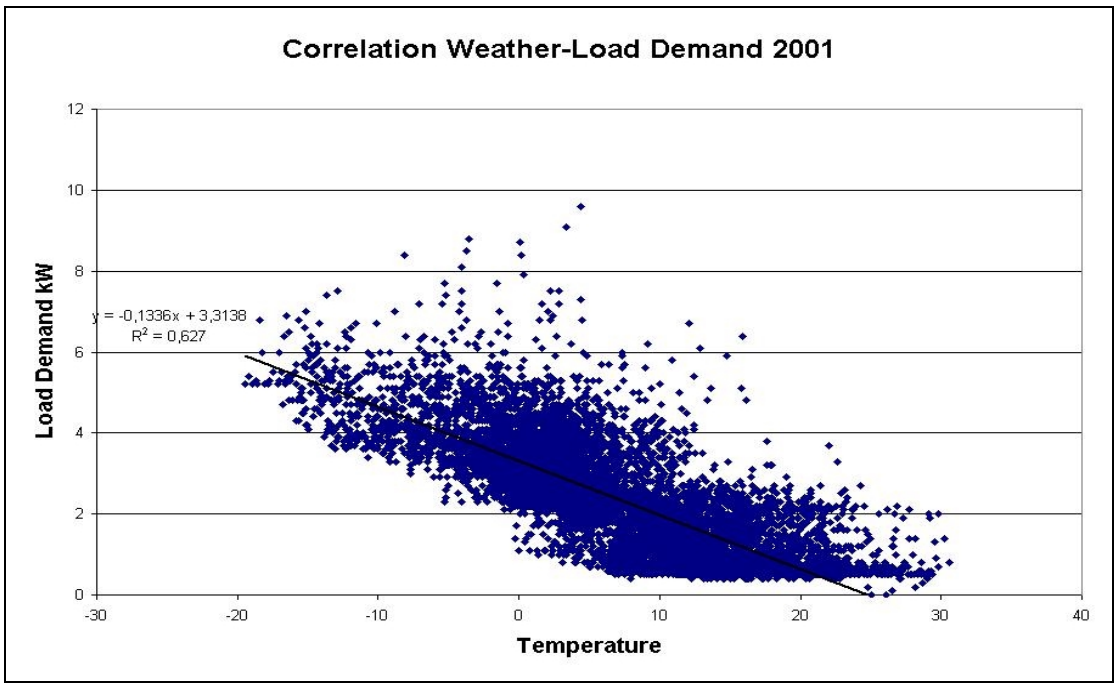

Figure A.3: Relationship between load demand and temperature.

B3) Villa C

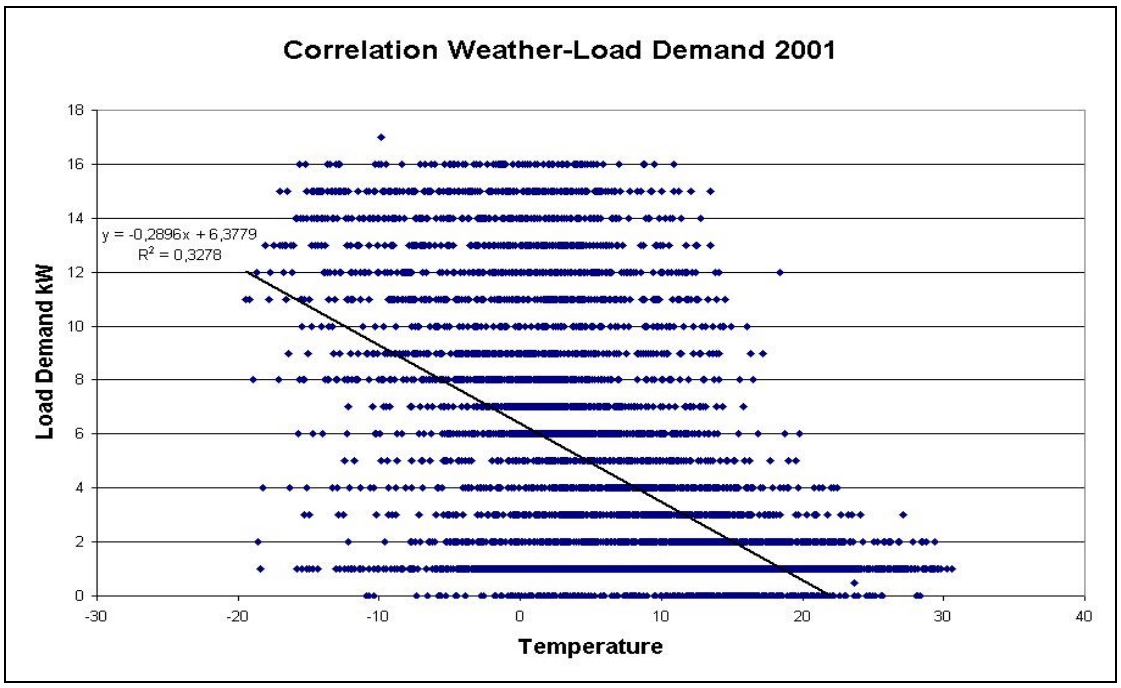

Figure A.4: Relationship between load demand and temperature.

B4) Villa D

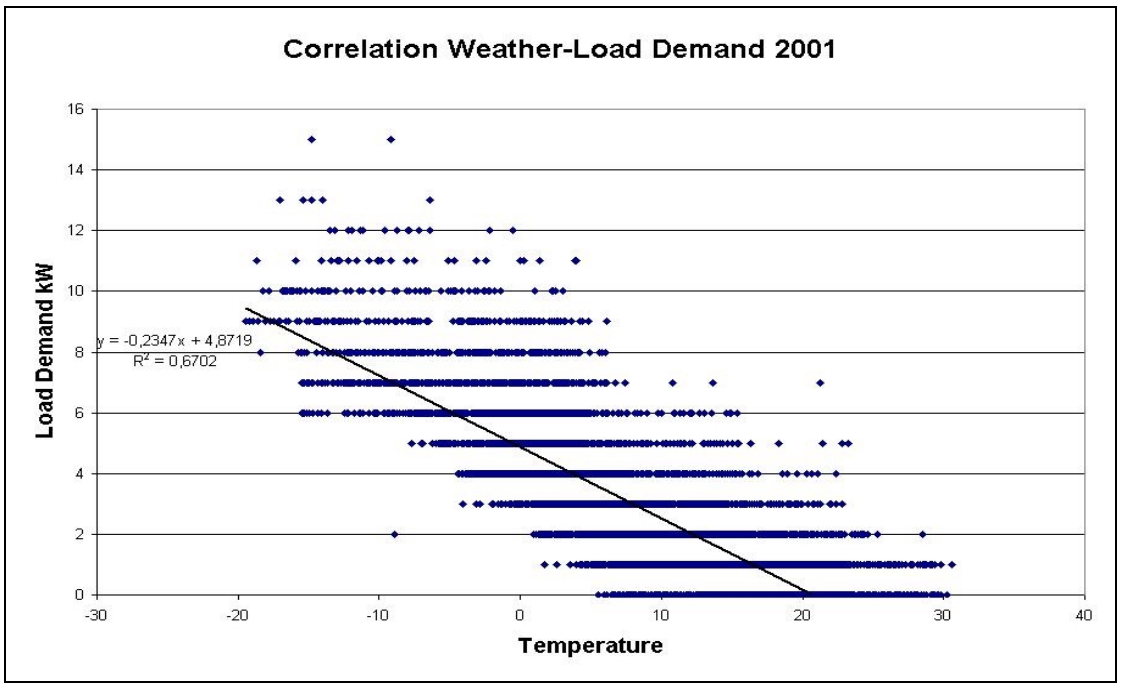

Figure A.5: Relationship between load demand and temperature.

B5) Villa E

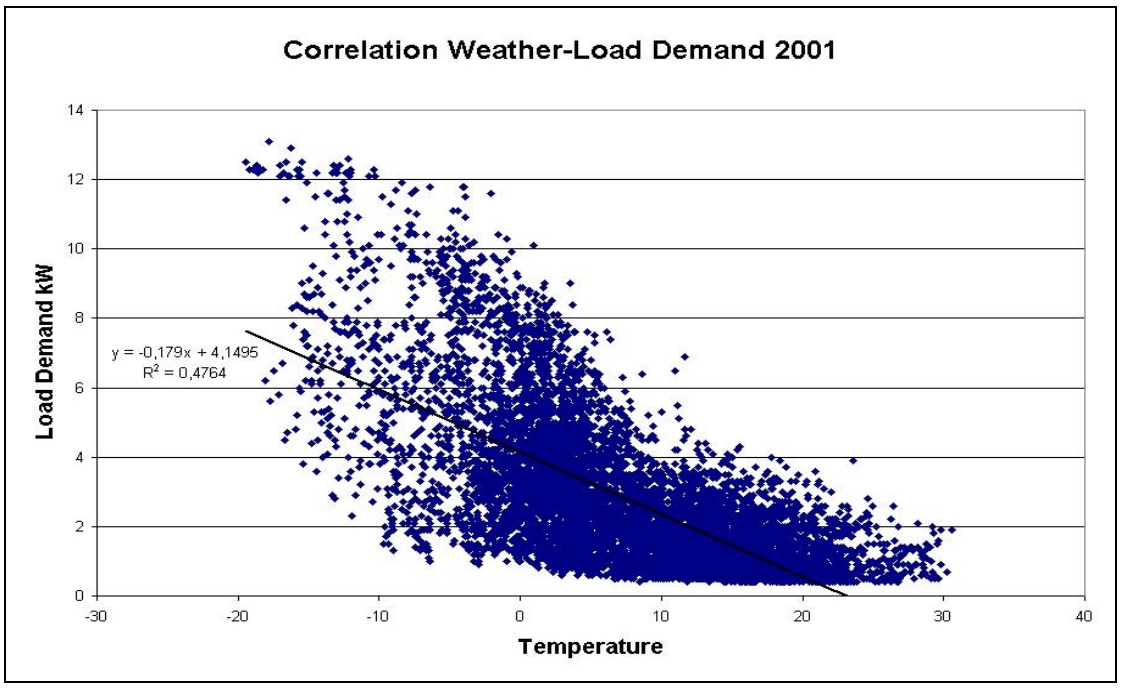

Figure A.6: Relationship between load demand and temperature.

C1) Semi-detached House A (Electrical Heating)

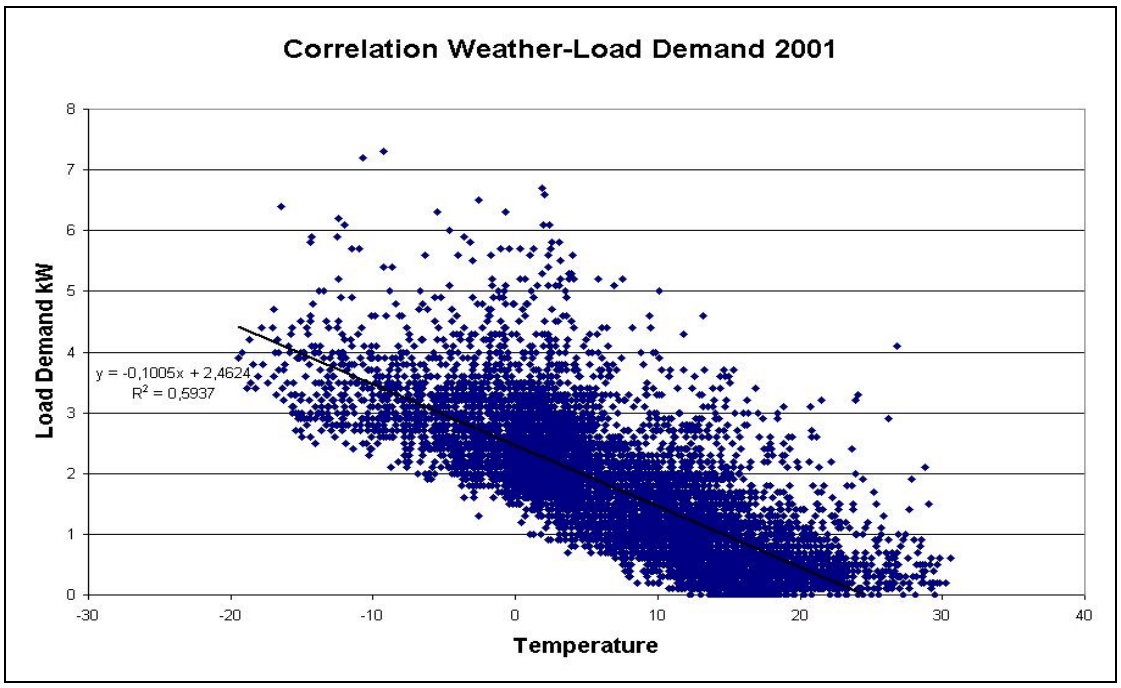

Figure A.7: Relationship between load demand and temperature.

C2) Semi-detached House B (Electrical Heating)

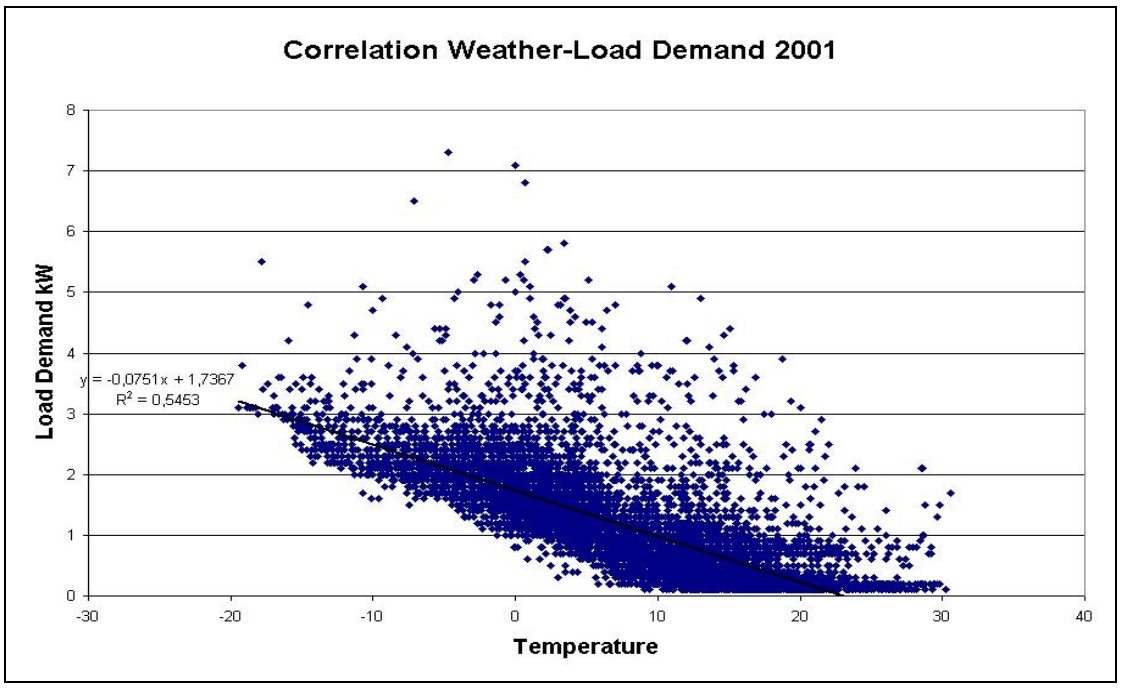

Figure A.8: Relationship between load demand and temperature.

C3) Semi-detached House C (Electrical Heating)

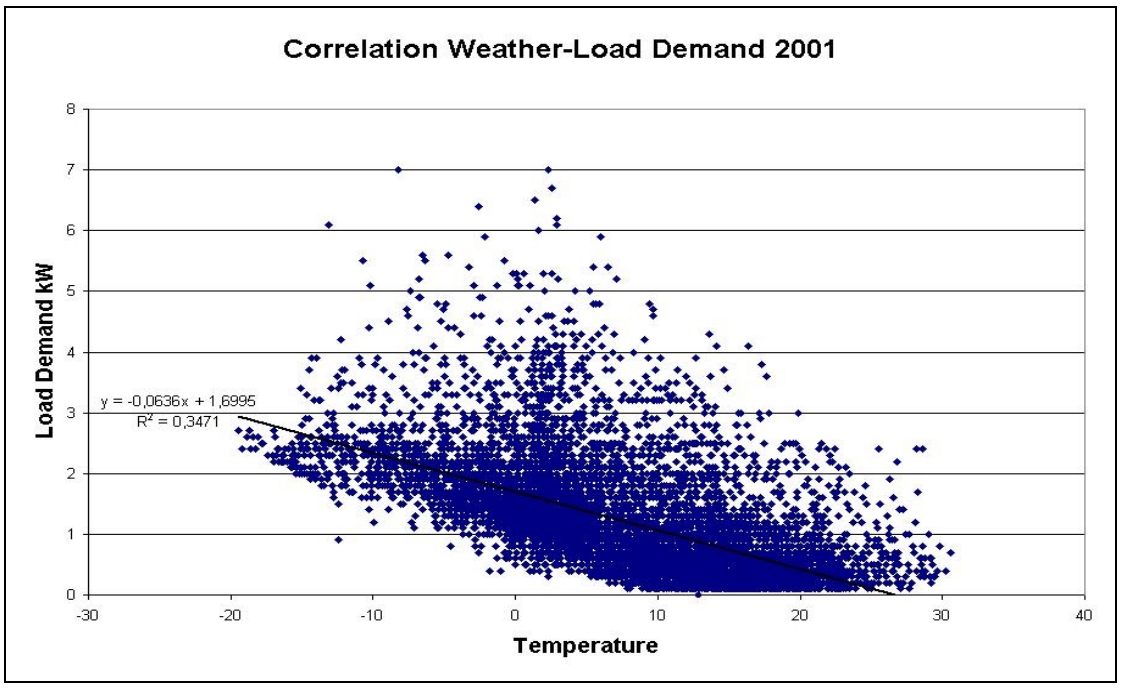

Figure A.9: Relationship between load demand and temperature.

C4) Semi-detached House D (District Heating)

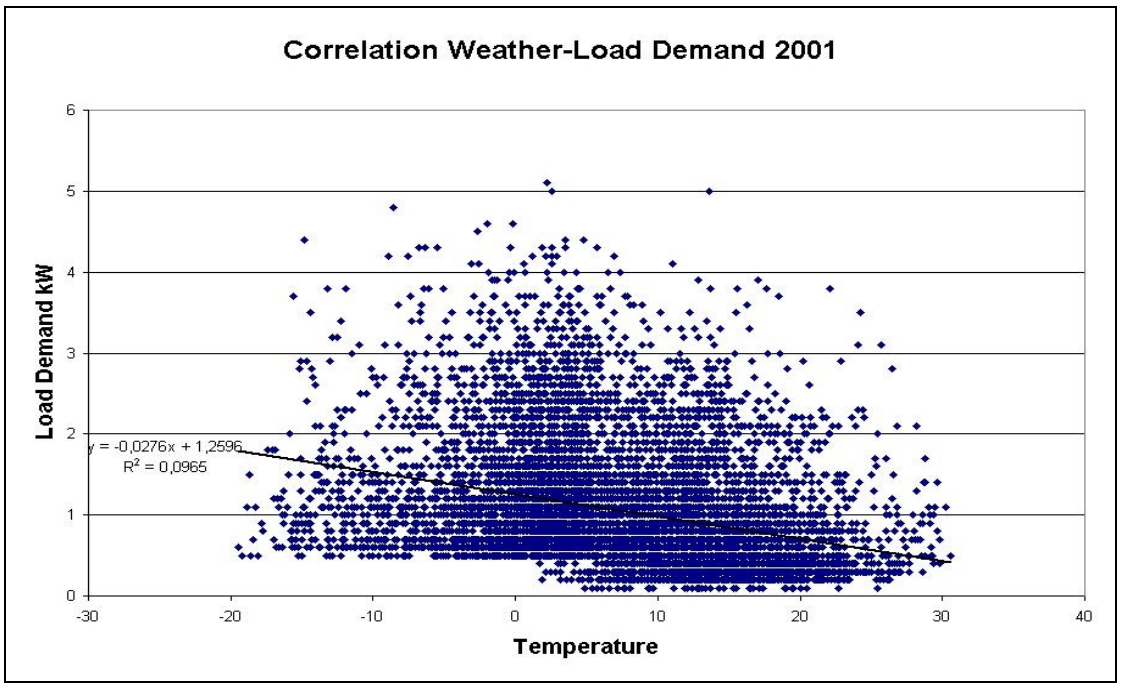

Figure A.10: Relationship between load demand and temperature.

C5) Semi-detached House E (District Heating)

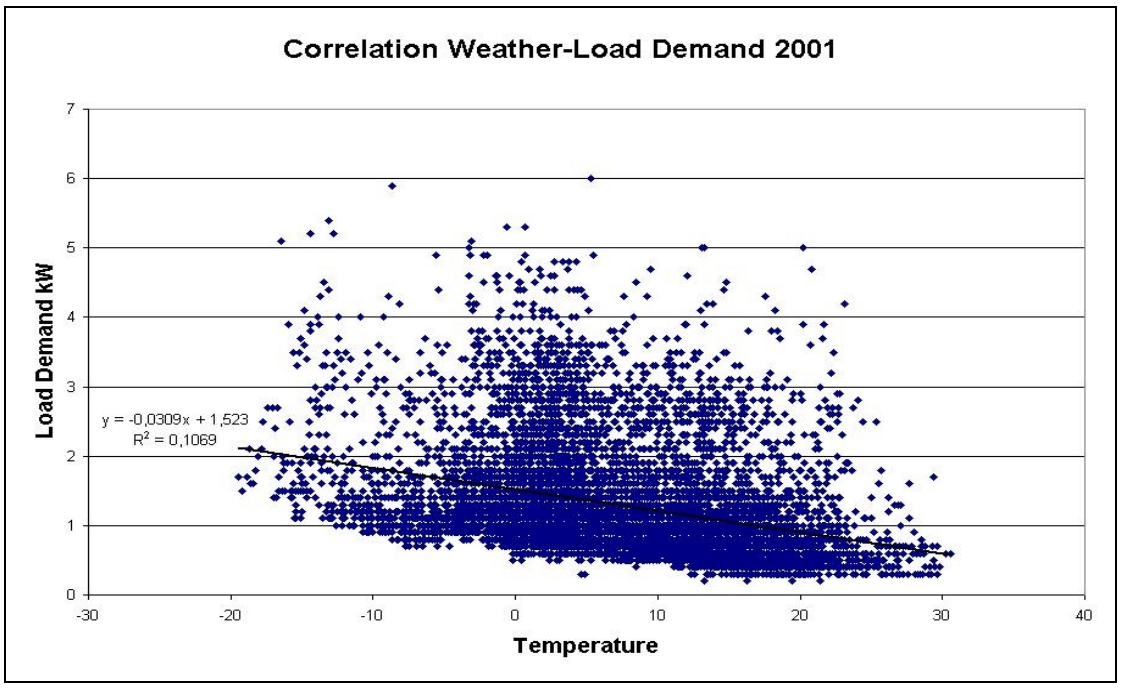

Figure A.11: Relationship between load demand and temperature.

D1) Flat A

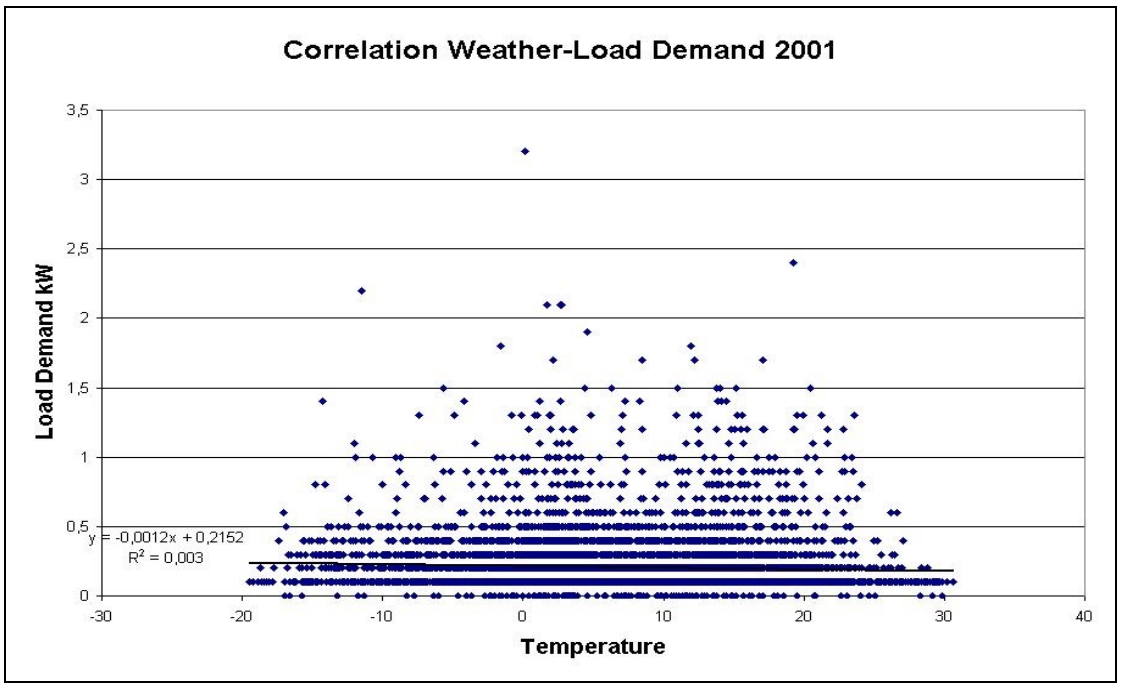

Figure A.12: Relationship between load demand and temperature.

D2) Flat B

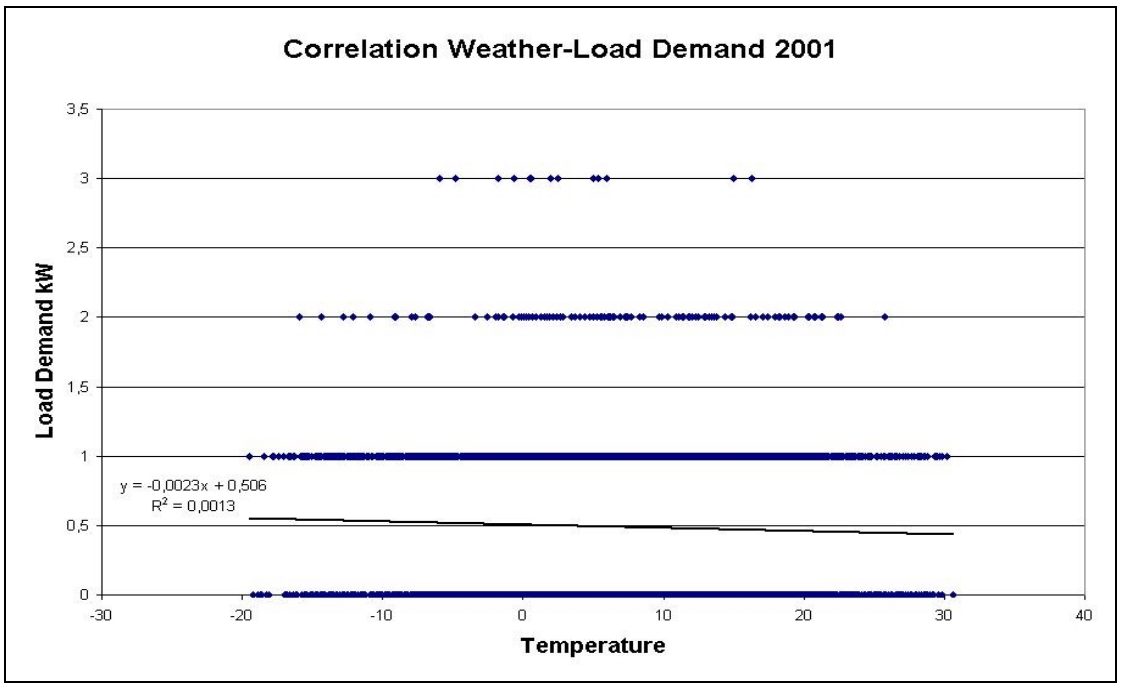

Figure A.13: Relationship between load demand and temperature.

D3) Flat C

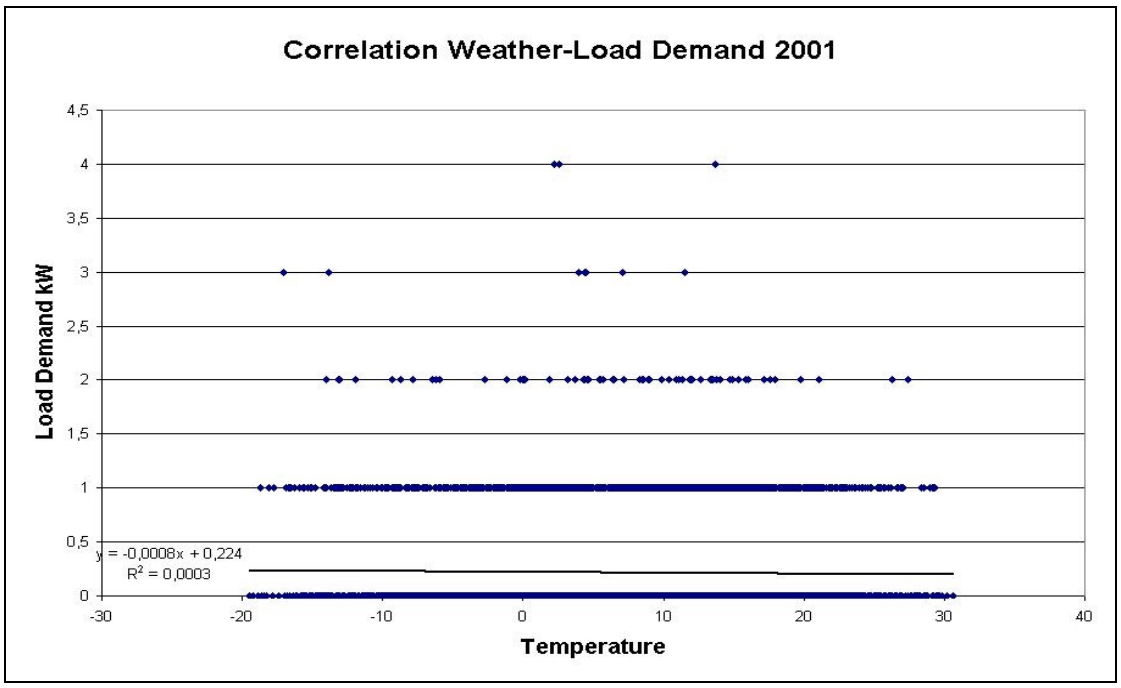

Figure A.14: Relationship between load demand and temperature.

D4) Flat D

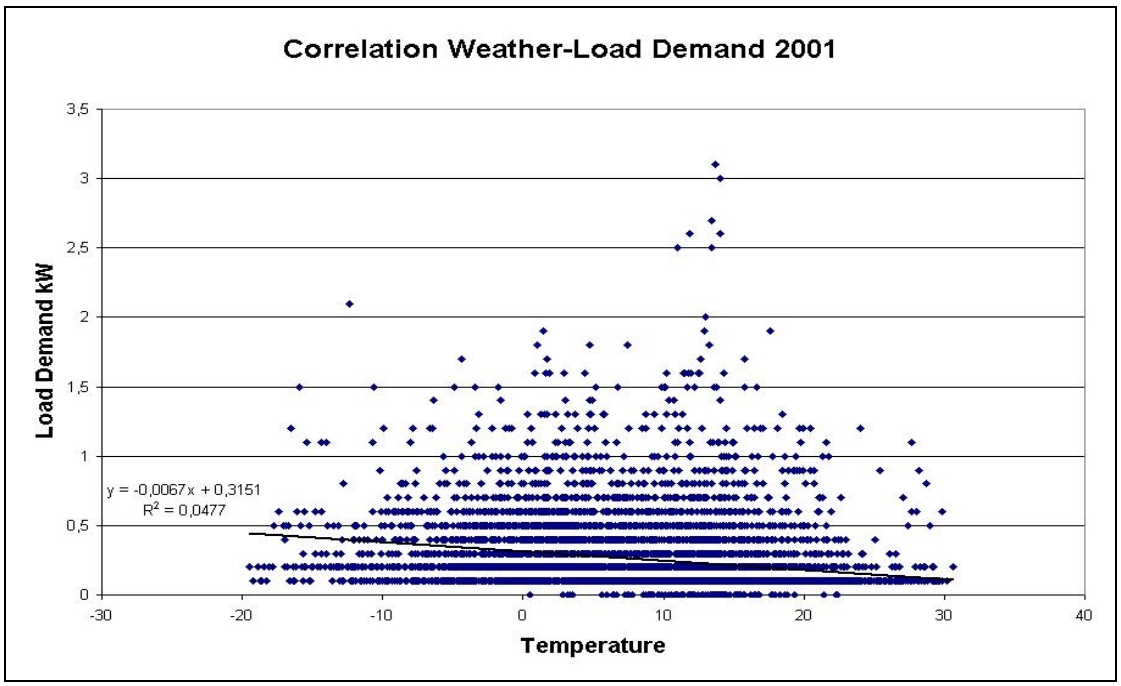

Figure A.15: Relationship between load demand and temperature.

D5) Flat E

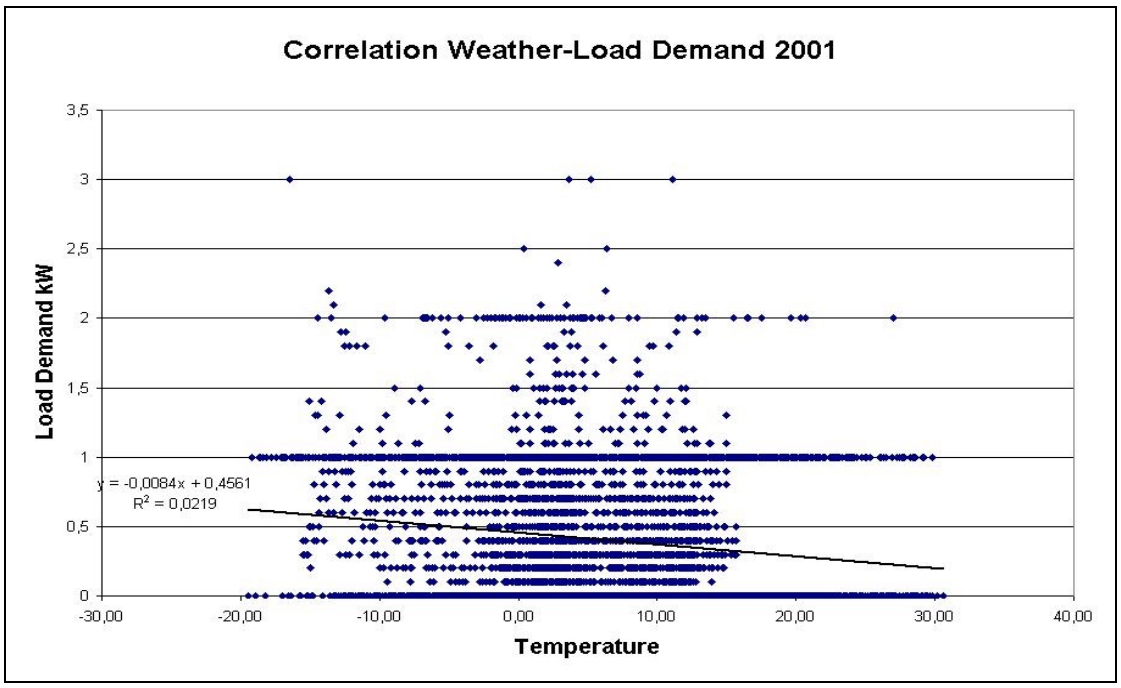

Figure A.16: Relationship between load demand and temperature.

E) Skånska-Energi

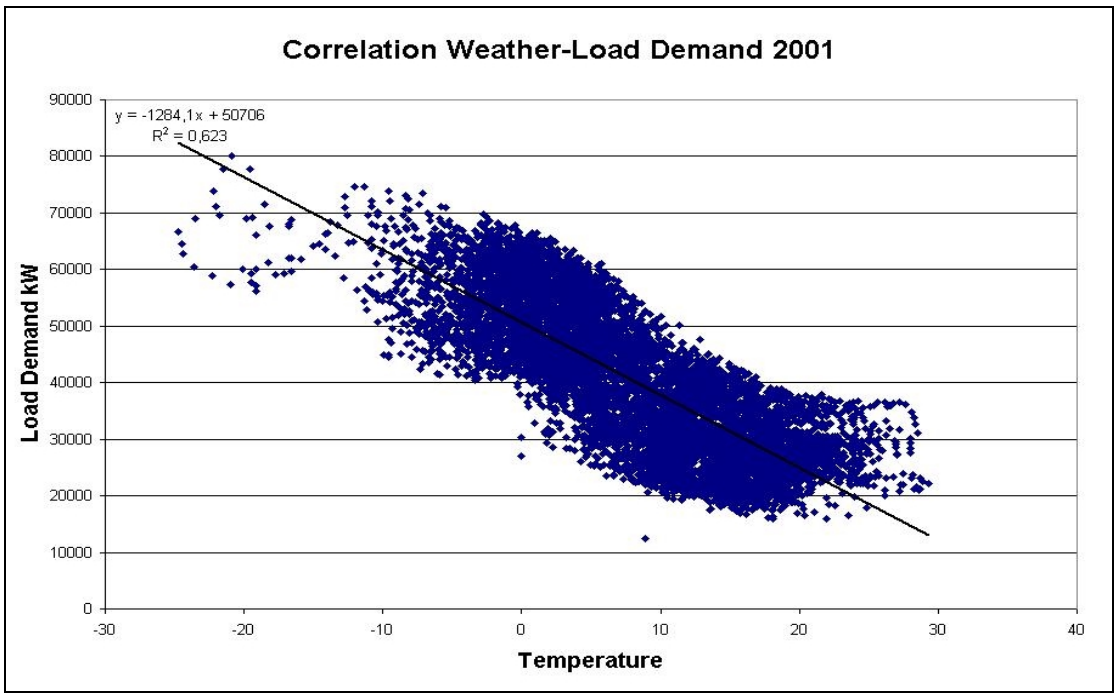

Figure A.17: Relationship between load demand and temperature.

Appendix B: Sollentuna Energy Analysis

This appendix compiles graphs and tables from the fifteen Sollentuna-Energi's customers. There are two tables and four graphs per customer, which are divided in two areas:

- Economic Analysis
- Consumption Analysis

Data represented in the graphs and shown in the tables has been downloaded from the Sollentuna-Energi's CustCom service module (www.sollentunaenergi.se).

B.1 FLATS (with district heating)

a) Flat A

Economic Analysis

Table B.1: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	168,2	1,8	1,7	1,3	1,60
February	142,7	2,2	1,5	1,3	1,67
March	144,8	2,1	2,1	1,1	1,77
April	130,9	1,7	1,5	1,5	1,57
May	137	1,3	1,2	1,2	1,23
June	138,2	1,5	1,3	1,3	1,37
July	119,9	1,5	1,3	1,2	1,33
August	137,2	2,4	1,7	1,5	1,87
September	147,7	1,4	1,3	1,3	1,33
October	172,1	1,8	1,7	1,5	1,67
November	167,5	3,2	2,1	1,4	2,23
December	197,5	1,9	1,5	1,4	1,60

Table B.2: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.1.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	176	93	**269**	153	84	**237**	0,881
February	173	79	**252**	156	71	**227**	0,901
March	173	80	**253**	162	72	**234**	0,925
April	172	73	**245**	110	65	**175**	0,714
May	172	76	**248**	101	76	**177**	0,714
June	173	77	**250**	105	77	**182**	0,728
July	171	67	**238**	104	67	**171**	0,718
August	172	76	**248**	118	76	**194**	0,782
September	174	82	**256**	104	82	**186**	0,727
October	176	96	**272**	113	96	**209**	0,768
November	176	93	**269**	186	93	**279**	1,037
December	179	110	**289**	153	110	**263**	0,910

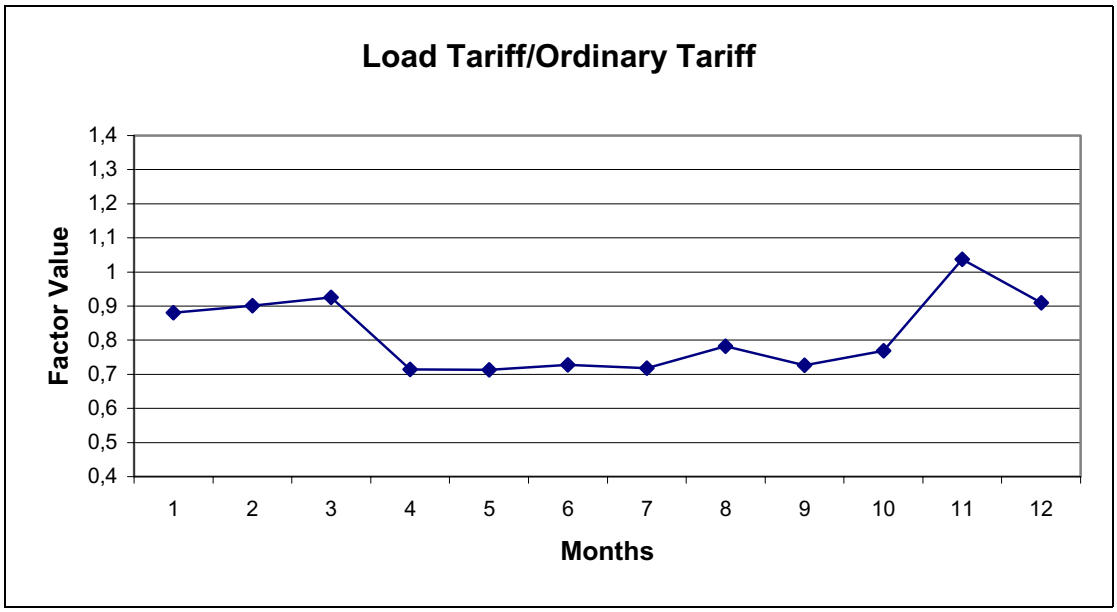

Figure B.1: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

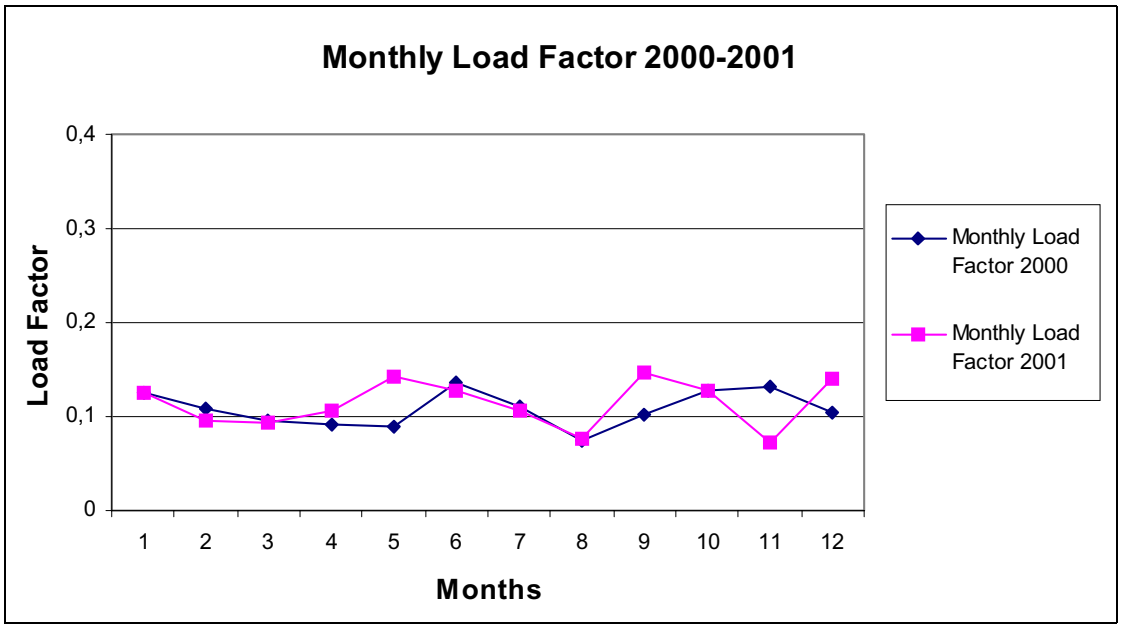

Figure B.2: Monthly load factor during 2000 and 2001.

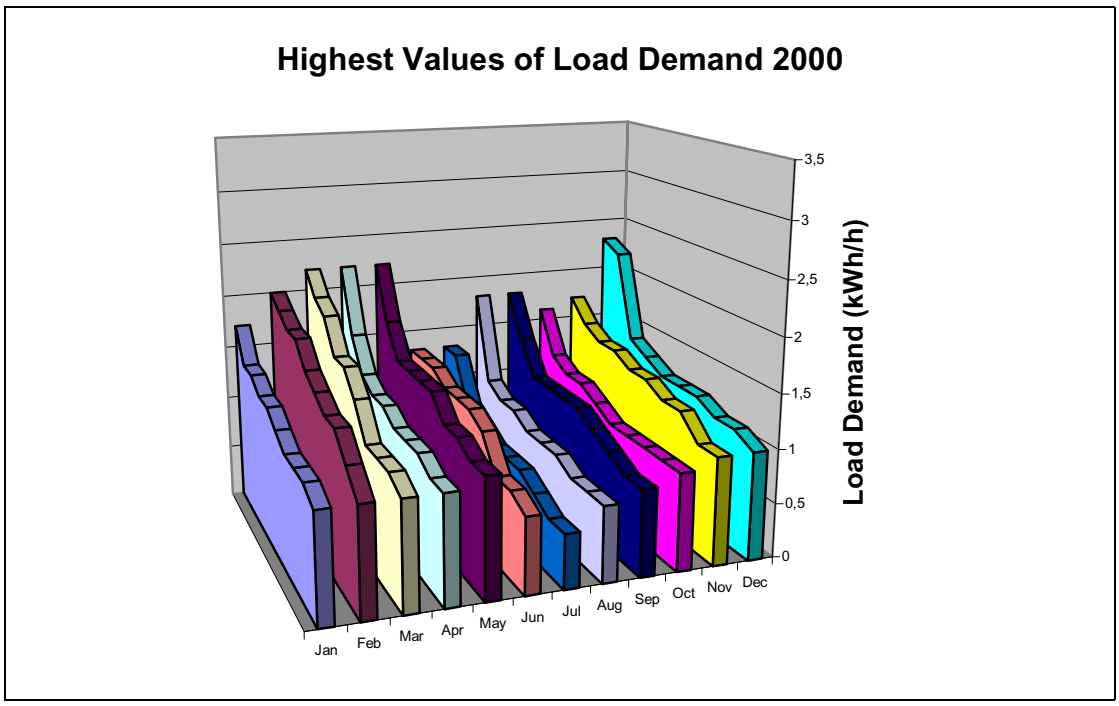

Figure B.3: Ten highest load demand values each month during 2000.

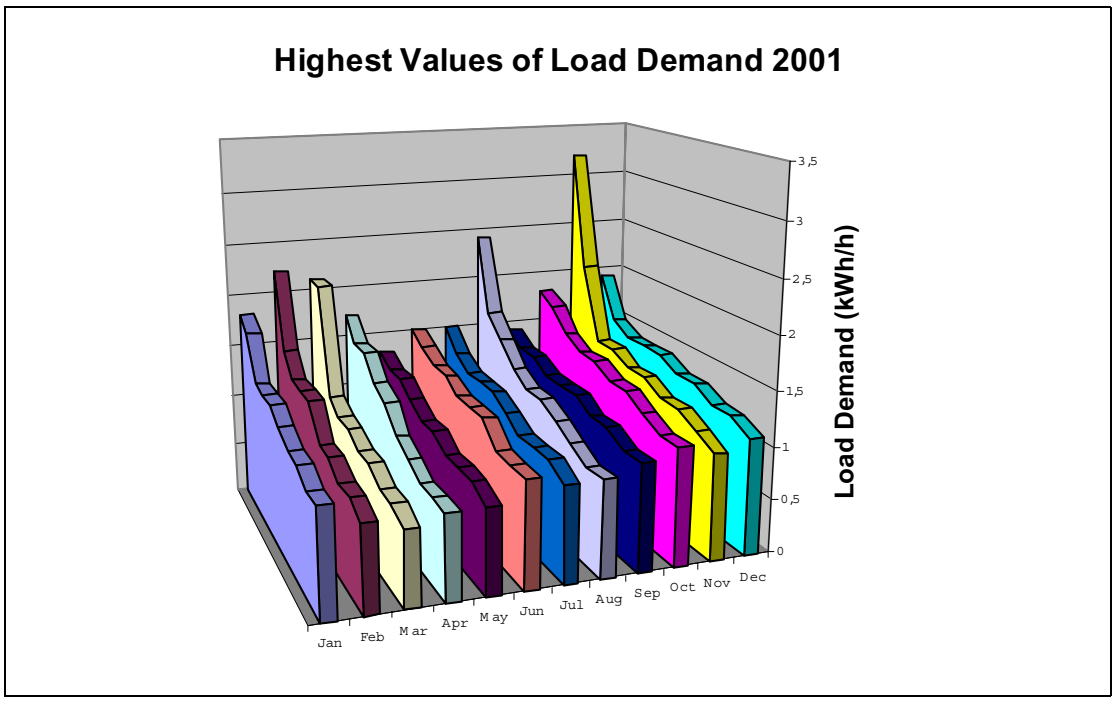

Figure B.4: Ten highest load demand values each month during 2001.

b) Flat B

Economic Analysis

Table B.3: Electricity use per month and values of load demand used with the new electricity tariff

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	399	3	3	3	3,00
February	349	3	2	2	2,33
March	364	3	2	2	2,33
April	342	2	2	2	2,00
May	337	2	2	2	2,00
June	305	2	2	1	1,67
July	344	2	2	2	2,00
August	324	3	2	2	2,33
September	348	2	2	2	2,00
October	378	3	2	2	2,33
November	379	3	3	3	3,00
December	416	3	3	2	2,67

Table B.4: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.3.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	199	221	**420**	226	199	**425**	1,012
February	194	194	**388**	191	174	**365**	0,941
March	195	202	**397**	191	182	**373**	0,940
April	193	190	**383**	121	171	**292**	0,762
May	192	187	**379**	121	187	**308**	0,813
June	189	169	**358**	113	169	**282**	0,788
July	193	191	**384**	121	191	**312**	0,813
August	191	180	**371**	130	180	**310**	0,836
September	194	193	**387**	121	193	**314**	0,811
October	197	210	**407**	130	210	**340**	0,835
November	197	210	**407**	226	210	**436**	1,071
December	200	231	**431**	209	231	**440**	1,021

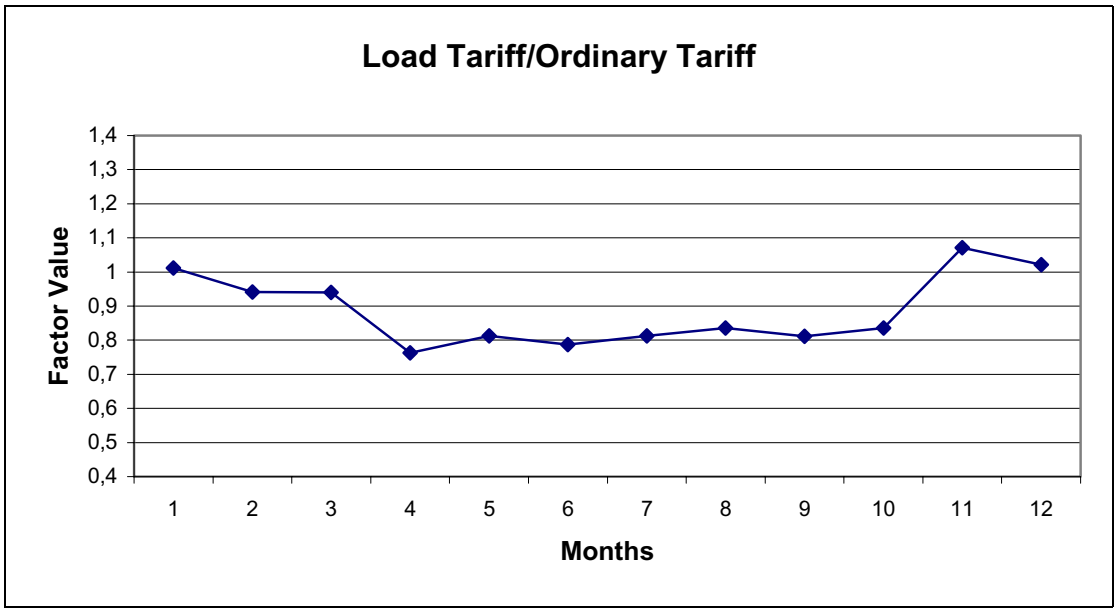

Figure B.5: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

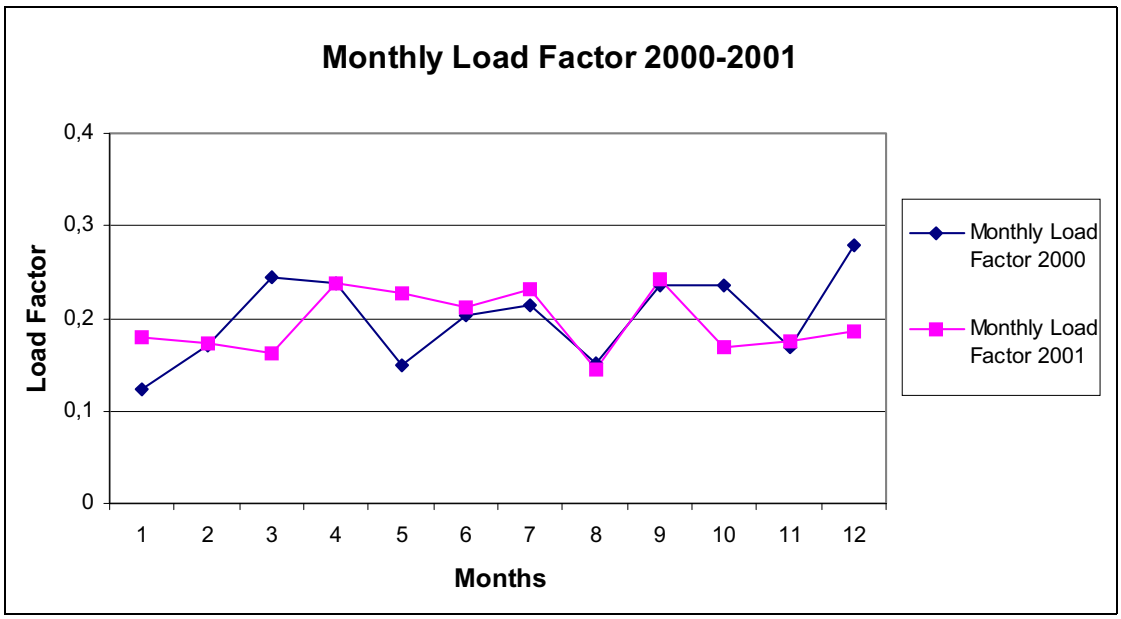

Figure B.6: Monthly load factor during 2000 and 2001.

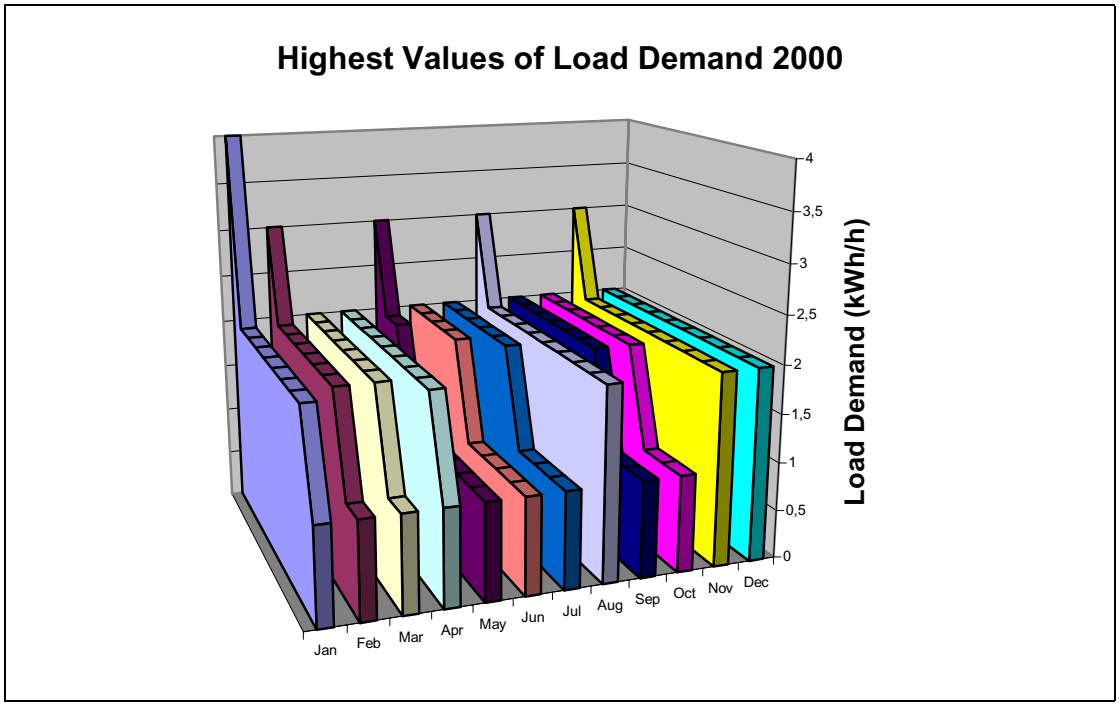

Figure B.7: Ten highest load demand values each month during 2000.

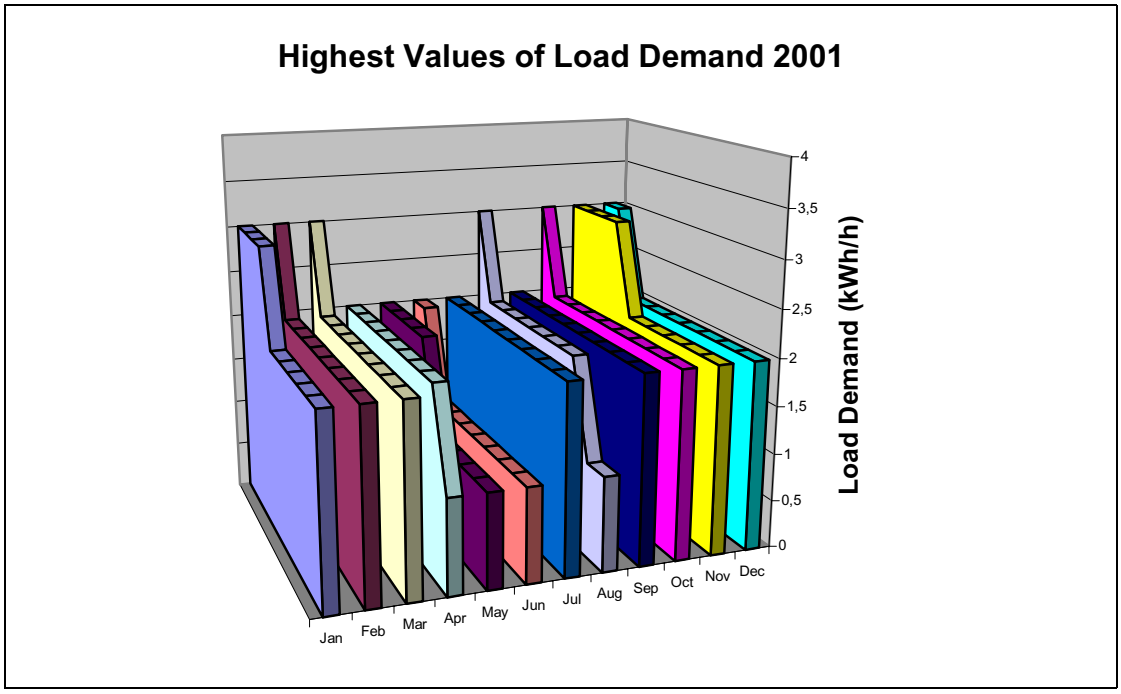

Figure B.8: Ten highest load demand values each month during 2001.

c) Flat C

Economic Analysis

Table B.5: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	212	3	2	2	2,33
February	164	3	2	2	2,33
March	98	1	1	1	1,00
April	127	3	2	2	2,33
May	131	4	1	1	2,00
June	107	2	1	1	1,33
July	159	2	2	2	2,00
August	179	2	2	2	2,00
September	185	2	2	2	2,00
October	180	2	2	2	2,00
November	213	4	3	2	3,00
December	153	4	3	2	3,00

Table B.6: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.5.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	180	118	**298**	191	106	**297**	0,997
February	175	91	**266**	191	82	**273**	1,026
March	169	54	**223**	121	49	**170**	0,762
April	171	70	**241**	130	63	**193**	0,801
May	172	73	**245**	121	73	**194**	0,792
June	169	59	**228**	104	59	**163**	0,715
July	175	88	**263**	121	88	**209**	0,795
August	177	99	**276**	121	99	**220**	0,797
September	177	103	**280**	121	103	**224**	0,800
October	177	100	**277**	121	100	**221**	0,798
November	180	118	**298**	226	118	**344**	1,154
December	174	85	**259**	226	85	**311**	1,201

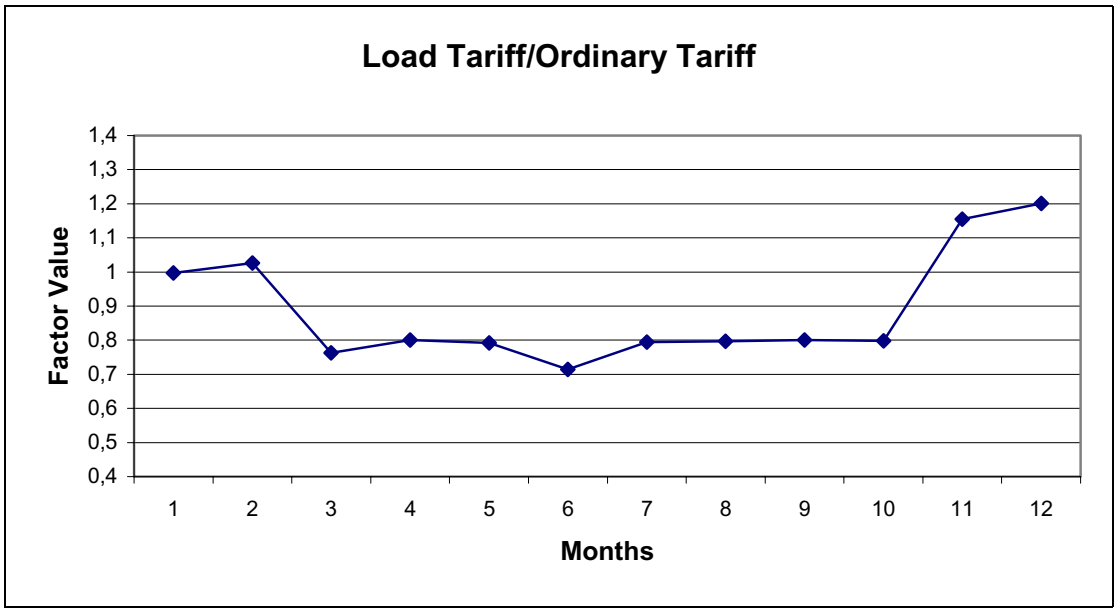

Figure B.9: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

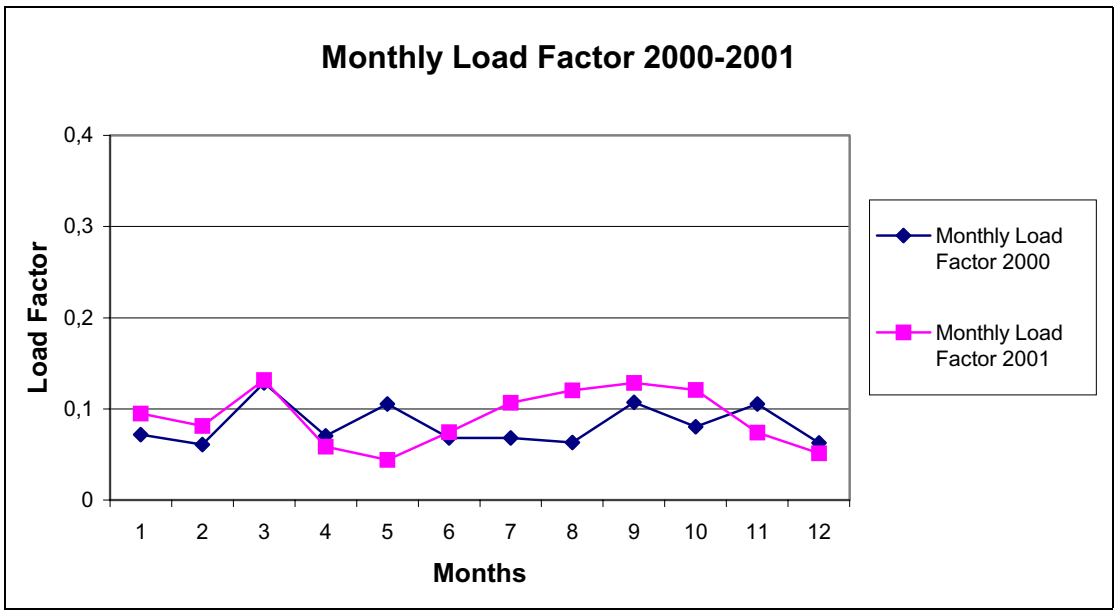

Figure B.10: Monthly load factor during 2000 and 2001.

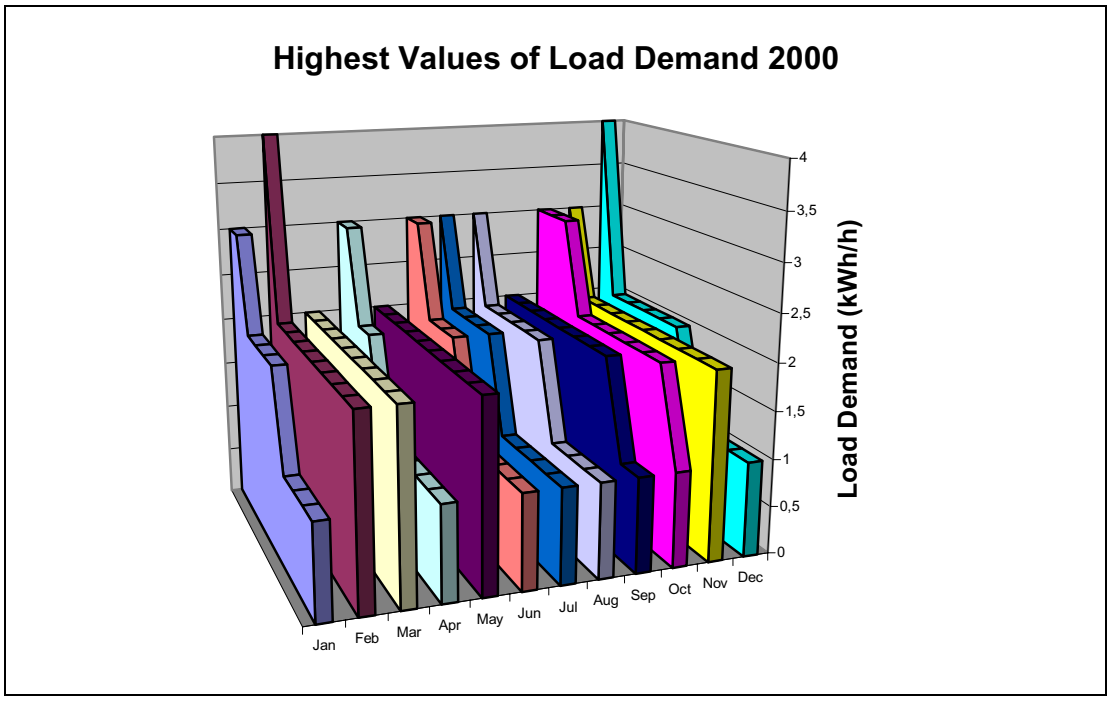

Figure B.11: Ten highest load demand values each month during 2000.

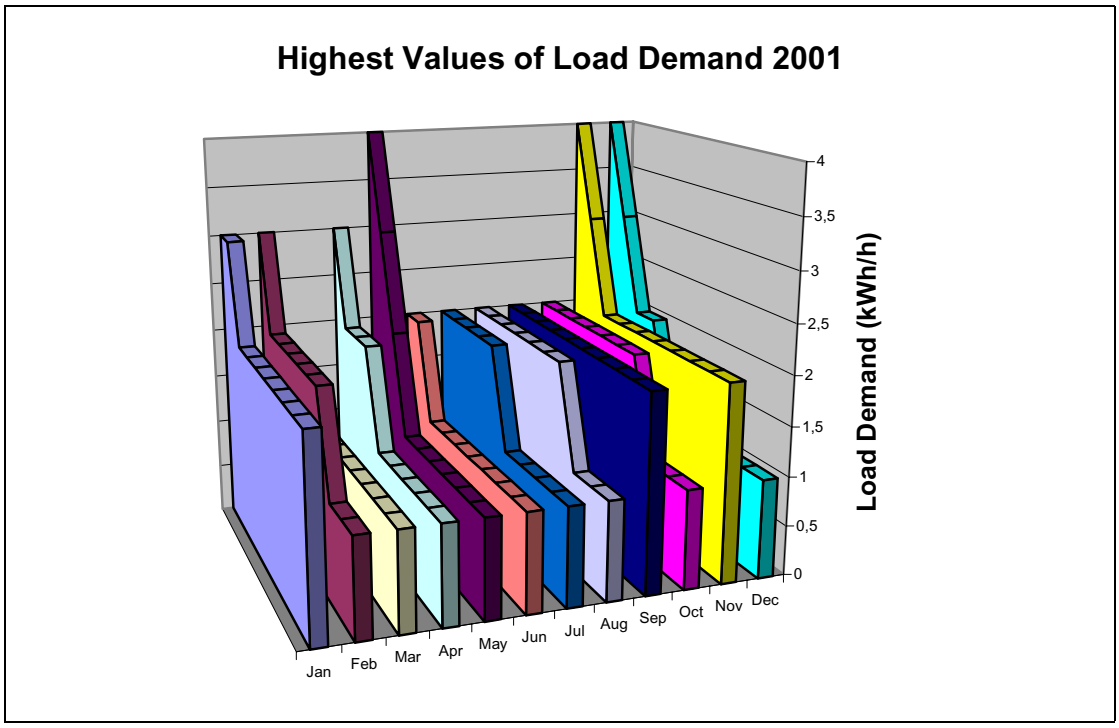

Figure B.12: Ten highest load demand values each month during 2001.

d) Flat D

Economic Analysis

Table B.7: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	289,5	1,9	1,8	1,8	1,83
February	232,2	2,1	1,7	1,5	1,77
March	240,3	1,6	1,6	1,4	1,53
April	192,5	1,1	1,1	1,1	1,10
May	127,5	1,4	1,4	1,2	1,33
June	122,7	1,4	1,2	1,1	1,23
July	115,6	1,3	1,2	0,9	1,13
August	128,6	1,9	1,7	1,2	1,60
September	185,3	3,1	2,7	1,6	2,47
October	237,6	2,6	2,5	1,9	2,33
November	--------	--------	--------	--------	--------
December	--------	--------	--------	--------	--------

Table B.8: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.7.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	188	161	**349**	165	144	**309**	0,885
February	182	129	**311**	162	116	**278**	0,894
March	183	133	**316**	149	120	**269**	0,851
April	178	107	**285**	98	96	**194**	0,681
May	172	71	**243**	104	71	**175**	0,720
June	171	68	**239**	101	68	**169**	0,707
July	170	64	**234**	99	64	**163**	0,697
August	172	71	**243**	111	71	**182**	0,749
September	177	103	**280**	134	103	**237**	0,846
October	183	132	**315**	130	132	**262**	0,832
November	--------	--------	--------	--------	--------	--------	--------
December	--------	--------	--------	--------	--------	--------	--------

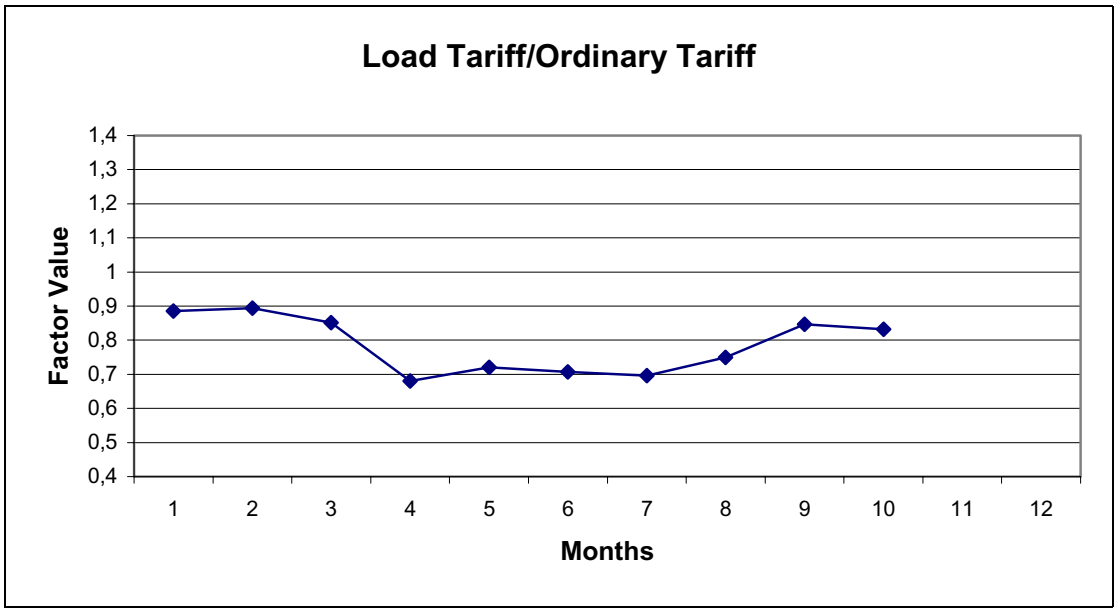

Figure B.13: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

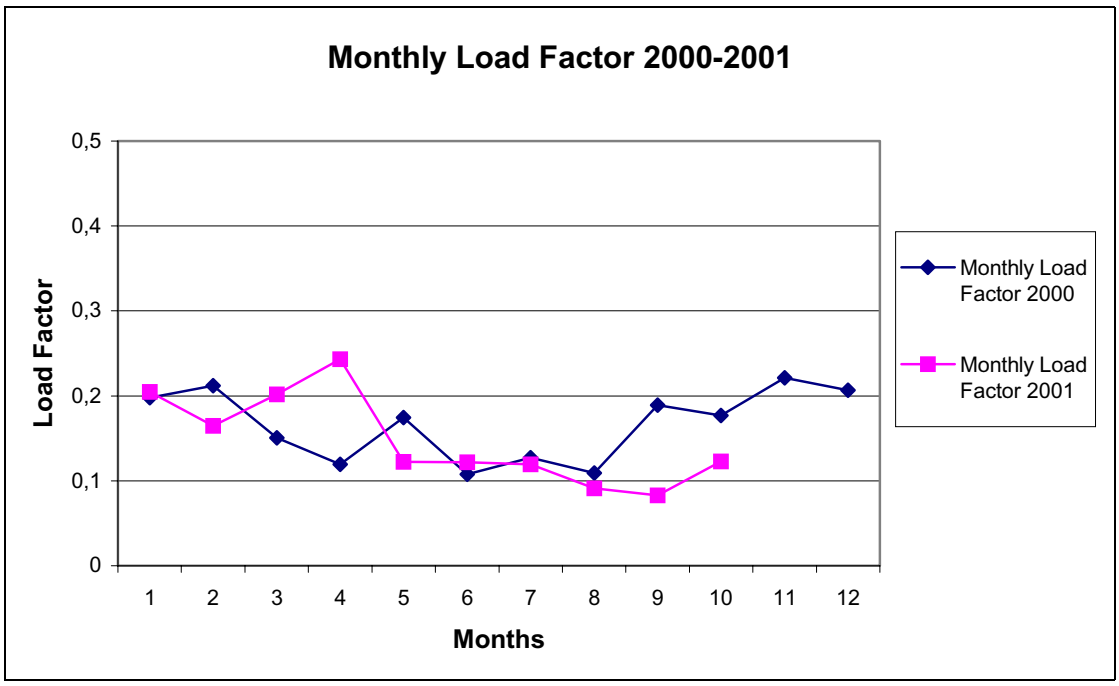

Figure B.14: Monthly load factor during 2000 and 2001.

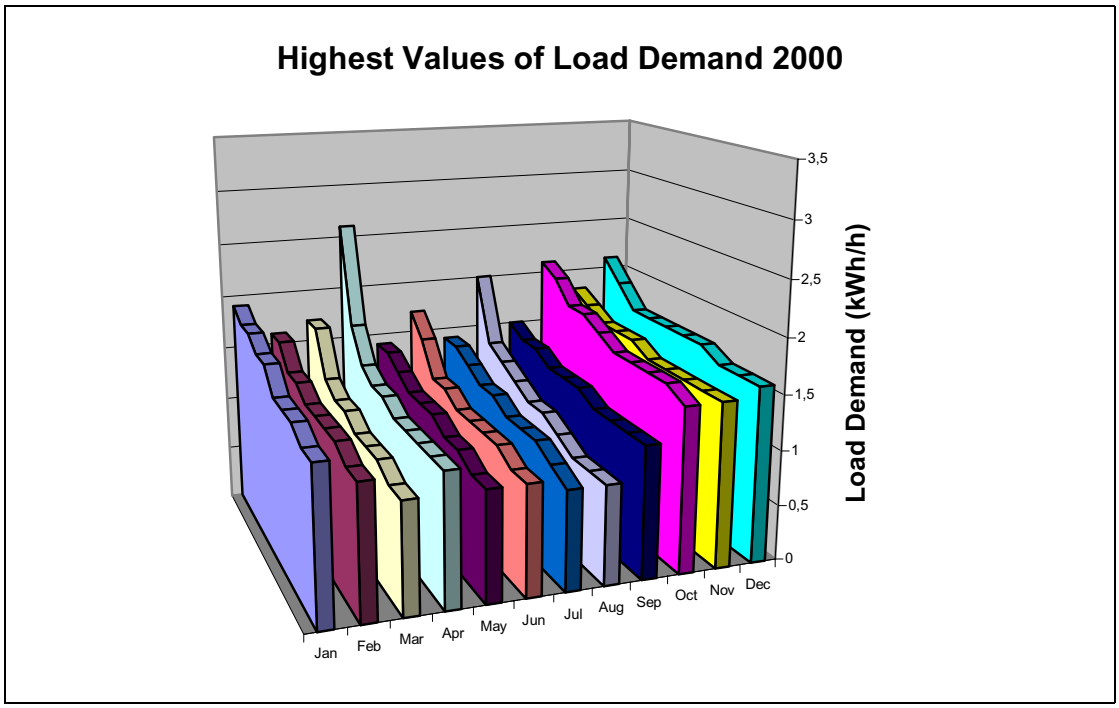

Figure B.15: Ten highest load demand values each month during 2000.

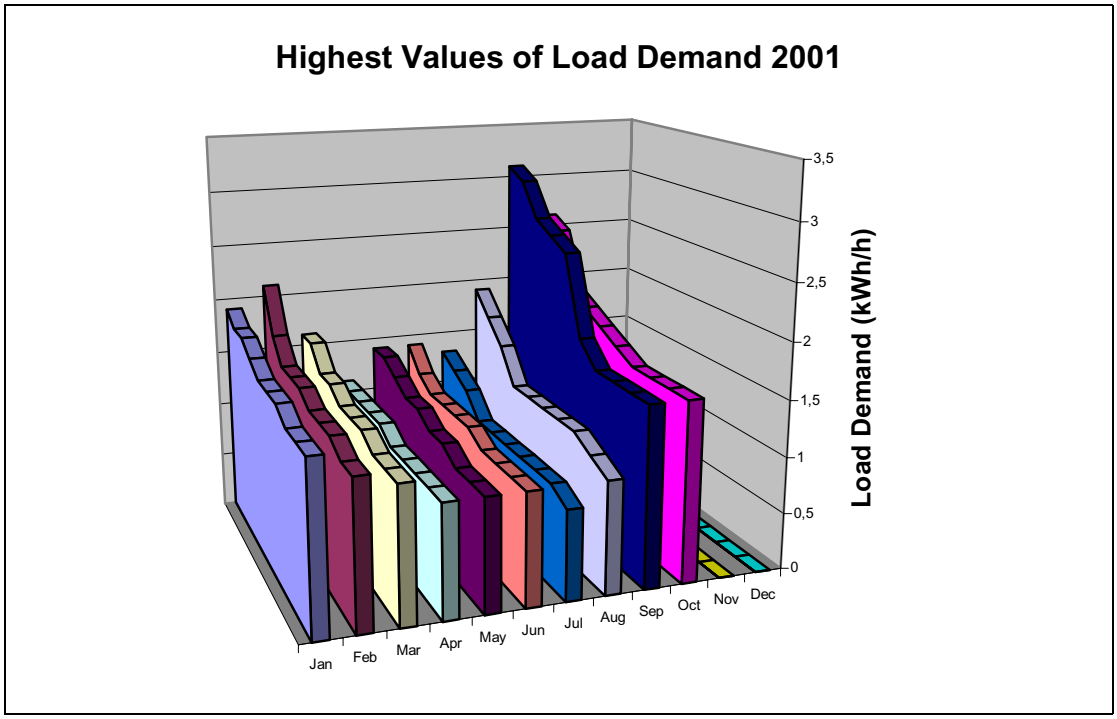

Figure B.16: Ten highest load demand values each month during 2001.

e) Flat E

Economic Analysis

Table B.9: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	330	3	2	2	2,33
February	313	3	2	2	2,33
March	300	2	2	2	2,00
April	266	3	2	2	2,33
May	227	2	2	2	2,00
June	222	2	2	2	2,00
July	211	2	2	1	1,67
August	--------	--------	--------	--------	--------
September	--------	--------	--------	--------	--------
October	324	1,9	1,9	1,9	1,90
November	354,2	3	2,5	2,5	2,67
December	412,9	2,2	2,1	2	2,10

Table B.10: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.9.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	192	183	**375**	191	165	**356**	0,949
February	190	174	**364**	191	156	**347**	0,953
March	189	167	**356**	174	150	**324**	0,910
April	185	148	**333**	130	133	**263**	0,790
May	181	126	**307**	121	126	**247**	0,805
June	181	123	**304**	121	123	**244**	0,803
July	180	117	**297**	113	117	**230**	0,774
August	--------	--------	--------	--------	--------	--------	--------
September	--------	--------	--------	--------	--------	--------	--------
October	191	180	**371**	119	180	**299**	0,806
November	194	197	**391**	209	197	**406**	1,038
December	200	229	**429**	179	229	**408**	0,951

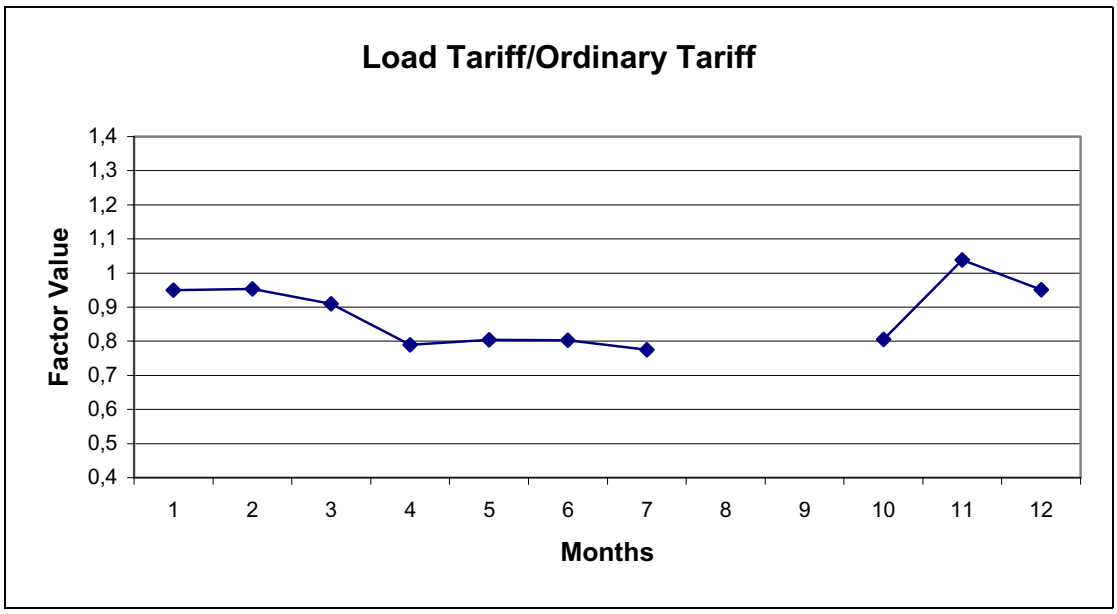

Figure B.17: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

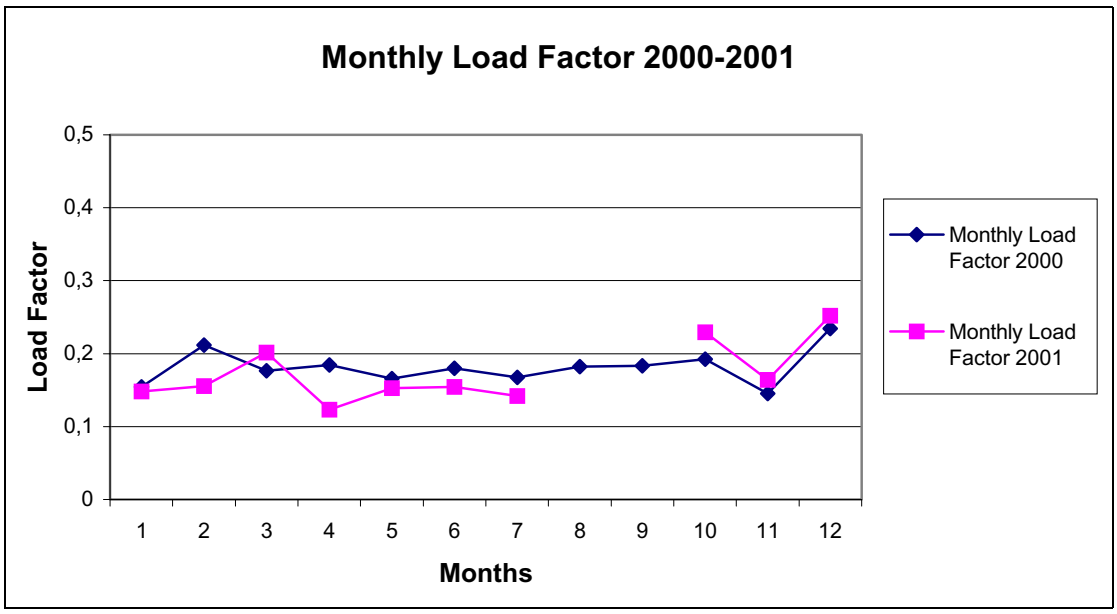

Figure B.18: Monthly load factor during 2000 and 2001.

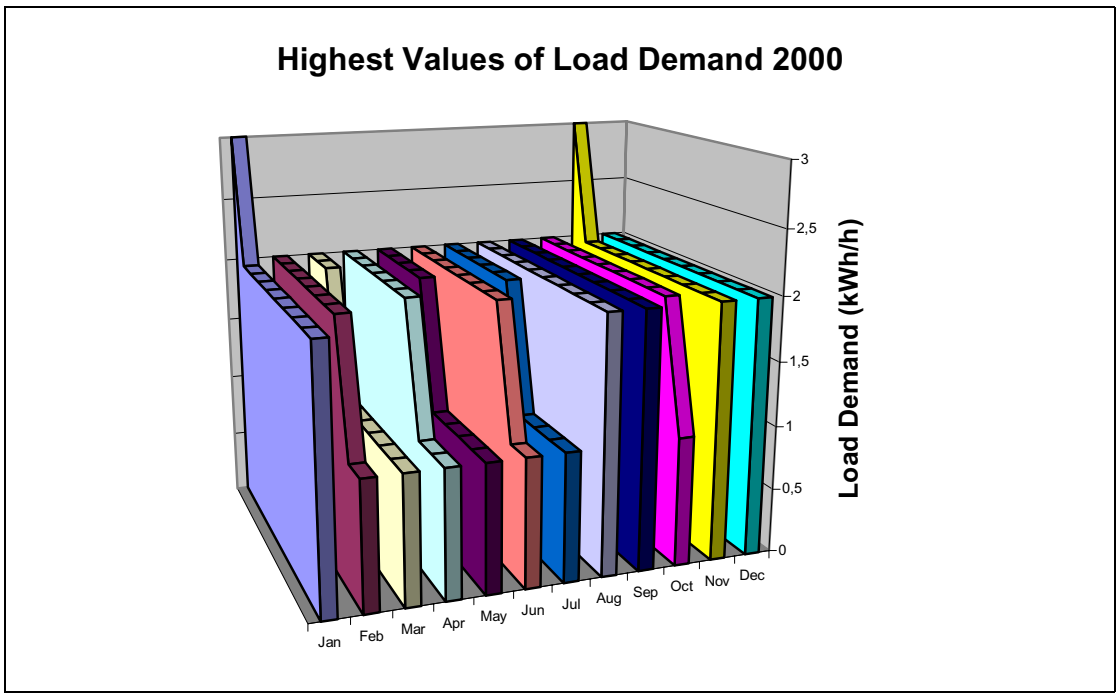

Figure B.19: Ten highest load demand values each month during 2000.

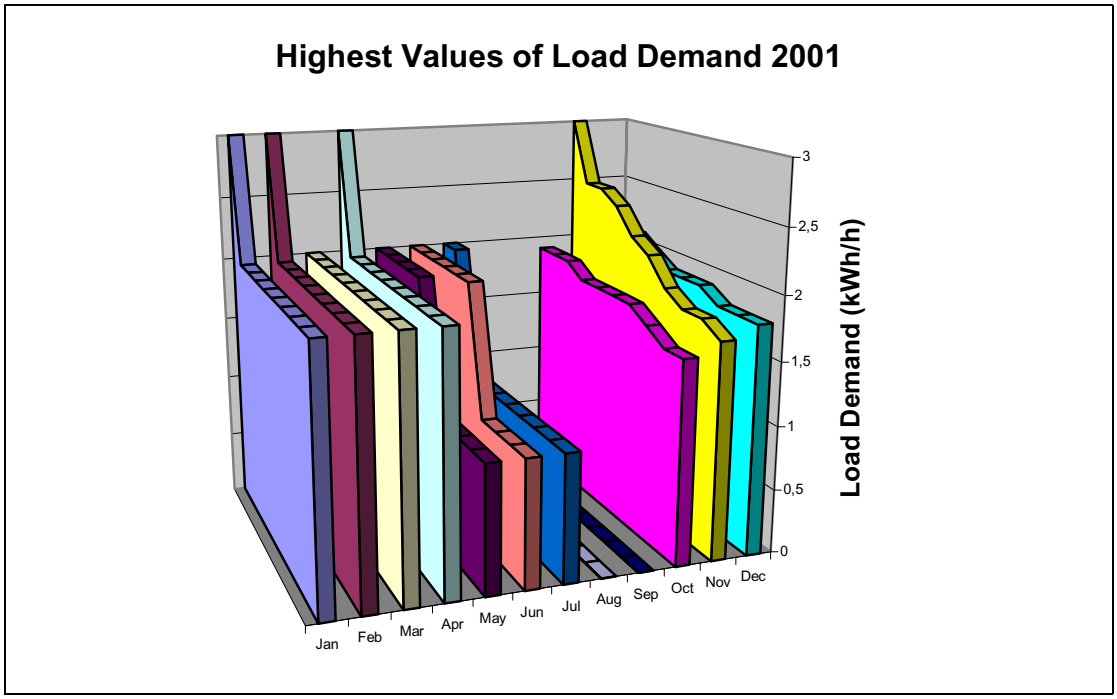

Figure B.20: Ten highest load demand values each month during 2001.

B.1 VILLAS (with electrical heating)

a) Villa A

Economic Analysis

Table B.11: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	5566,1	14,6	12,3	12,1	13,00
February	5303,2	12,4	11,9	11,7	12,00
March	5693,5	12,3	12,2	12	12,17
April	4708,8	11,4	11,3	10,7	11,13
May	4009	11,1	10,2	10	10,43
June	3268,5	11,7	10,5	10,5	10,90
July	2649,3	7,4	6,7	6,6	6,90
August	2738	7,3	7,2	7,1	7,20
September	2872,9	10,6	8,1	7,9	8,87
October	3963,2	11	10,1	9,9	10,33
November	4416,3	11,7	11,2	11	11,30
December	5418,4	13,6	12,7	12,2	12,83

Table B.12: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.11.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	888	3089	**3977**	820	2777	**3597**	0,904
February	862	2943	**3805**	768	2646	**3414**	0,897
March	901	3160	**4061**	776	2841	**3617**	0,891
April	802	2613	**3415**	430	2350	**2780**	0,814
May	732	2225	**2957**	411	2225	**2636**	0,891
June	658	1814	**2472**	424	1814	**2238**	0,905
July	596	1470	**2066**	319	1470	**1789**	0,866
August	605	1520	**2125**	327	1520	**1847**	0,869
September	619	1594	**2213**	370	1594	**1964**	0,887
October	728	2200	**2928**	409	2200	**2609**	0,891
November	773	2451	**3224**	731	2451	**3182**	0,987
December	873	3007	**3880**	811	3007	**3818**	0,984

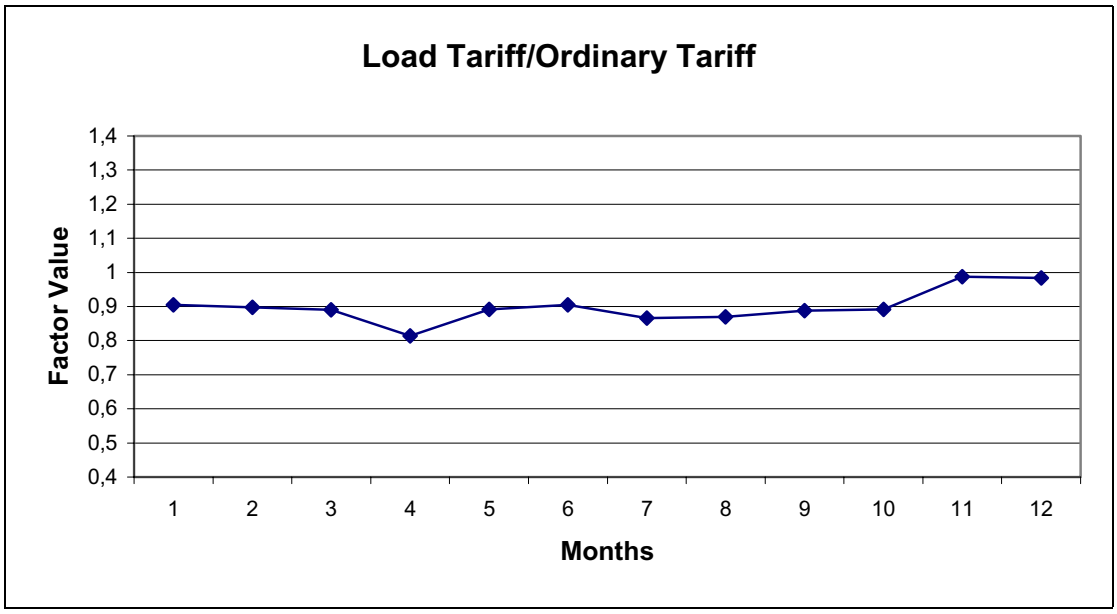

Figure B.21: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

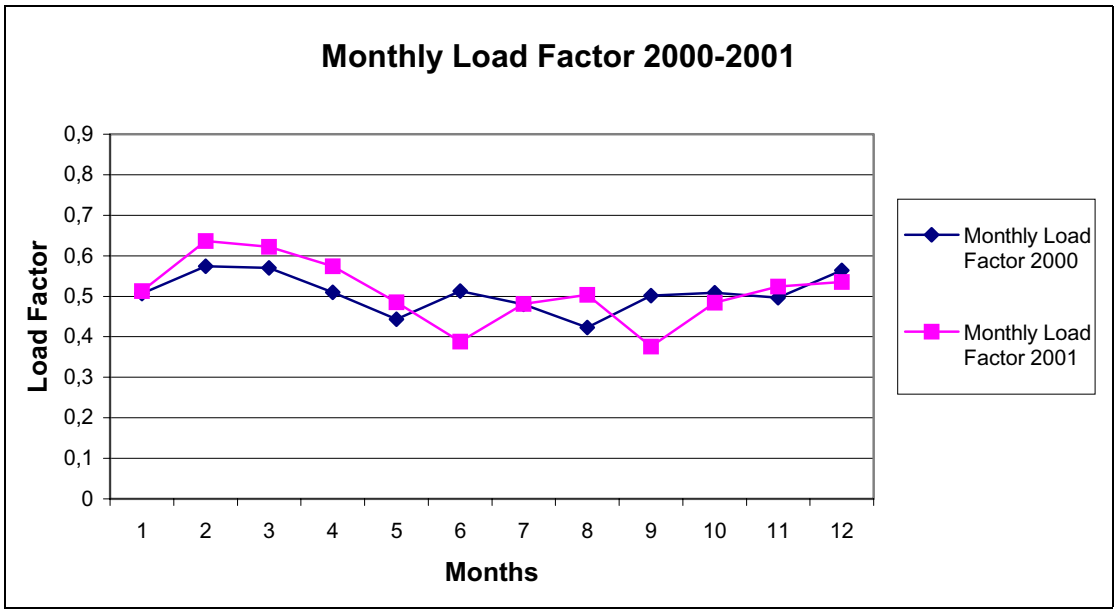

Figure B.22: Monthly load factor during 2000 and 2001.

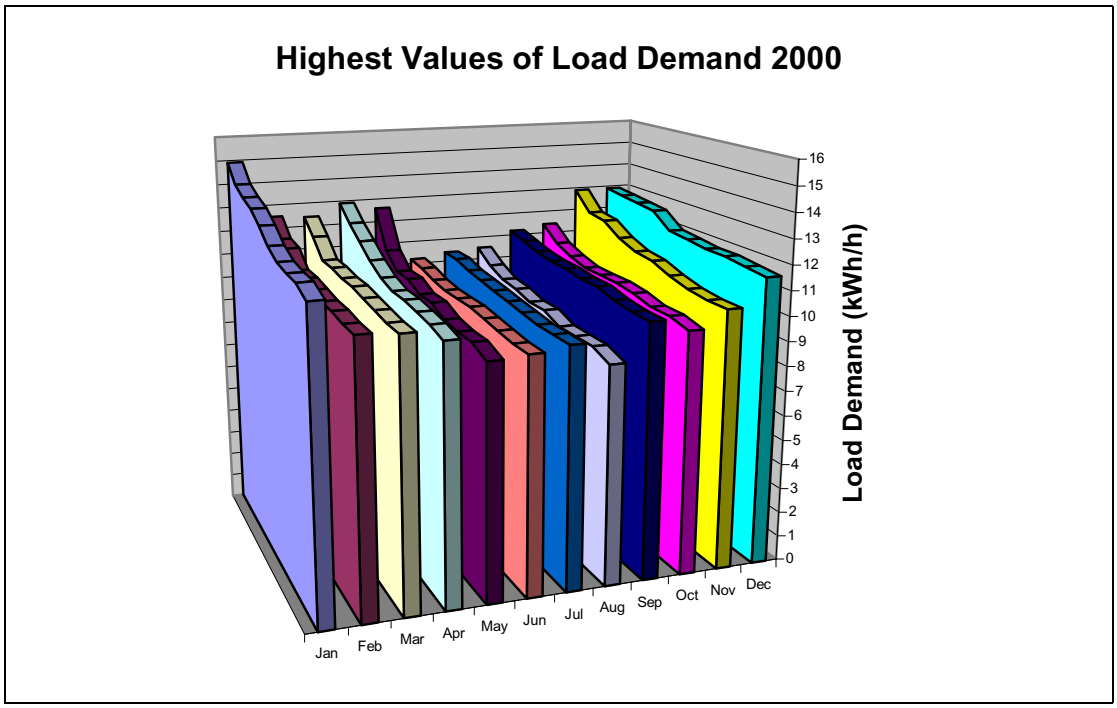

Figure B.23: Ten highest load demand values each month during 2000.

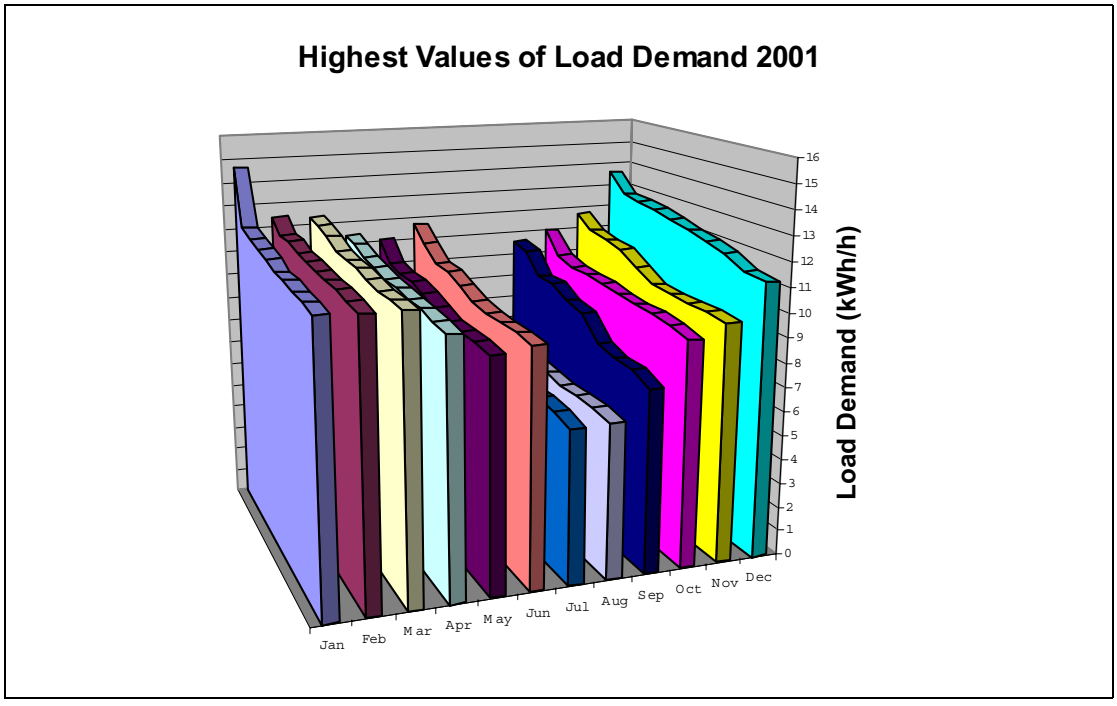

Figure B.24: Ten highest load demand values each month during 2001.

b) Villa B

Economic Analysis

Table B.13: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	2717,3	8,5	8,1	7,7	8,10
February	2561,1	8,4	7,5	7,5	7,80
March	2566	8,8	7,2	7	7,67
April	1601,2	8,4	6,4	5,7	6,83
May	958,3	5,4	4,8	3,7	4,63
June	742,6	6,4	5,1	4,8	5,43
July	654,2	5,1	3,3	2,7	3,70
August	687,5	3,7	2,7	2,6	3,00
September	913,6	6,2	5,9	3,5	5,20
October	1658,4	9,6	6,1	6	7,23
November	2382,4	9,1	8,7	7,9	8,57
December	2868,1	7,7	7,5	7,4	7,53

Table B.14: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.13.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	603	1508	**2111**	563	1356	**1919**	0,909
February	587	1421	**2008**	547	1278	**1825**	0,909
March	588	1424	**2012**	540	1280	**1820**	0,905
April	491	889	**1380**	317	799	**1116**	0,809
May	427	532	**959**	259	532	**791**	0,825
June	406	412	**818**	280	412	**692**	0,846
July	397	363	**760**	235	363	**598**	0,787
August	400	382	**782**	216	382	**598**	0,765
September	423	507	**930**	274	507	**781**	0,840
October	497	920	**1417**	327	920	**1247**	0,880
November	569	1322	**1891**	587	1322	**1909**	1,010
December	618	1592	**2210**	533	1592	**2125**	0,962

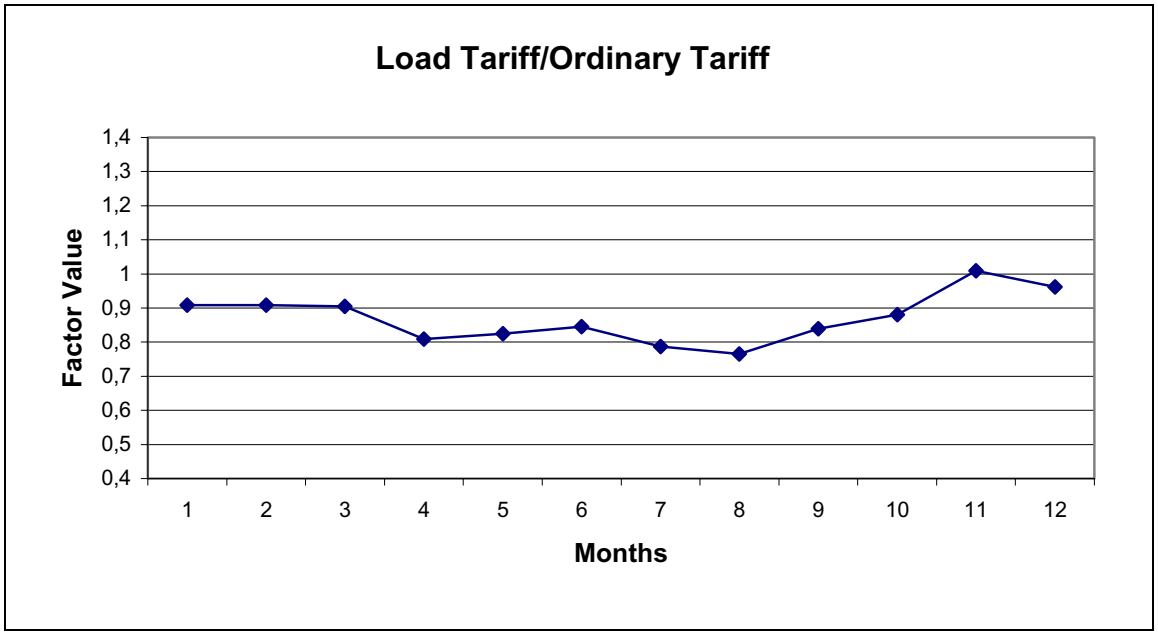

Figure B.25: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

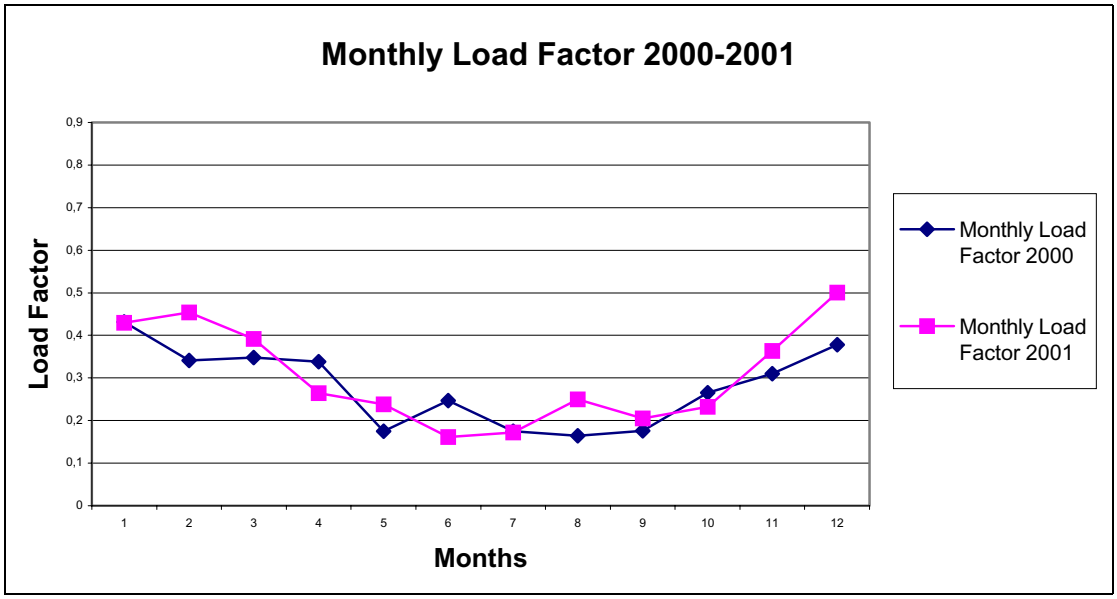

Figure B.26: Monthly load factor during 2000 and 2001

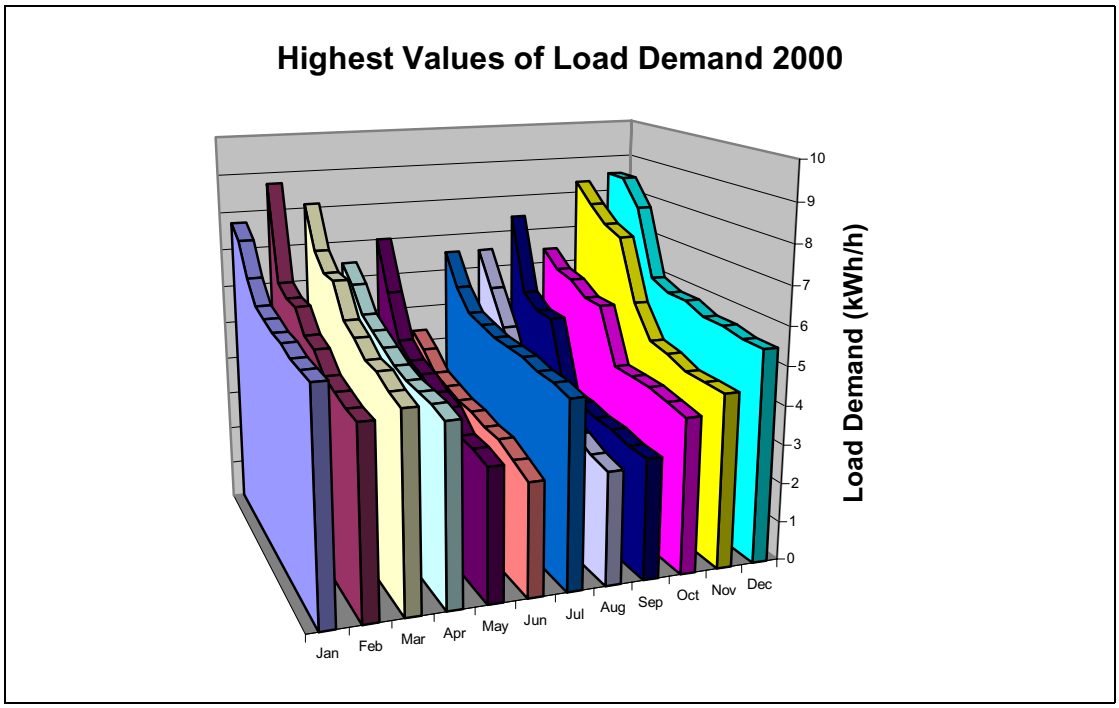

Figure B.27: Ten highest load demand values each month during 2000.

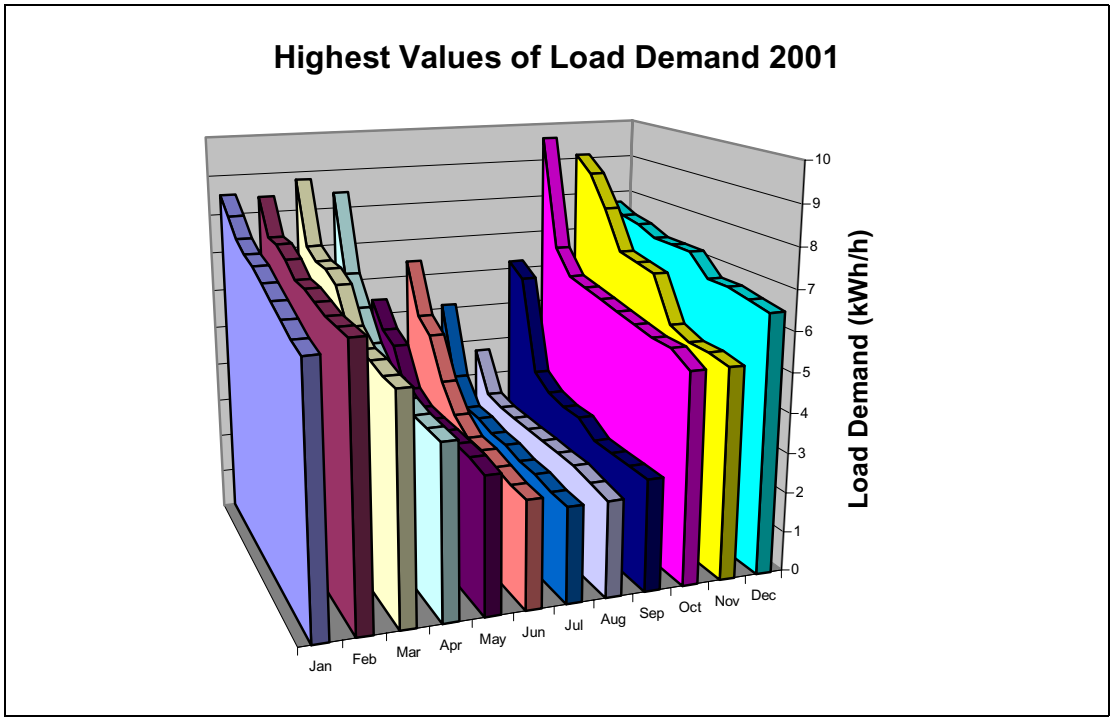

Figure B.28: Ten highest load demand values each month during 2001.

c) Villa C

Economic Analysis

Table B.15: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	5209	16	16	16	16,00
February	5588	17	16	16	16,33
March	5073	16	16	16	16,00
April	3265	16	16	16	16,00
May	1736	14	14	13	13,67
June	913,5	9	8	8	8,33
July	751	5	4	3	4,00
August	838	5	4	4	4,33
September	1400	16	15	15	15,33
October	2619	16	15	15	15,33
November	4243	16	16	16	16,00
December	5336	16	16	16	16,00

Table B.16: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.15.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	852	2891	**3743**	978	2599	**3577**	0,956
February	890	3101	**3991**	995	2788	**3783**	0,948
March	839	2816	**3655**	978	2531	**3509**	0,960
April	658	1812	**2470**	558	1629	**2187**	0,885
May	505	963	**1468**	496	963	**1459**	0,994
June	423	507	**930**	356	507	**863**	0,928
July	406	417	**823**	243	417	**660**	0,802
August	415	465	**880**	251	465	**716**	0,814
September	471	777	**1248**	540	777	**1317**	1,055
October	593	1454	**2047**	540	1454	**1994**	0,974
November	756	2355	**3111**	978	2355	**3333**	1,071
December	865	2961	**3826**	978	2961	**3939**	1,030

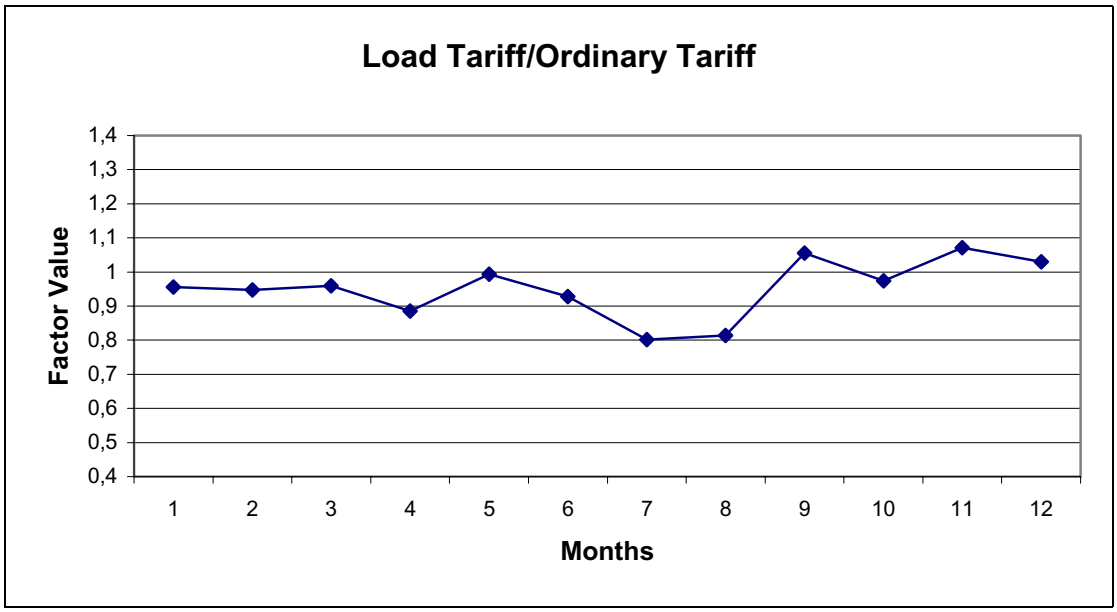

Figure B.29: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

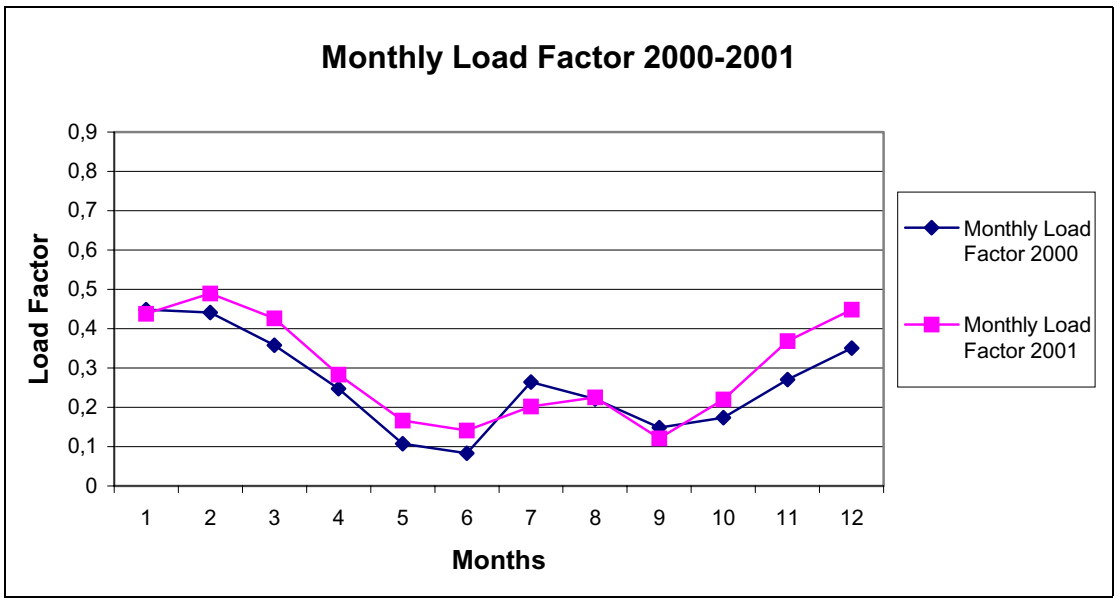

Figure B.30: Monthly load factor during 2000 and 2001.

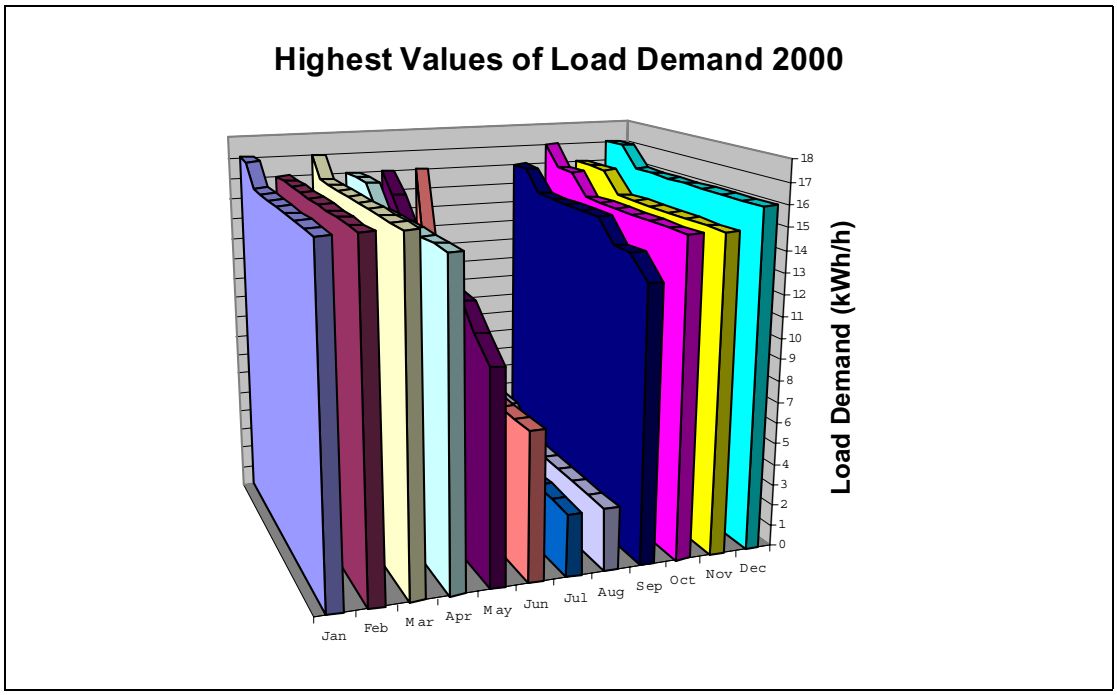

Figure B.31: Ten highest load demand values each month during 2000.

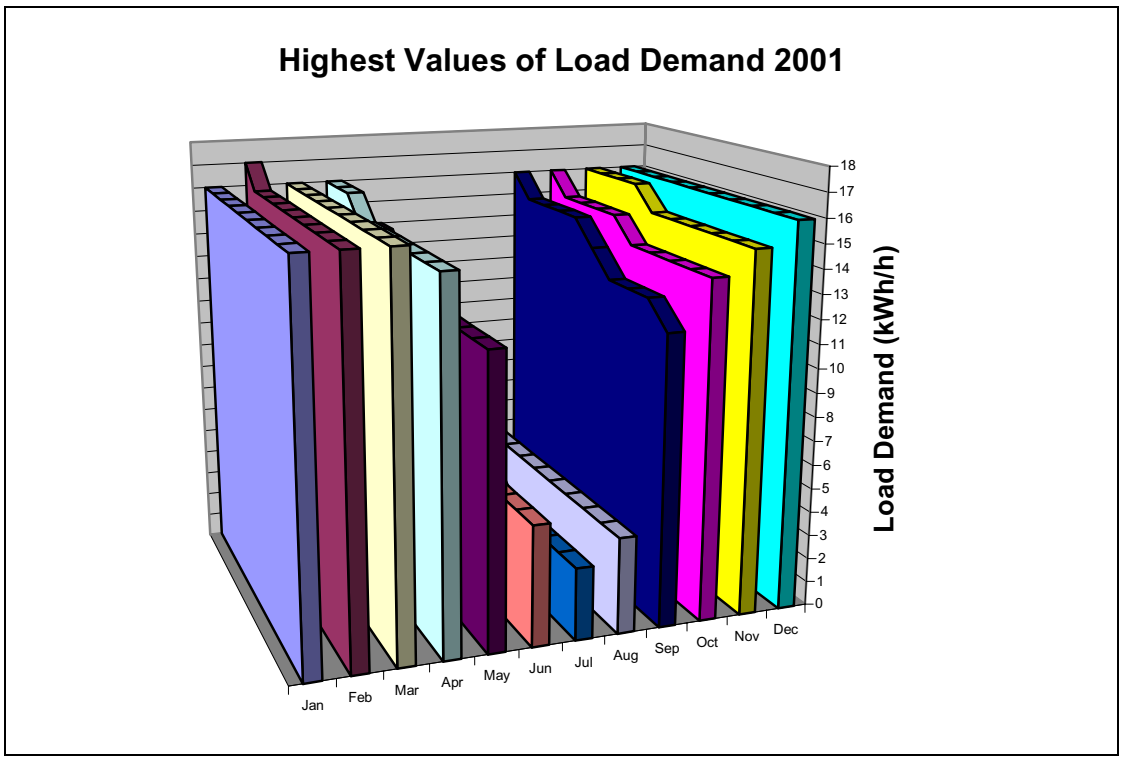

Figure B.32: Ten highest load demand values each month during 2001.

d) Villa D

Economic Analysis

Table B.17: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	4000	11	11	10	10,67
February	4136	15	15	13	14,33
March	3895	13	12	12	12,33
April	2110	8	8	8	8,00
May	956	7	7	6	6,67
June	1522	7	6	6	6,33
July	406	7	5	5	5,67
August	545	5	4	4	4,33
September	1193	6	6	6	6,00
October	1714	8	7	7	7,33
November	2939	11	11	10	10,67
December	3944	12	12	11	11,67

Table B.18: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.17.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	731	2220	**2951**	698	1996	**2694**	0,913
February	745	2295	**3040**	890	2064	**2954**	0,972
March	721	2162	**2883**	785	1944	**2729**	0,947
April	542	1171	**1713**	348	1053	**1401**	0,818
May	427	531	**958**	313	531	**844**	0,881
June	483	845	**1328**	304	845	**1149**	0,865
July	372	225	**597**	286	225	**511**	0,856
August	386	302	**688**	251	302	**553**	0,804
September	451	662	**1113**	295	662	**957**	0,860
October	503	951	**1454**	330	951	**1281**	0,881
November	625	1631	**2256**	698	1631	**2329**	1,032
December	726	2189	**2915**	750	2189	**2939**	1,008

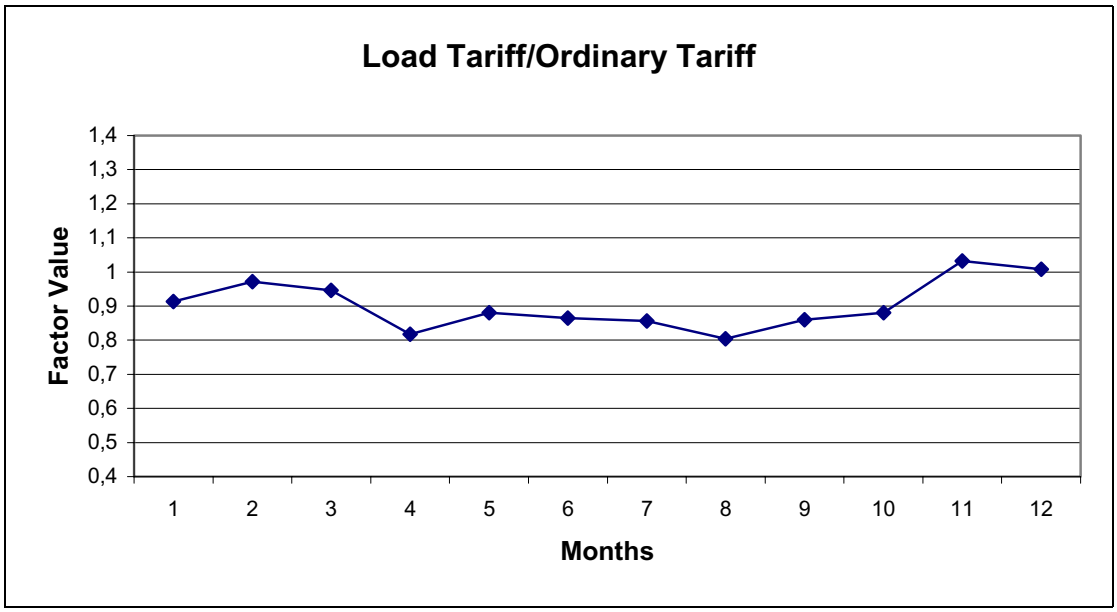

Figure B.33: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

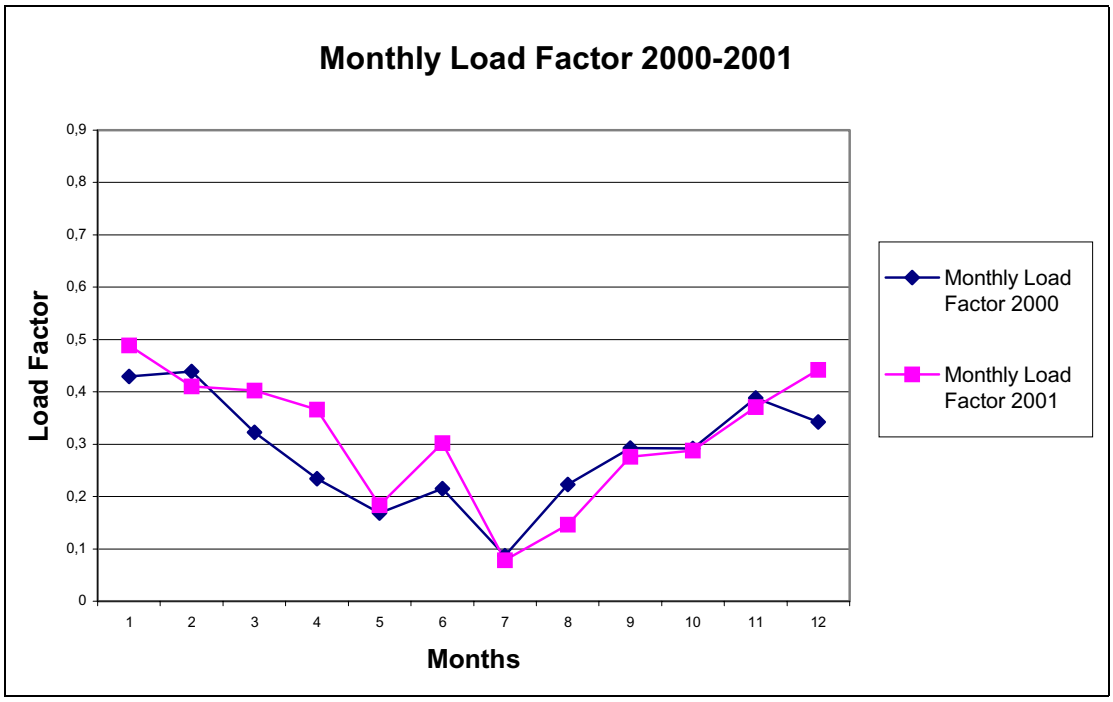

Figure B.34: Monthly load factor during 2000 and 2001.

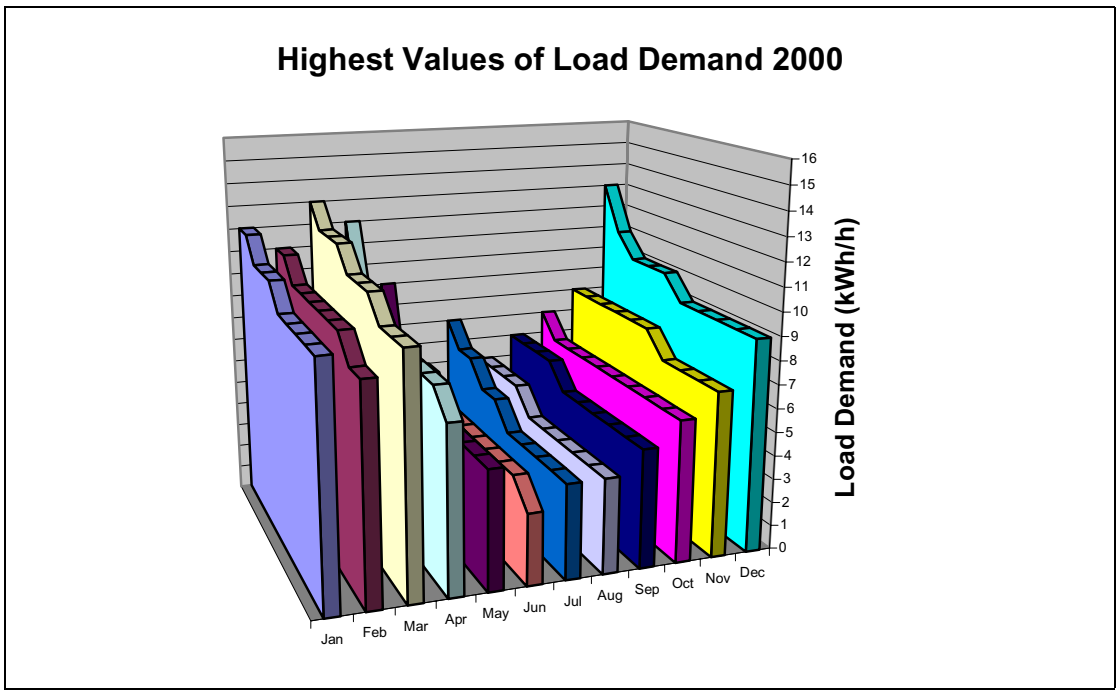

Figure B.35: Ten highest load demand values each month during 2000.

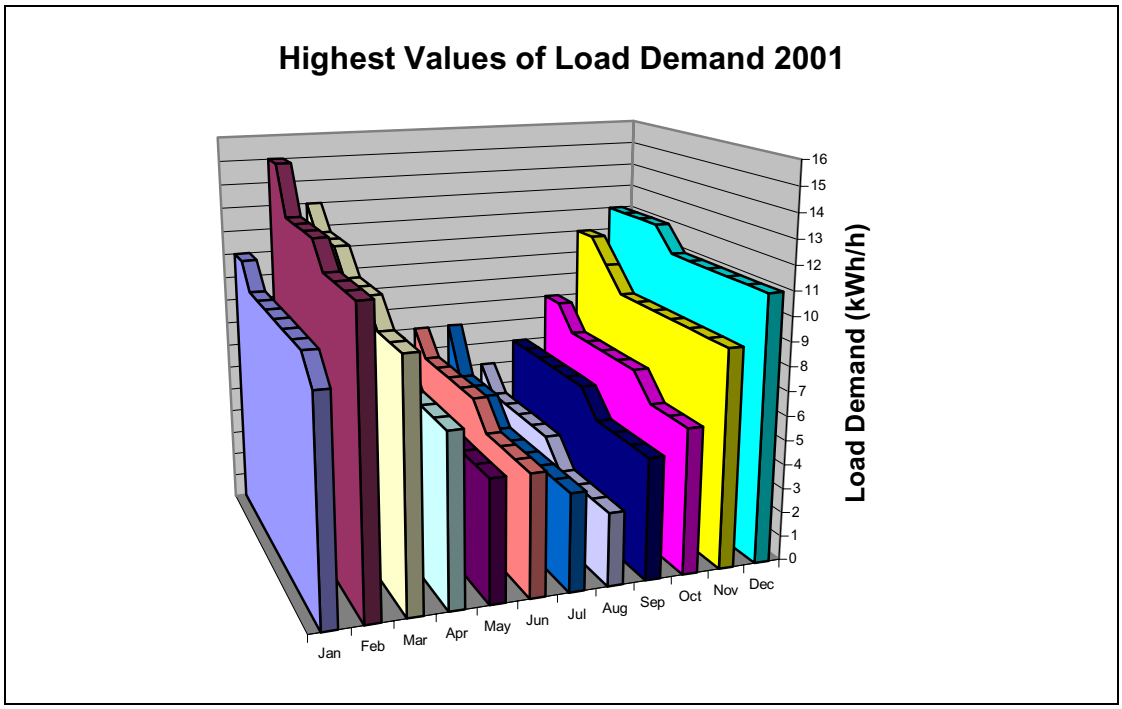

Figure B.36: Ten highest load demand values each month during 2001.

e) Villa E

Economic Analysis

Table B.19: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	**The 3 Highest Load Peaks KW**			**Average Load Peak kW**
		1	**2**	**3**	
January	3401,8	9,8	9,7	9,7	9,73
February	3287,1	13,1	12,9	12,6	12,87
March	3079	11,9	11,8	11,7	11,80
April	2079,7	9,8	8,6	8,4	8,93
May	1364,5	6,7	6,4	6,3	6,47
June	997,9	4	3,9	3,8	3,90
July	728,4	3,6	3,6	3,2	3,47
August	1003,6	4,3	3,9	3,9	4,03
September	1291,2	7,4	5,5	4,7	5,87
October	1611,5	6,9	6,5	6,1	6,50
November	2384,2	7,8	7,3	6,8	7,30
December	3443,3	12,2	11,8	9,6	11,20

Table B.20: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.19.

	Ordinary Tariff SEK			**Load Tariff SEK**			**Sum2/Sum1**
	Grid	**Energy**	**Sum1**	**Grid**	**Energy**	**Sum2**	
January	671	1888	**2559**	649	1697	**2346**	0,917
February	660	1824	**2484**	813	1640	**2453**	0,988
March	639	1709	**2348**	757	1536	**2293**	0,977
April	539	1154	**1693**	372	1038	**1410**	0,833
May	468	757	**1225**	307	757	**1064**	0,869
June	431	554	**985**	240	554	**794**	0,806
July	404	404	**808**	229	404	**633**	0,783
August	432	557	**989**	243	557	**800**	0,809
September	460	717	**1177**	292	717	**1009**	0,857
October	492	894	**1386**	308	894	**1202**	0,867
November	570	1323	**1893**	521	1323	**1844**	0,974
December	676	1911	**2587**	726	1911	**2637**	1,019

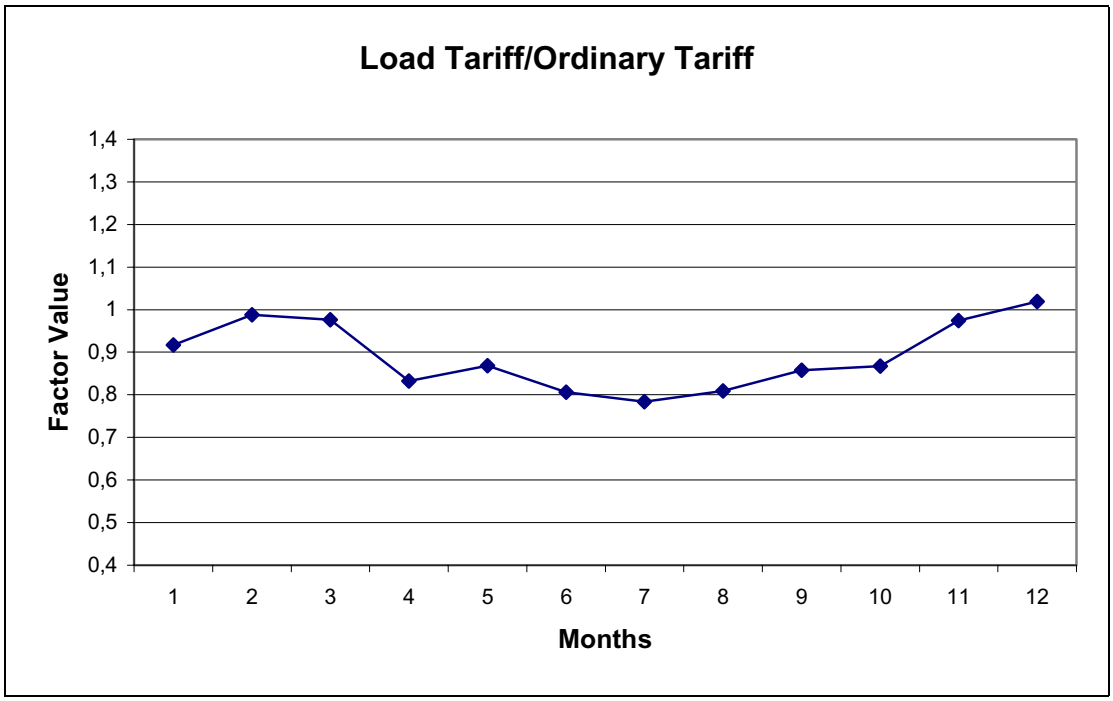

Figure B.37: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

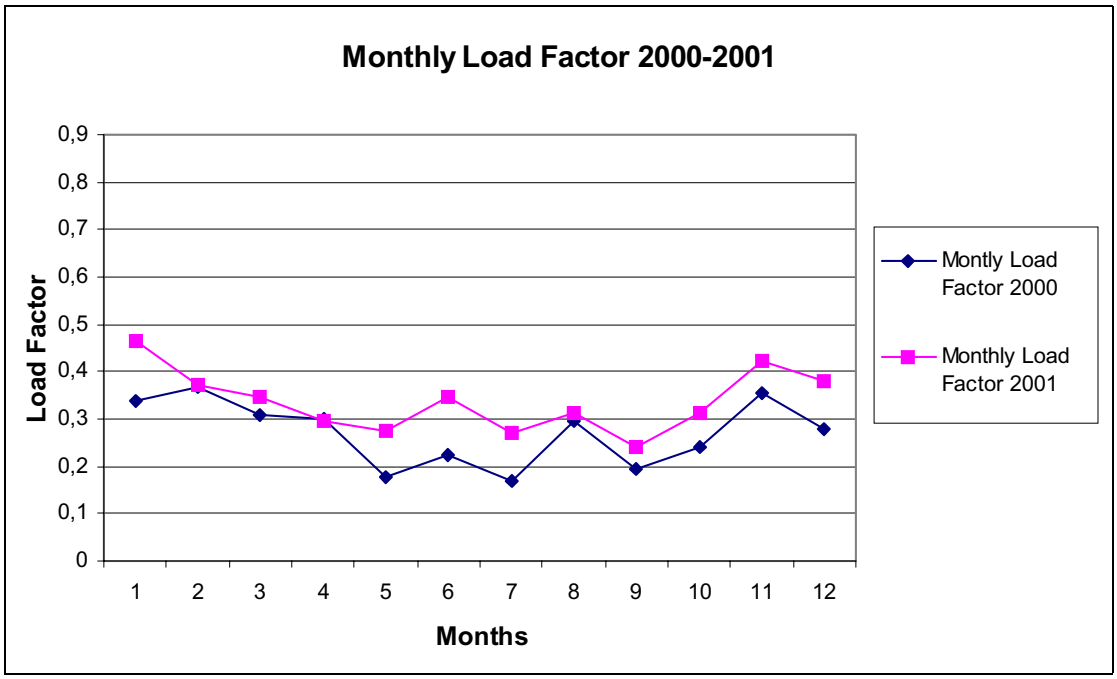

Figure B.38: Monthly load factor during 2000 and 2001.

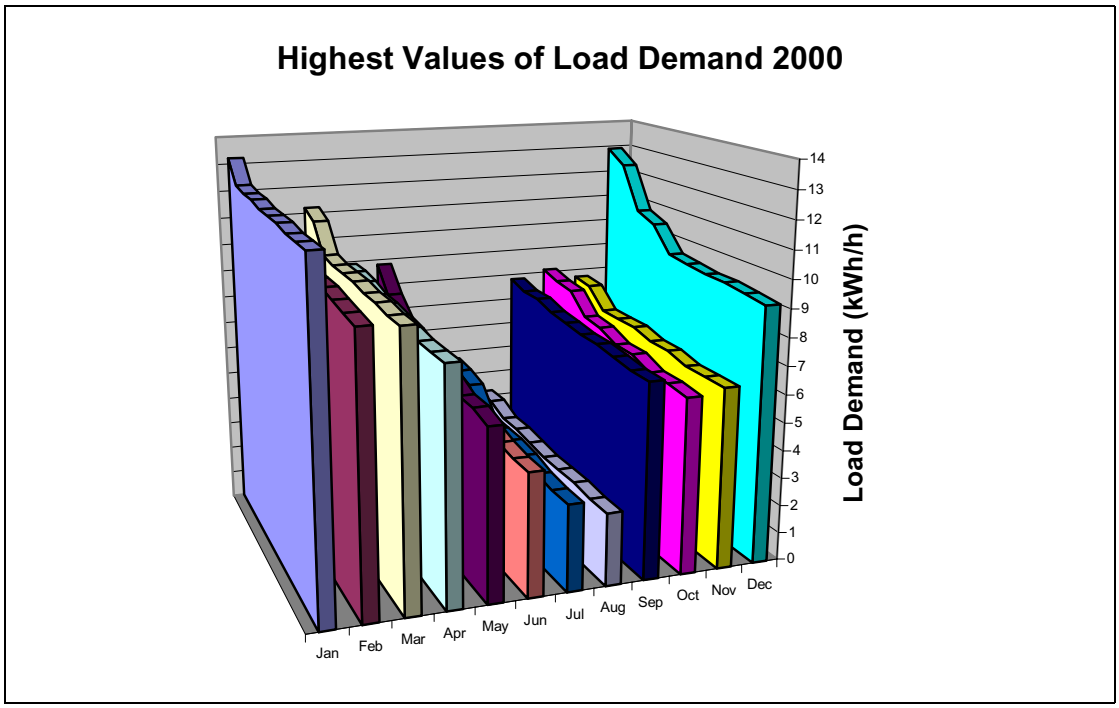

Figure B.39: Ten highest load demand values each month during 2000.

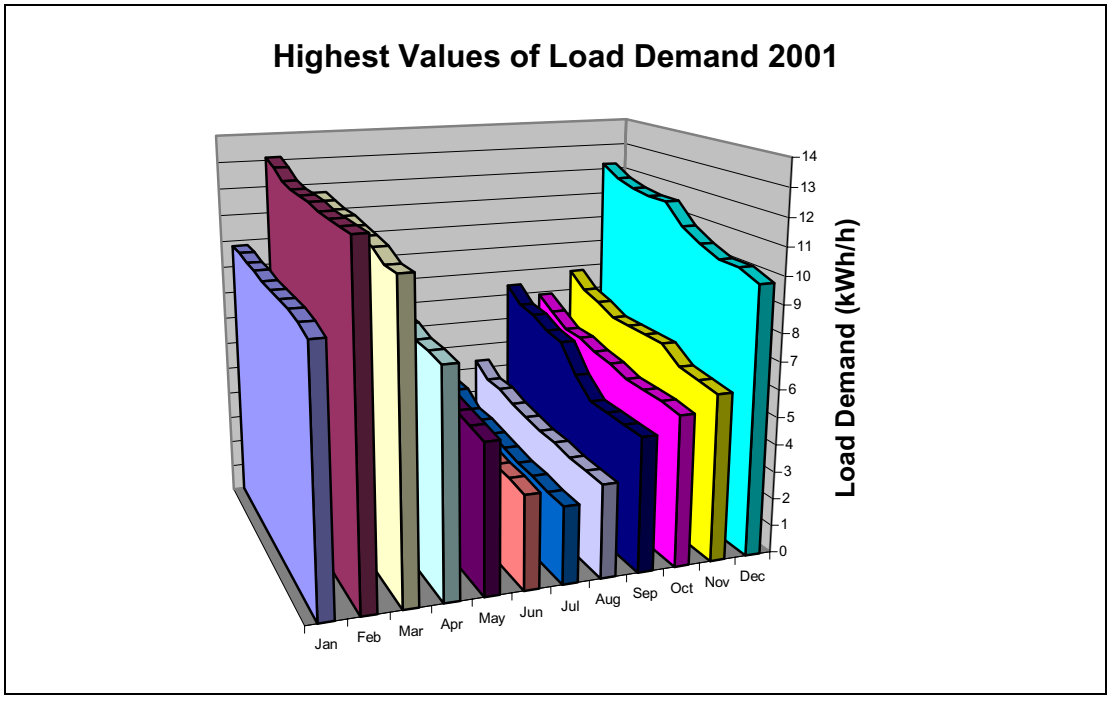

Figure B.39: Ten highest load demand values each month during 2001.

B.3 SEMI-DETACHED HOUSES

a) Semi-detached A (electrical heating)

Economic Analysis

Table B.21: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	2051,2	6,3	6,1	5,8	6,07
February	1963,7	7,3	7,2	6,4	6,97
March	1936,5	6,6	6,3	5,9	6,27
April	1335,8	5,6	5,1	5	5,23
May	856,3	5,1	4,6	4,3	4,67
June	465,1	3,4	3,3	3,2	3,30
July	345,9	4,1	3,3	3,1	3,50
August	442,6	3,4	3,2	3,1	3,23
September	831	4,4	4,4	3,7	4,17
October	1124,9	5,2	4,6	4	4,60
November	1667,2	6,5	5,7	5,7	5,97
December	1990,5	6,7	6,2	5,9	6,27

Table B.22: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.21.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	458	1138	**1596**	425	1024	**1449**	0,908
February	449	1090	**1539**	472	980	**1452**	0,943
March	446	1075	**1521**	435	966	**1401**	0,921
April	386	741	**1127**	244	667	**911**	0,808
May	338	475	**813**	229	475	**704**	0,866
June	299	258	**557**	193	258	**451**	0,810
July	287	192	**479**	198	192	**390**	0,814
August	297	246	**543**	191	246	**437**	0,805
September	336	461	**797**	216	461	**677**	0,849
October	365	624	**989**	227	624	**851**	0,860
November	419	925	**1344**	420	925	**1345**	1,001
December	452	1105	**1557**	435	1105	**1540**	0,989

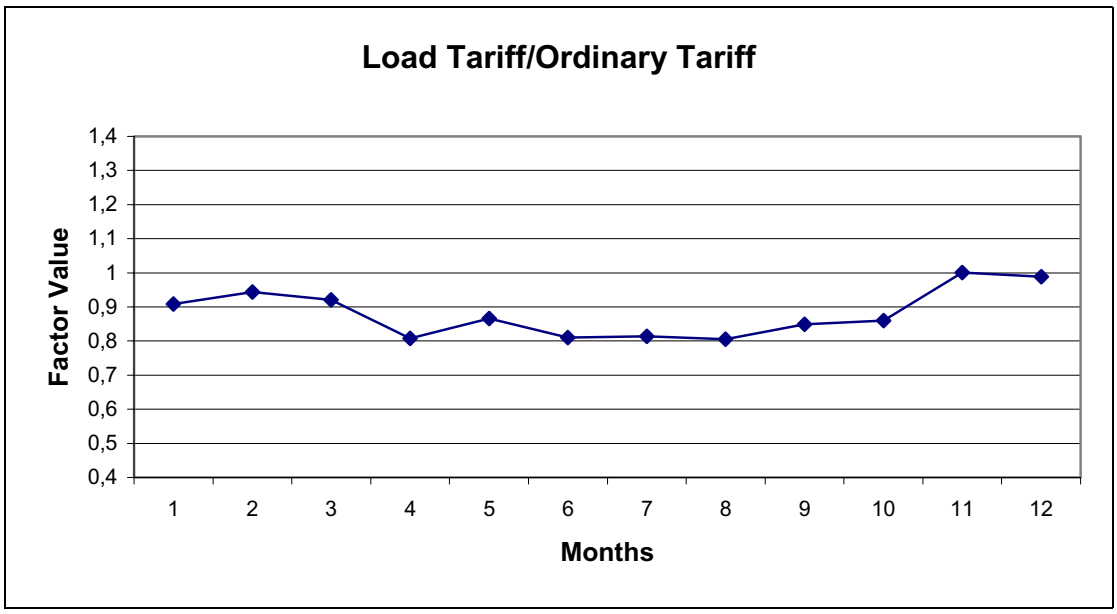

Figure B.41: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

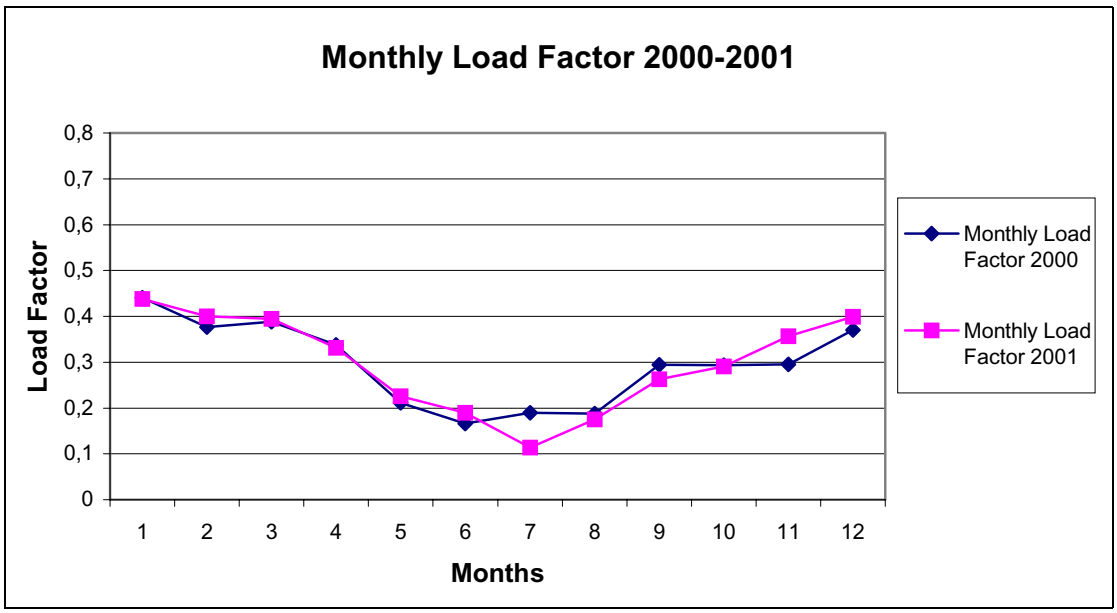

Figure B.42: Monthly load factor during 2000 and 2001.

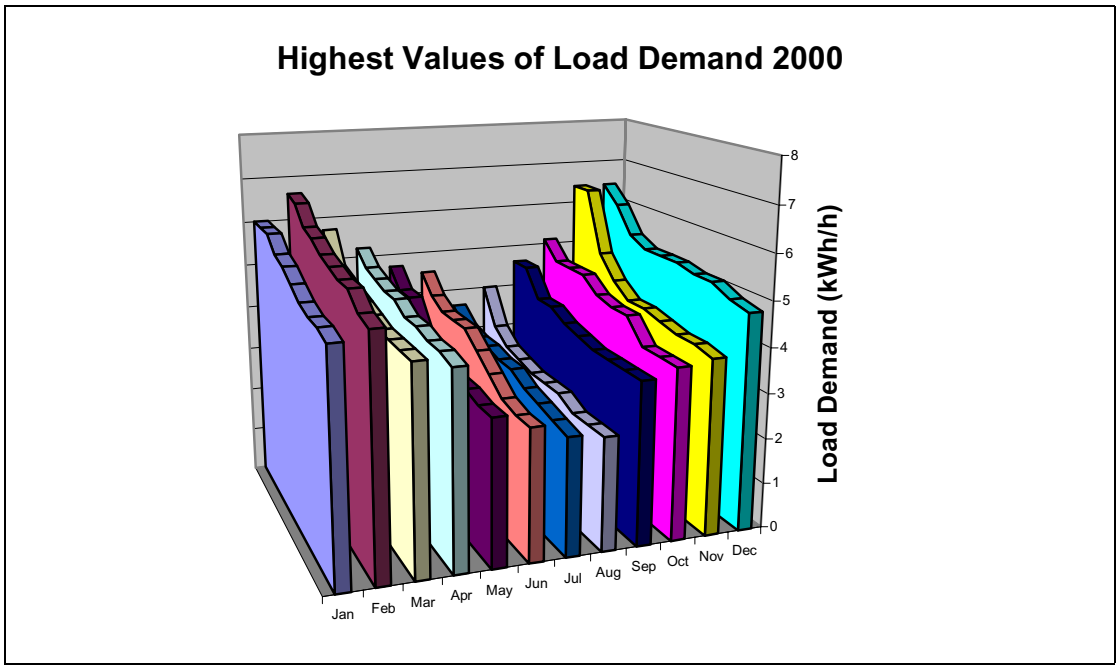

Figure B.43: Ten highest load demand values each month during 2000.

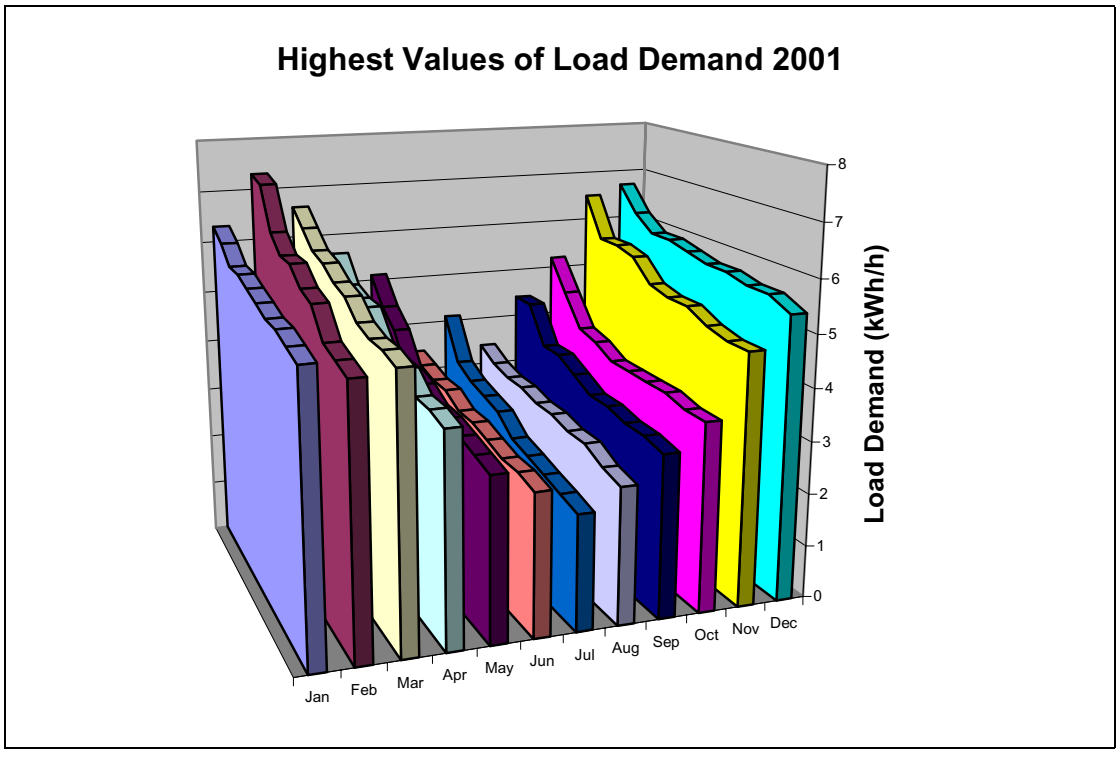

Figure B.44: Ten highest load demand values each month during 2001.

b) Semi-detached B (electrical heating)

Economic Analysis

Table B.23: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	1534,4	5,5	5,1	4,6	5,07
February	1391,7	7,3	6,5	5,5	6,43
March	1329,4	7,1	5,8	5,7	6,20
April	840,8	5,7	4,9	4,8	5,13
May	504,8	4,7	3,9	3,7	4,10
June	318,3	4,1	3,3	3,2	3,53
July	279,3	3,1	2,9	2,4	2,80
August	298,9	3,9	3,4	2,7	3,33
September	580,7	5,2	4,9	4,4	4,83
October	749,4	5,1	4,5	4,2	4,60
November	1100,7	5,2	4,5	4,5	4,73
December	1382,8	4,7	4,5	4,4	4,53

Table B.24: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.23.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	406	852	**1258**	372	766	**1138**	0,905
February	392	772	**1164**	444	694	**1138**	0,978
March	385	738	**1123**	432	663	**1095**	0,975
April	337	467	**804**	241	420	**661**	0,822
May	303	280	**583**	214	280	**494**	0,847
June	284	177	**461**	199	177	**376**	0,816
July	280	155	**435**	180	155	**335**	0,770
August	282	166	**448**	194	166	**360**	0,804
September	311	322	**633**	233	322	**555**	0,877
October	327	416	**743**	227	416	**643**	0,865
November	363	611	**974**	355	611	**966**	0,992
December	391	767	**1158**	344	767	**1111**	0,959

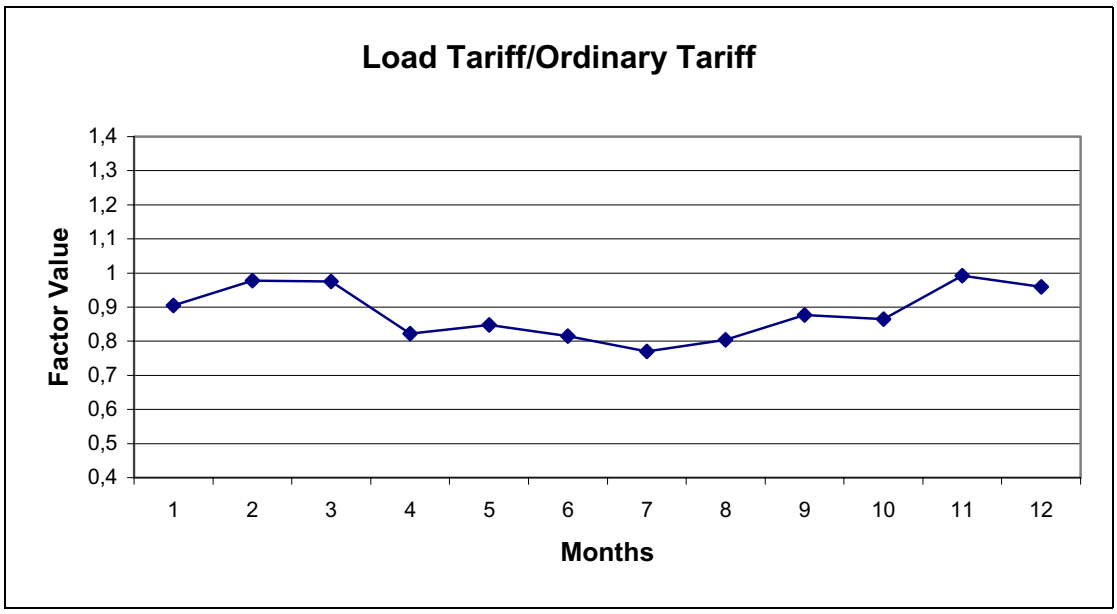

Figure B.45: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

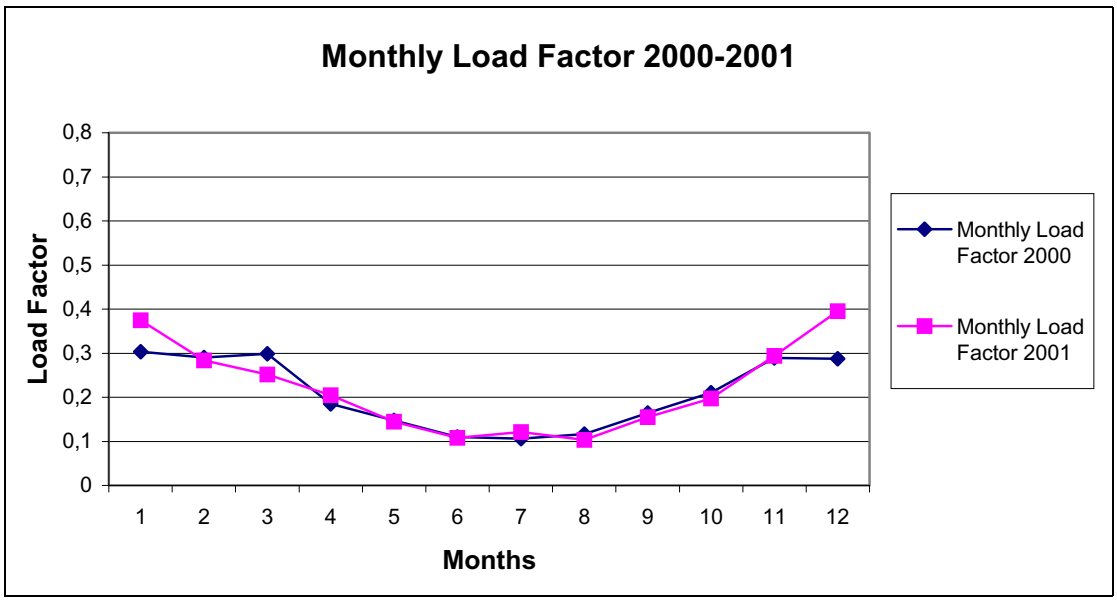

Figure B.46: Monthly load factor during 2000 and 2001.

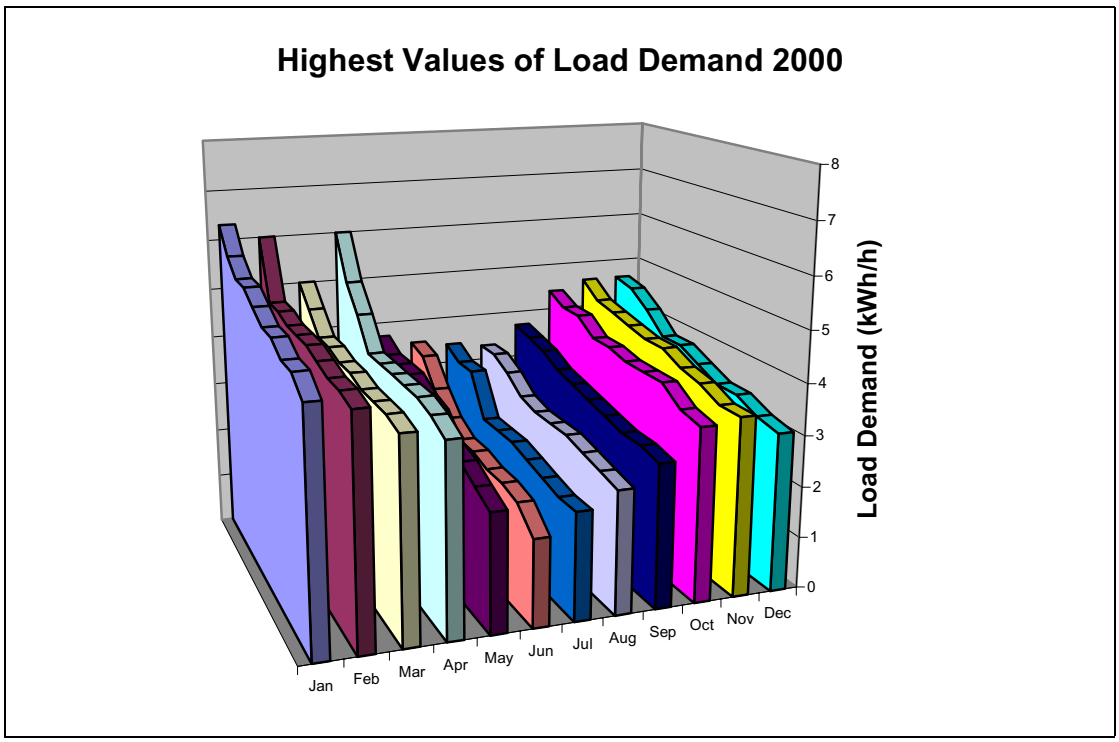

Figure B.47: Ten highest load demand values each month during 2000.

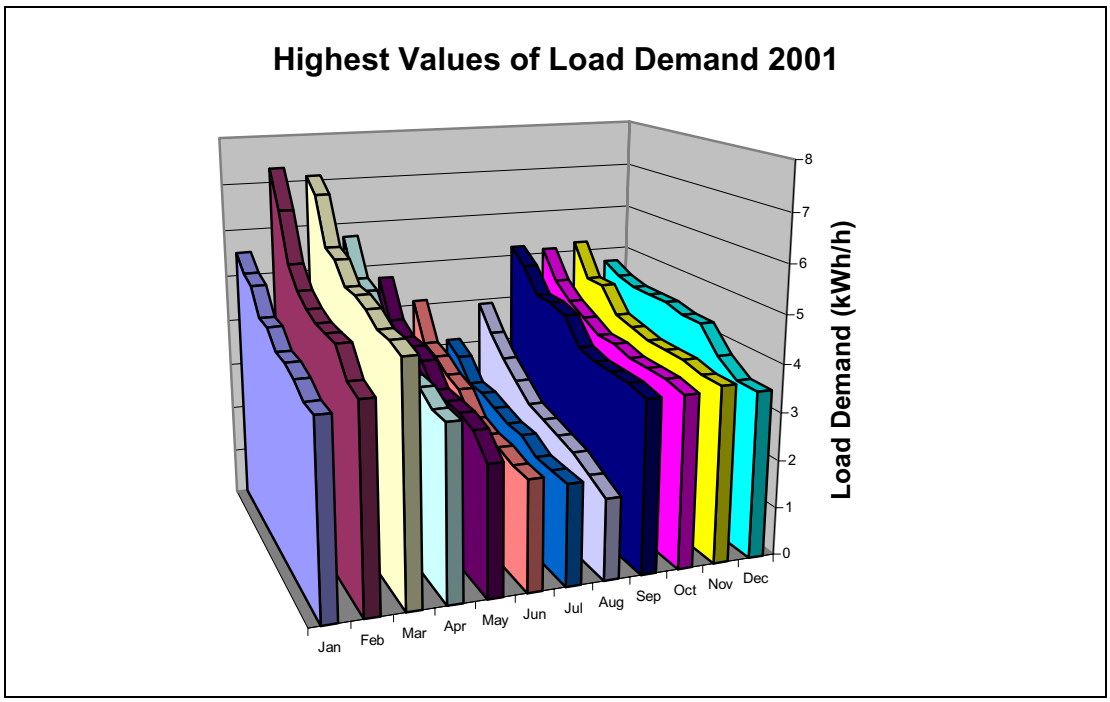

Figure B.48: Ten highest load demand values each month during 2001.

c) Semi-detached C (electrical heating)

Economic Analysis

Table B.25: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	1256,5	6,4	5,3	5,2	5,63
February	1178,0	7,0	6,2	5,6	6,27
March	1497,7	6,5	6,0	5,6	6,03
April	958,8	5,9	4,8	4,4	5,03
May	605,4	3,6	3,6	3,2	3,47
June	344,9	3,0	2,8	2,5	2,77
July	332,1	3,0	2,4	2,4	2,60
August	376,0	3,4	3,0	3,0	3,13
September	647,7	4,7	4,3	4,1	4,37
October	879,4	5,2	5,0	4,6	4,93
November	1256,2	5,5	5,4	5,3	5,40
December	1406,1	7,0	6,7	6,1	6,60

Table B.26: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.25.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	378	697	**1075**	402	627	**1029**	0,957
February	370	654	**1024**	435	588	**1023**	0,999
March	402	831	**1233**	423	747	**1170**	0,949
April	348	532	**880**	238	478	**716**	0,814
May	313	336	**649**	197	336	**533**	0,821
June	287	191	**478**	179	191	**370**	0,774
July	286	184	**470**	175	184	**359**	0,764
August	290	209	**499**	189	209	**398**	0,798
September	224	359	**583**	183	359	**542**	0,930
October	340	488	**828**	236	488	**724**	0,874
November	378	697	**1075**	390	697	**1087**	1,011
December	393	780	**1173**	453	780	**1233**	1,051

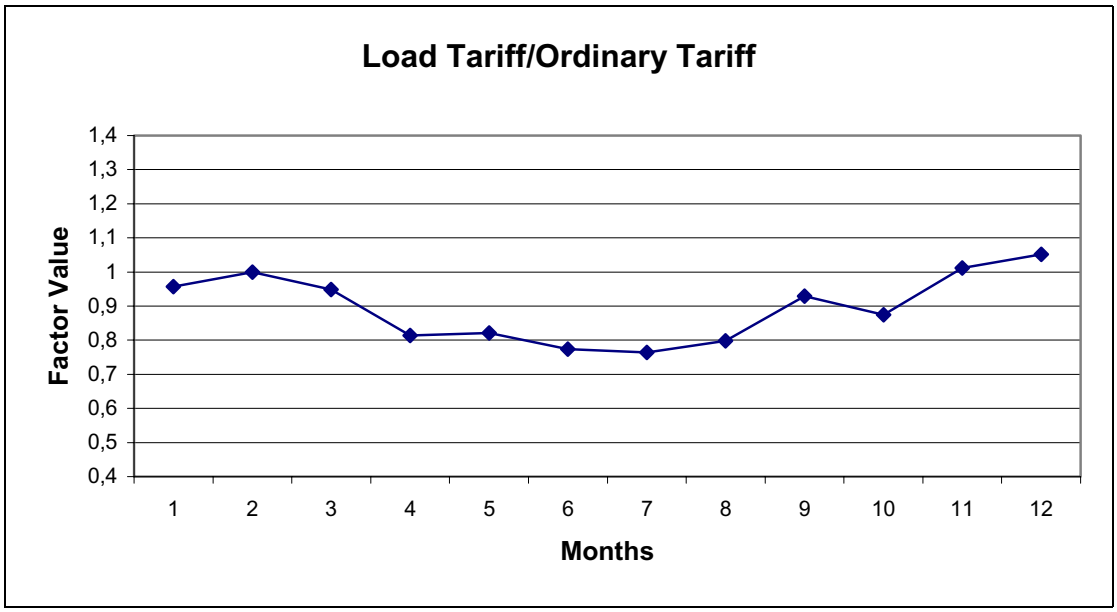

Figure B.49: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

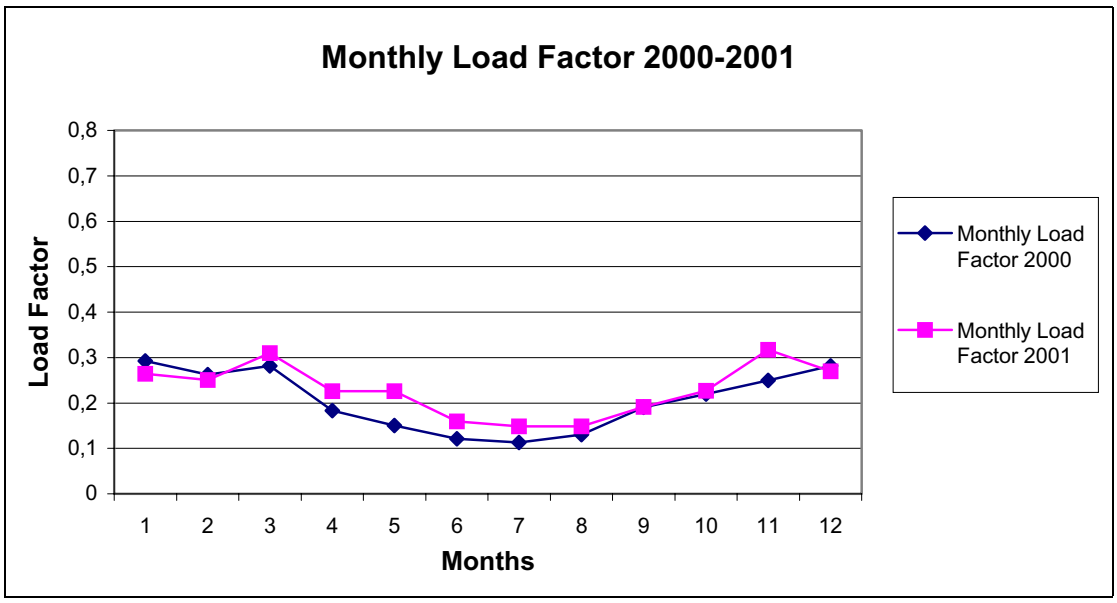

Figure B.50: Monthly load factor during 2000 and 2001.

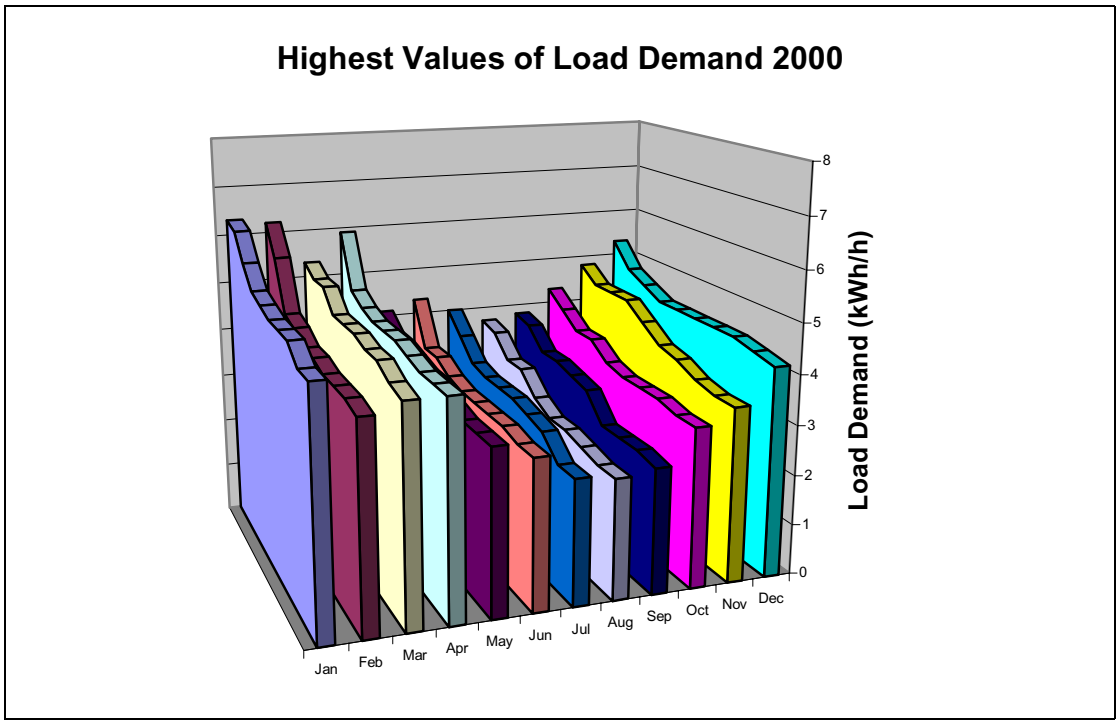

Figure B.51: Ten highest load demand values each month during 2000.

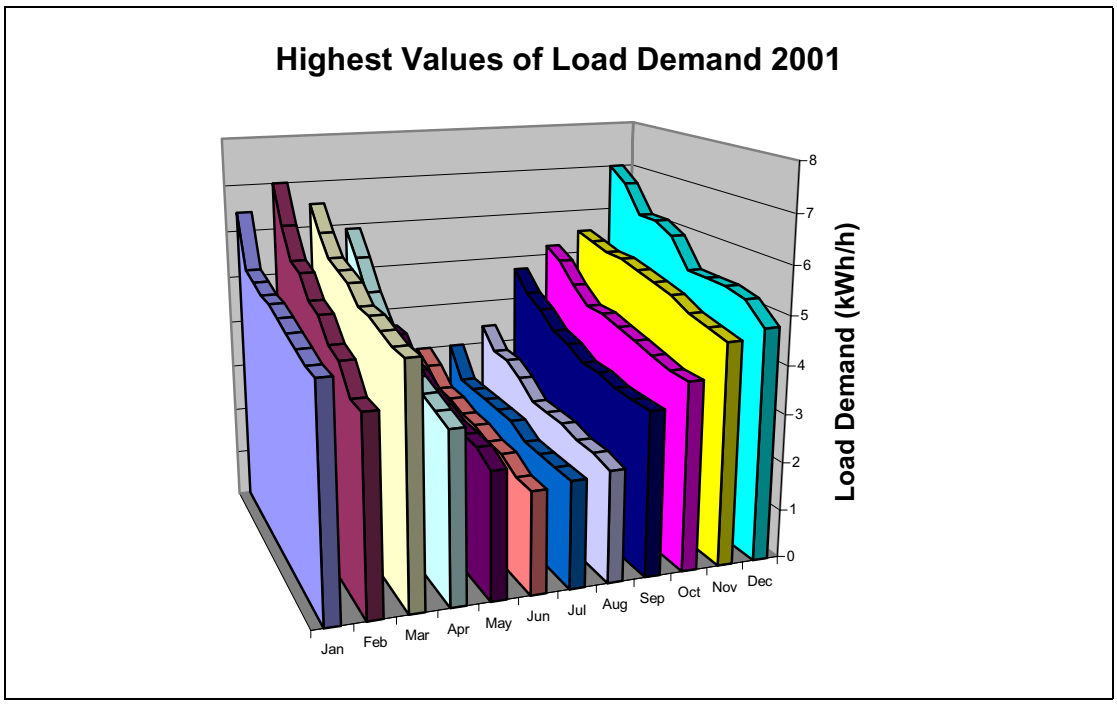

Figure B.52: Ten highest load demand values each month during 2000.

d) Semi-detached D (district heating)

Economic Analysis

Table B.27: Electricity use per month and values of load demand used with the new electricity tariff

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	1016,1	5,1	4,6	4,2	4,63
February	871,1	4,8	4,4	4,3	4,50
March	964,9	4,3	4,3	4,2	4,27
April	841,5	4,0	3,8	3,7	3,83
May	583,1	3,9	3,3	3,2	3,47
June	589,3	3,8	3,6	3,1	3,50
July	485,5	3,5	3,1	2,6	3,07
August	407,5	3,8	3,8	2,8	3,47
September	659,7	5,0	3,9	3,8	4,23
October	807,6	4,1	3,7	3,5	3,77
November	929,7	4,6	4,4	4,4	4,47
December	1080,1	5,0	4,5	4,3	4,60

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Table B.28: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.27.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	260	564	**824**	312	507	**819**	0,994
February	246	483	**729**	305	435	**740**	1,015
March	255	536	**791**	293	481	**774**	0,979
April	243	467	**710**	169	420	**589**	0,830
May	217	324	**541**	160	324	**484**	0,895
June	218	327	**545**	161	327	**488**	0,895
July	207	269	**476**	149	269	**418**	0,878
August	200	226	**426**	160	226	**386**	0,906
September	225	366	**591**	180	366	**546**	0,924
October	240	448	**688**	168	448	**616**	0,895
November	252	516	**768**	303	516	**819**	1,066
December	267	599	**866**	310	599	**909**	1,050

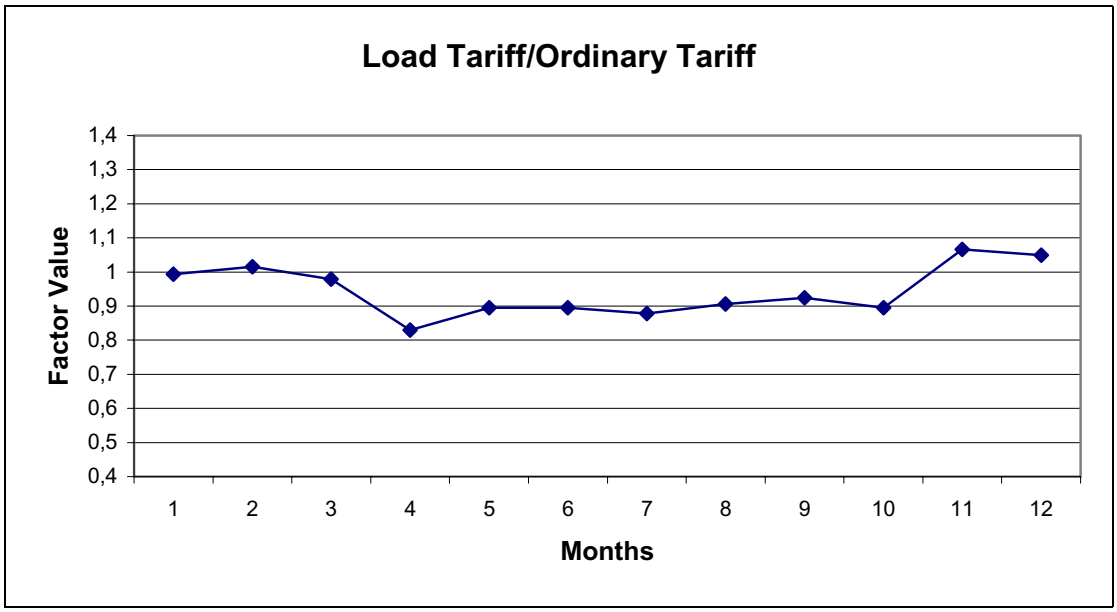

Figure B.53: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analisys

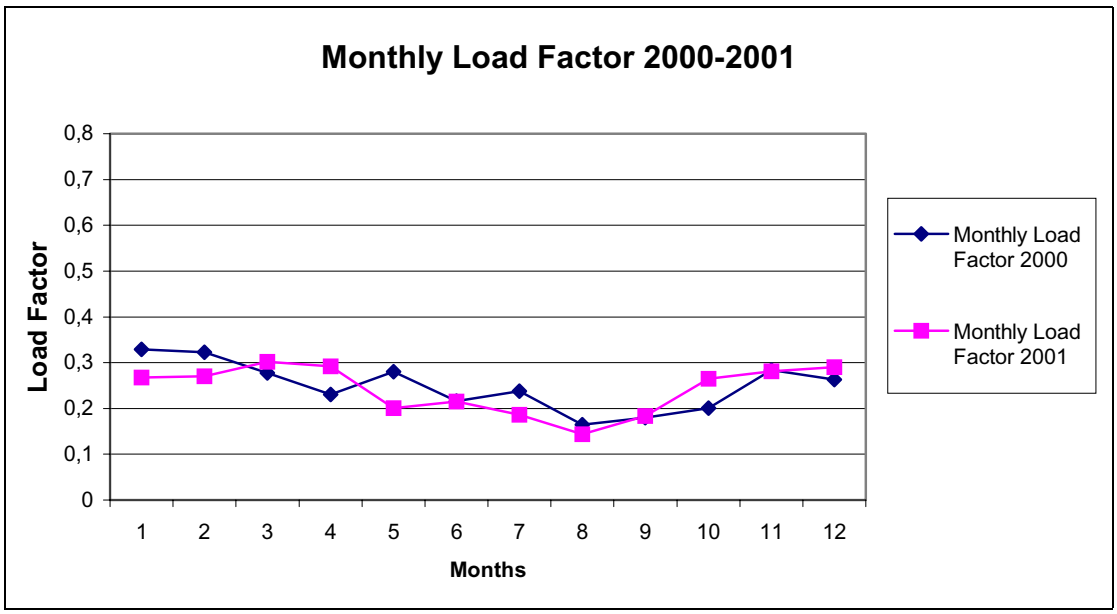

Figure B.54: Monthly load factor during 2000 and 2001.

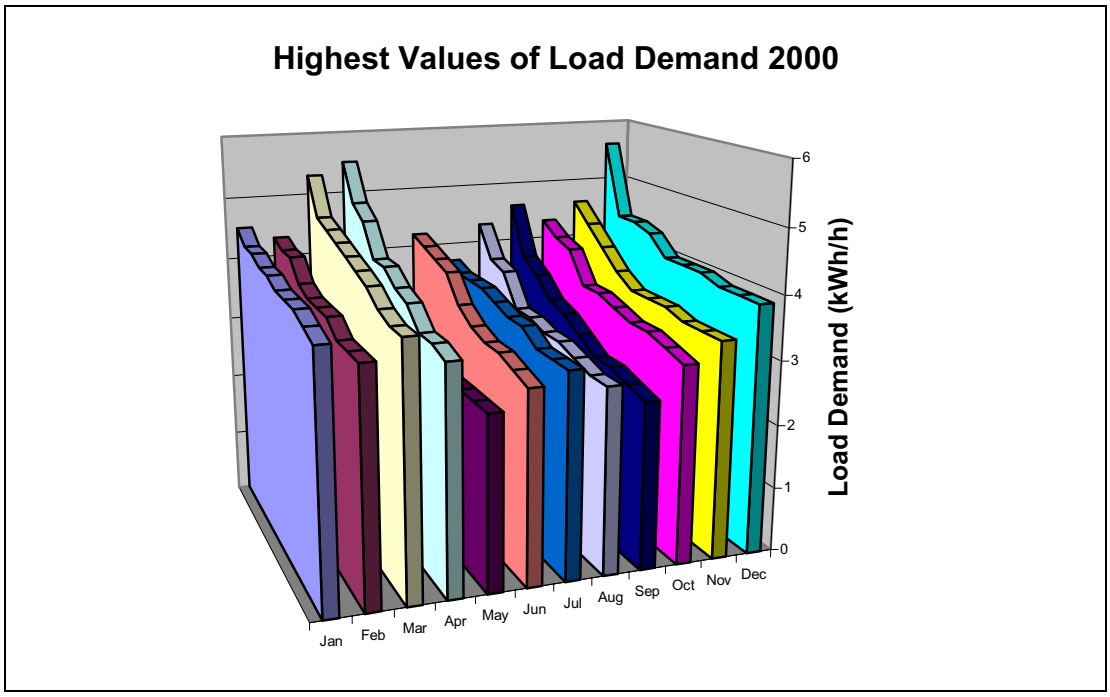

Figure B.55: Ten highest load demand values each month during 2000.

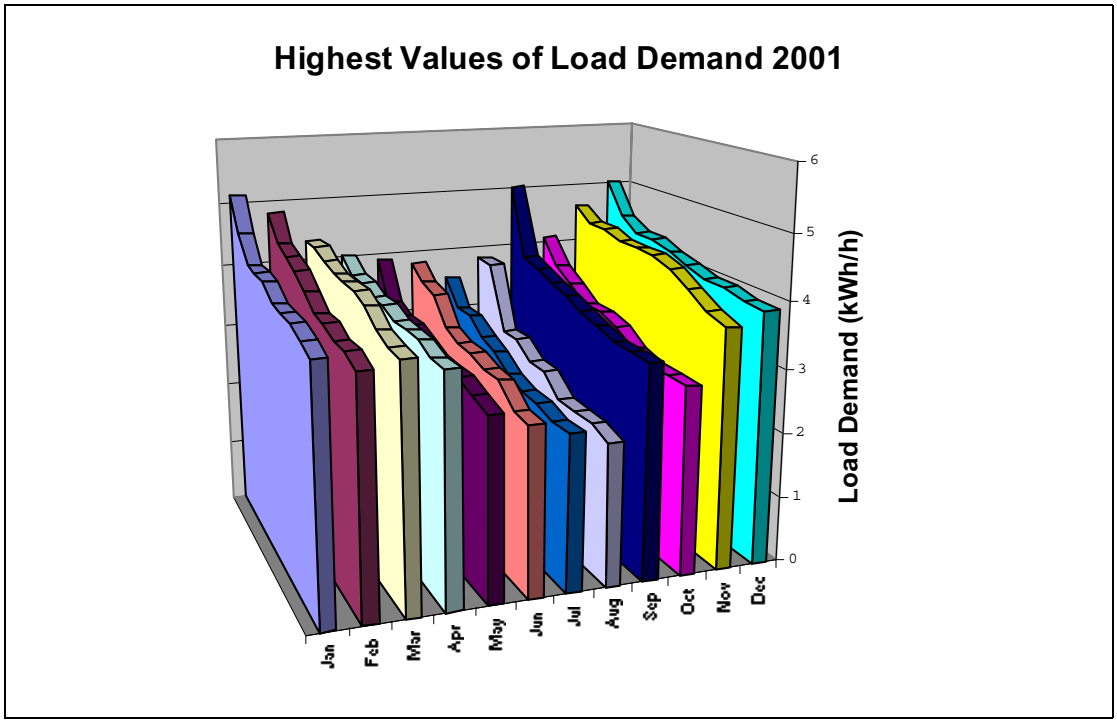

Figure B.56: Ten highest load demand values each month during 2001.

e) Semi-detached E (district heating)

Economic Analysis

Table B.29: Electricity use per month and values of load demand used with the new electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	1239,1	5,3	5,3	5,1	5,23
February	1092,6	5,9	5,4	5,2	5,50
March	1095,9	5,1	4,9	4,9	4,97
April	938,7	6,0	4,8	4,6	5,13
May	864,8	4,5	4,3	4,2	4,33
June	716,1	4,7	4,2	3,9	4,27
July	517,0	5,0	3,2	2,9	3,70
August	716,7	4,3	4,2	4,1	4,20
September	829,6	4,4	3,9	3,8	4,03
October	956,0	5,0	5,0	4,7	4,90
November	1093,3	4,7	4,6	4,6	4,63
December	1262,8	4,5	4,5	4,4	4,47

Table B.30: Monthly costs for the ordinary versus the load demand dependent tariff, calculated for typical data in Table B.29.

	Ordinary Tariff SEK			Load Tariff SEK			Sum2/Sum1
	Grid	Energy	Sum1	Grid	Energy	Sum2	
January	283	688	**971**	344	618	**962**	0,991
February	268	606	**874**	358	545	**903**	1,033
March	268	608	**876**	330	547	**877**	1,001
April	253	521	**774**	204	468	**672**	0,868
May	245	480	**725**	183	480	**663**	0,914
June	230	397	**627**	181	397	**578**	0,922
July	210	287	**497**	166	287	**453**	0,911
August	230	398	**628**	179	398	**577**	0,919
September	242	460	**702**	175	460	**635**	0,905
October	254	531	**785**	197	531	**728**	0,927
November	268	607	**875**	312	607	**919**	1,050
December	285	701	**986**	303	701	**1004**	1,018

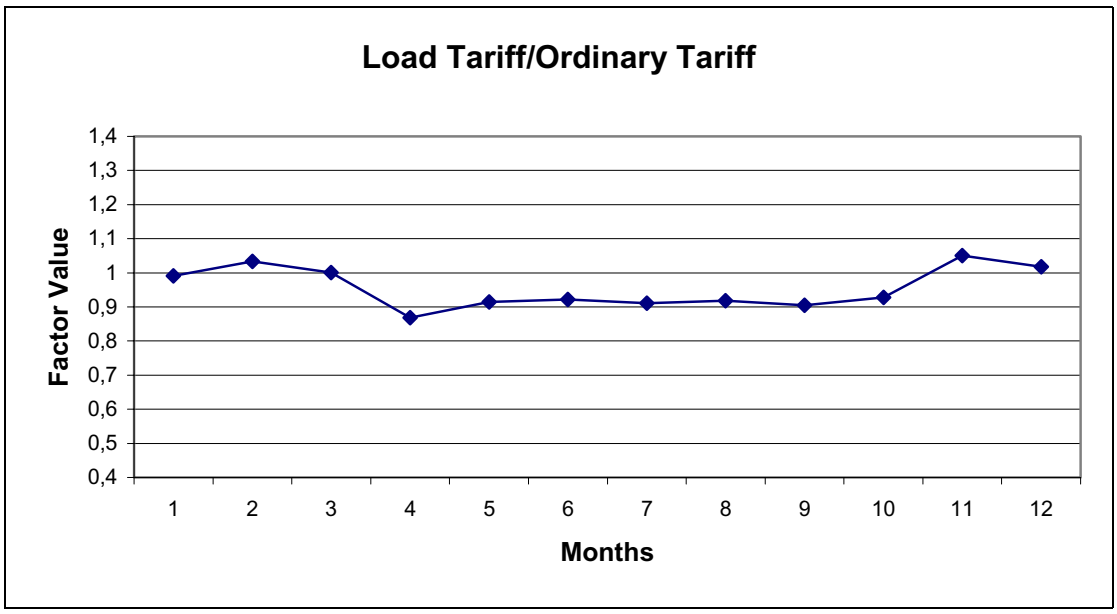

Figure B.57: Cost of electricity with Load Tariff divided by cost of electricity with Ordinary Tariff.

Consumption Analysis

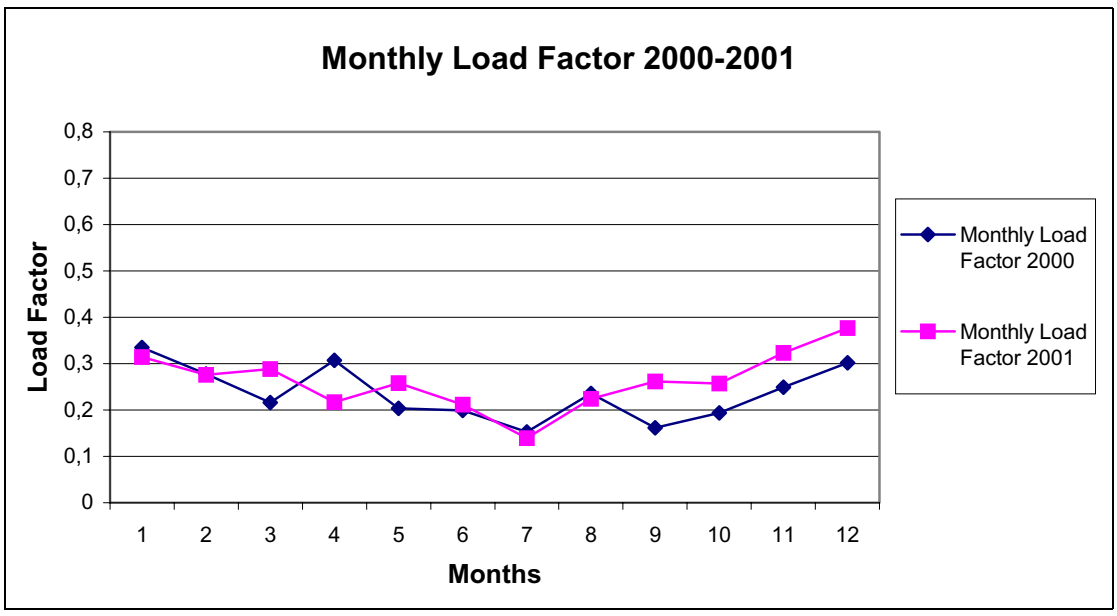

Figure B.58: Monthly load factor during 2000 and 2001.

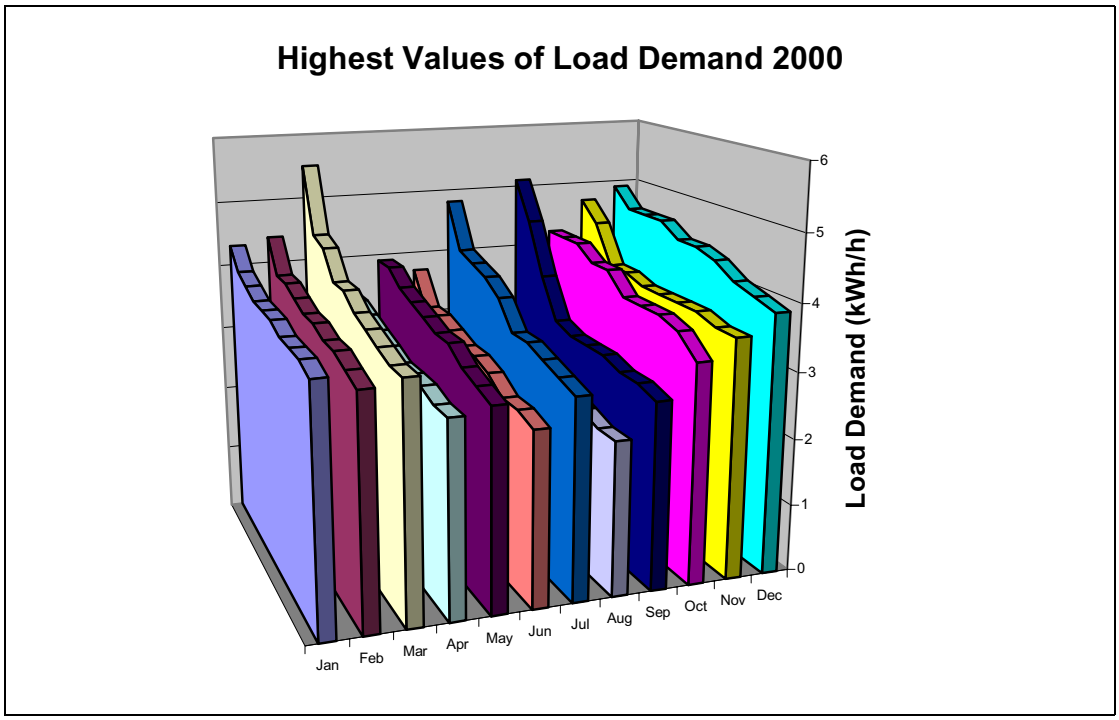

Figure B.59: Ten highest load demand values each month during 2000.

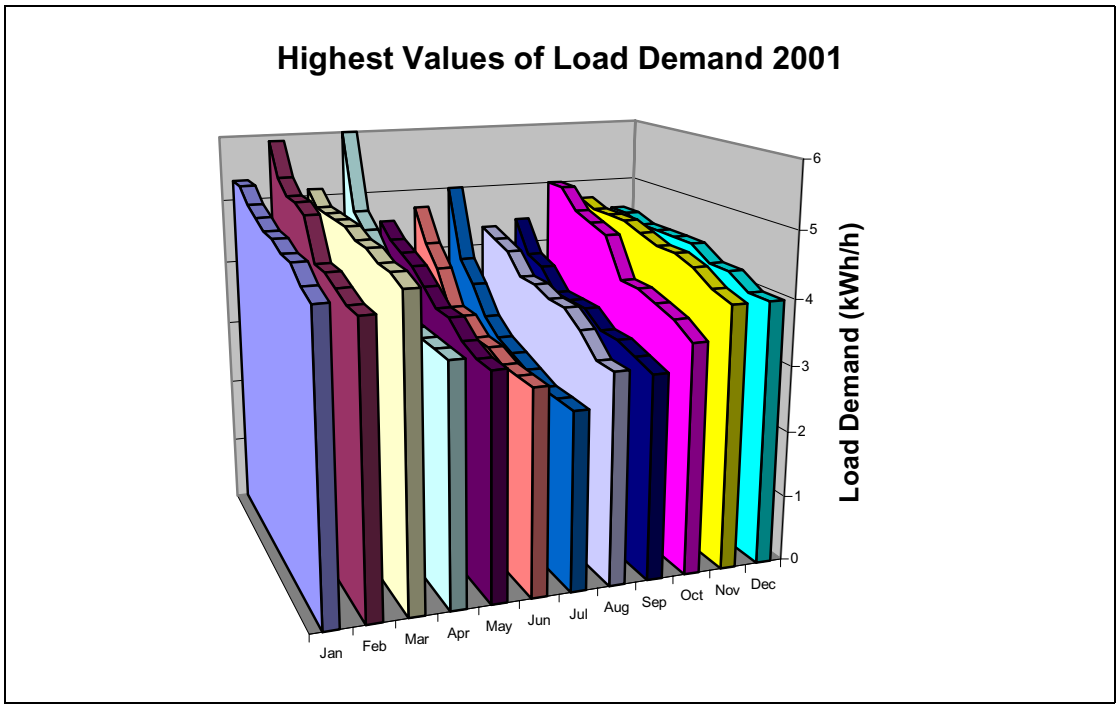

Figure B.60: Ten highest load demand values each month during 2001.

Appendix C: Critical Days and Superposition Factor

In Table C.1 the Critical Days are shown for every Sollentuna's customer analysed in this report. The Critical Days are those days where the load demanded by the customer reaches the daily highest value during the same hour as the total load demand for the utility is also maximum. (Data from some months in 2001 was not available).

Tables C.2, C.3 and C.4 express the superposition factor, one specific customer's influence on a total load curve, which is calculated as:

$$Sup\_Factor = \Delta P_{\max} / p_{\max}$$

- $\Delta P_{\max}$ is the hourly load demand value of one customer when the demand is maximum for the whole utility, considering one month as time period base.
- $p_{\max}$ is the maximum load demand of this customer during the time period of time considered, one month in this case.

Table C.1: Number of Critical Days during 2000 and 2001.

	2000		2001	
	Days	**Percent**	**Days**	**Percent**
Flat A	41	11,20	29	7,95
Flat B	189	51,64	152	41,64
Flat C	82	22,40	76	20,82
Flat D	93	25,41	55	18,09
Flat E	170	46,45	97	31,91
Villa A	38	10,38	34	9,32
Villa B	21	5,74	30	8,22
Villa C	42	11,48	54	14,79
Villa D	74	20,22	87	21,84
Villa E	16	4,37	27	7,40
Semi-detached A	34	9,29	40	10,96
Semi-detached B	24	6,56	22	6,03
Semi-detached C	16	4,37	20	5,48
Semi-detached D	24	6,56	30	8,22
Semi-detached E	45	12,30	40	10,96

C.1 SUPERPOSITION FACTOR

a) Flats

Table C.2: Superposition Factor for each Flat.

	Flat A		Flat B		Flat C		Flat D		Flat E	
	2000	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**
January	0,12	0,17	0	0,33	0,33	0	0,37	0,53	0,33	0,33
February	0,15	0,05	0	0,33	0	0	0,13	0,10	0,50	0,33
March	0,23	0,24	0,50	0	0,50	0	0,35	0,31	0,50	0,50
April	0,32	0,06	0	0	0	0	0,15	0,64	0,50	0
May	0,09	0,15	0,33	0,00	0	0	0,21	0,07	0	0
June	0,15	0,13	0,50	0,00	0	0	0,18	0,36	0,50	0
July	0,46	0,07	0,50	0,00	0	0	0,07	0,46	0	0
August	0,06	0,13	0	0,33	0	0	0,10	0,16	0	-----
September	0,06	0,14	0,50	0,50	0	0	0,27	0,03	0,50	-----
October	0,19	0,22	0,50	0,33	0	0	0,24	0,19	0	0,47
November	0,12	0,19	0,33	0,33	0	0,25	0,50	-----	0,33	0,57
December	0,30	0,16	1,00	0,33	0	0	0,48	-----	0,50	1,00

b) Villas

Table C.3: Superposition Factor for each Villa.

	Villa A		**Villa B**		**Villa C**		**Villa D**		**Villa E**	
	2000	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**
January	0,52	0,50	0,49	0,60	0,41	0,56	0,75	0,55	1,00	0,39
February	0,50	0,55	0,34	0,62	1,00	0,65	0,64	0,67	0,59	1,00
March	0,81	0,68	0,31	0,60	0,47	0,50	0,38	0,62	0,41	0,76
April	0,61	0,47	0,64	0,29	0,38	0,69	0,33	0,63	0,73	0,29
May	0,68	0,57	0,20	0,26	0,19	0,14	0,11	0,71	0,10	0,33
June	0,64	0,30	0,26	0,09	0,19	0,89	0,40	0,14	0,45	0,25
July	0,55	0,41	0,15	0,20	0,25	0,20	0,00	0,00	0,36	0,25
August	0,34	0,64	0,11	0,49	0,20	0,60	0,20	0,80	0,38	0,63
September	0,54	0,45	0,14	0,13	0,56	0,81	0,50	0,83	0,47	0,45
October	0,68	0,54	0,56	0,26	0,59	0,19	0,57	0,75	0,72	0,68
November	0,57	0,71	0,41	0,37	0,38	0,19	0,63	0,82	0,62	0,36
December	0,89	1,00	0,56	0,96	0,63	0,94	0,33	0,67	0,39	0,95

c) Semi-detached houses

Table C.1: Superposition Factor for each Semi-detached House.

	Semi-det A		**Semi-det B**		**Semi-det C**		**Semi-det D**		**Semi-det E**	
	2000	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**
January	0,80	0,71	0,68	0,38	0,40	0,20	0,31	0,45	0,37	0,38
February	0,92	0,60	0,78	0,75	0,31	0,36	0,19	0,19	0,25	0,36
March	0,79	0,64	0,38	0,27	0,34	0,45	0,64	1,00	0,25	0,16
April	0,40	0,38	0,33	0,25	0,36	0,42	0,11	0,13	0,26	0,33
May	0,30	0,39	0,19	0,30	0,29	0,14	0,29	0,56	0,13	0,42
June	0,20	0,68	0,14	0,05	0,49	0,43	0,31	0,26	0,43	0,17
July	0,19	0,22	0,09	0,03	0,13	0,23	0,08	0,23	0,08	0,18
August	0,23	0,26	0,18	0,18	0,43	0,18	0,16	0,21	0,07	0,56
September	0,59	0,41	0,22	0,29	0,18	0,62	0,43	0,14	0,12	0,18
October	0,75	0,40	0,34	0,22	0,21	0,33	0,19	0,73	0,14	0,42
November	0,57	0,71	0,41	0,37	0,38	0,19	0,63	0,82	0,62	0,36
December	0,89	1,00	0,56	0,96	0,63	0,94	0,33	0,67	0,39	0,95

Appendix D: Skånska Energi Analysis

This appendix compiles graphs and tables from the fifteen Skånska Energi's customers. There are two tables and two graphs per customer. All of them make reference to the economic analysis carried out with them.

Data represented in the graphs and shown in the tables has been downloaded from the Skånska Energi's CustCom service module (www.skanska-energi.se).

D.1 FLATS (with district heating)

a) Flat A

Table D.1: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	312	3	2	2	2,33
February	260	3	3	3	3,00
March	286	3	2	2	2,33
April	273	3	2	2	2,33
May	306	3	3	2	2,67
June	288	3	2	2	2,33
July	323	2	2	2	2,00
August	254	3	2	2	2,33
September	266	3	2	2	2,33
October	297	3	3	3	3,00
November	310	3	2	2	2,33
December	408	3	3	3	3,00

Table D.2: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKÅNSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	191,25	173,16	**364,41**	207,59	199,88	**407,47**
February	226,25	144,30	**370,55**	197,92	167,90	**365,82**
March	191,25	158,73	**349,98**	202,76	183,89	**386,65**
April	130,00	151,52	**281,52**	200,34	175,90	**376,24**
May	138,75	169,83	**308,58**	206,48	196,19	**402,67**
June	130,00	159,84	**289,84**	203,13	185,12	**388,25**
July	121,25	179,27	**300,52**	209,64	206,65	**416,29**
August	130,00	140,97	**270,97**	196,81	164,21	**361,02**
September	130,00	147,63	**277,63**	199,04	171,59	**370,63**
October	147,50	164,84	**312,34**	204,80	190,66	**395,46**
November	191,25	172,05	**363,30**	207,22	198,65	**405,87**
December	226,25	226,44	**452,69**	225,45	258,92	**484,37**

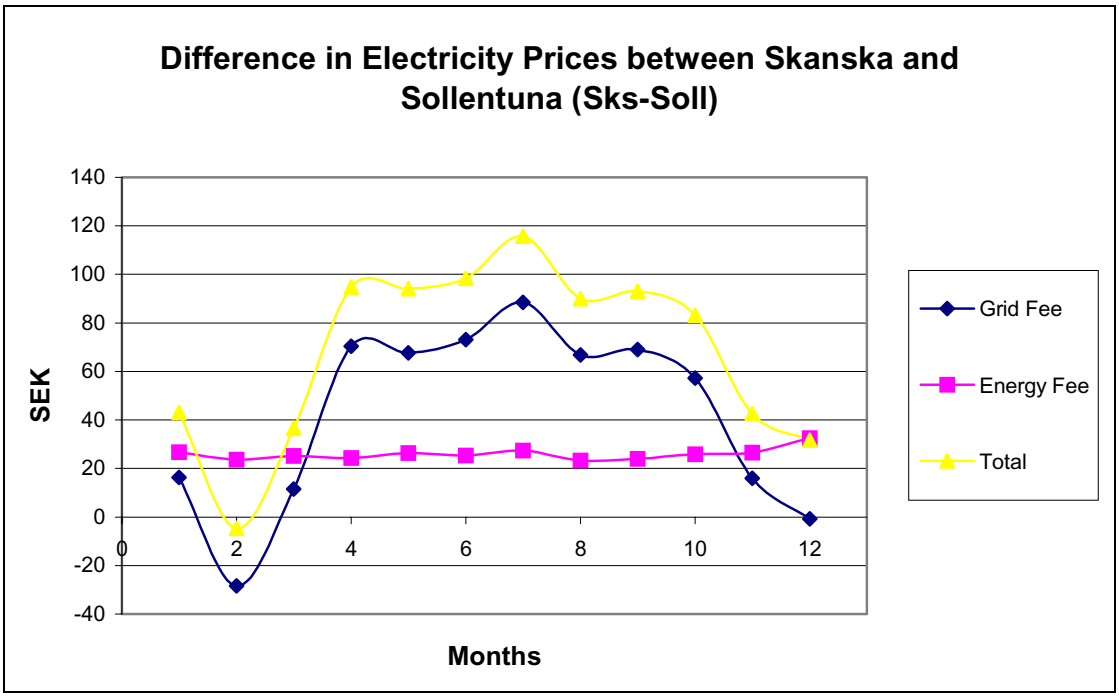

Figure D.1: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

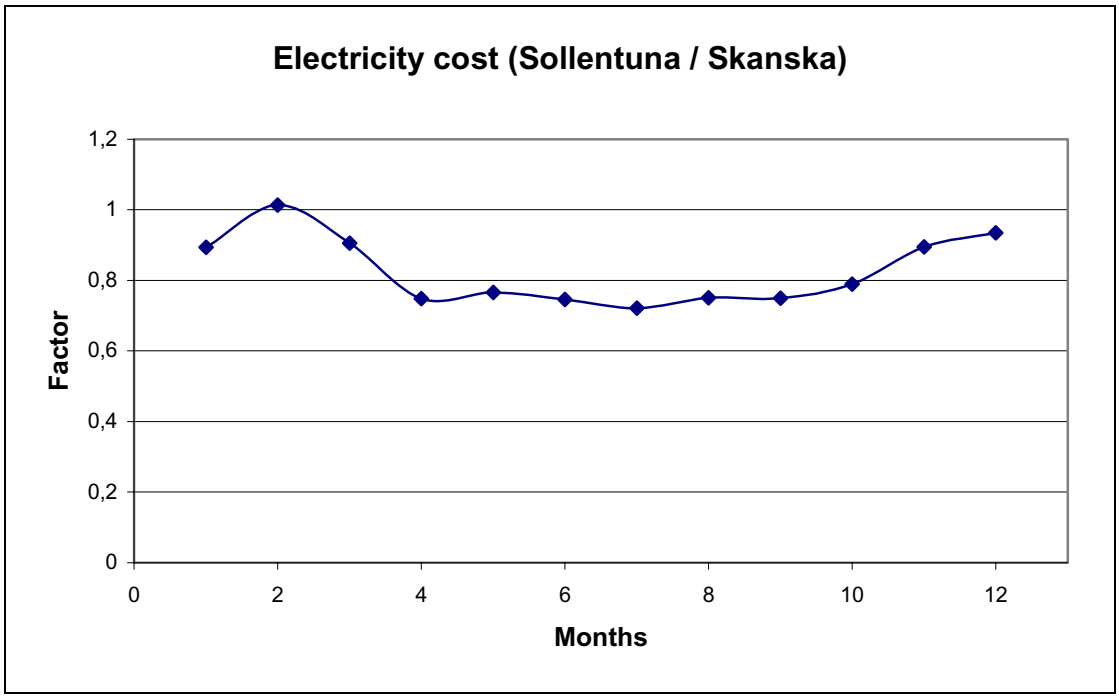

Figure D.2: Sollentuna and Skånska price factor.

b) Flat B

Table D.3: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	285	3	2	2	2,33
February	224	3	2	2	2,33
March	258	3	2	2	2,33
April	255	3	2	2	2,33
May	286	3	3	3	3,00
June	280	3	3	3	3,00
July	251	2	2	2	2,00
August	257	2	2	2	2,00
September	296	3	2	2	2,33
October	383	6	3	3	4,00
November	394	4	4	3	3,67
December	430	4	4	3	3,67

Table D.4: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	191,25	158,18	**349,43**	202,57	183,28	**385,85**
February	191,25	124,32	**315,57**	191,23	145,76	**336,99**
March	191,25	143,19	**334,44**	197,55	166,67	**364,22**
April	130,00	141,53	**271,53**	196,99	164,83	**361,82**
May	147,50	158,73	**306,23**	202,76	183,89	**386,65**
June	147,50	155,40	**302,90**	201,64	180,20	**381,84**
July	121,25	139,31	**260,56**	196,25	162,37	**358,61**
August	121,25	142,64	**263,89**	197,36	166,06	**363,42**
September	130,00	164,28	**294,28**	204,62	190,04	**394,66**
October	173,75	212,57	**386,32**	220,80	243,55	**464,35**
November	261,25	218,67	**479,92**	222,85	250,31	**473,16**
December	261,25	238,65	**499,90**	229,54	272,45	**501,99**

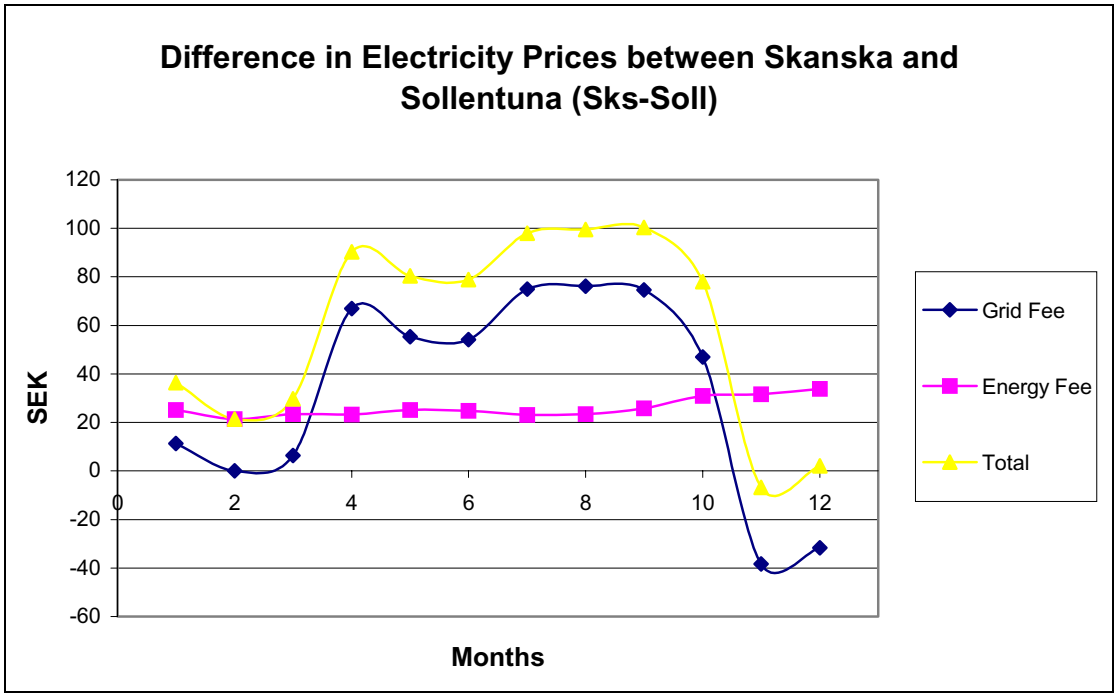

Figure D.3: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

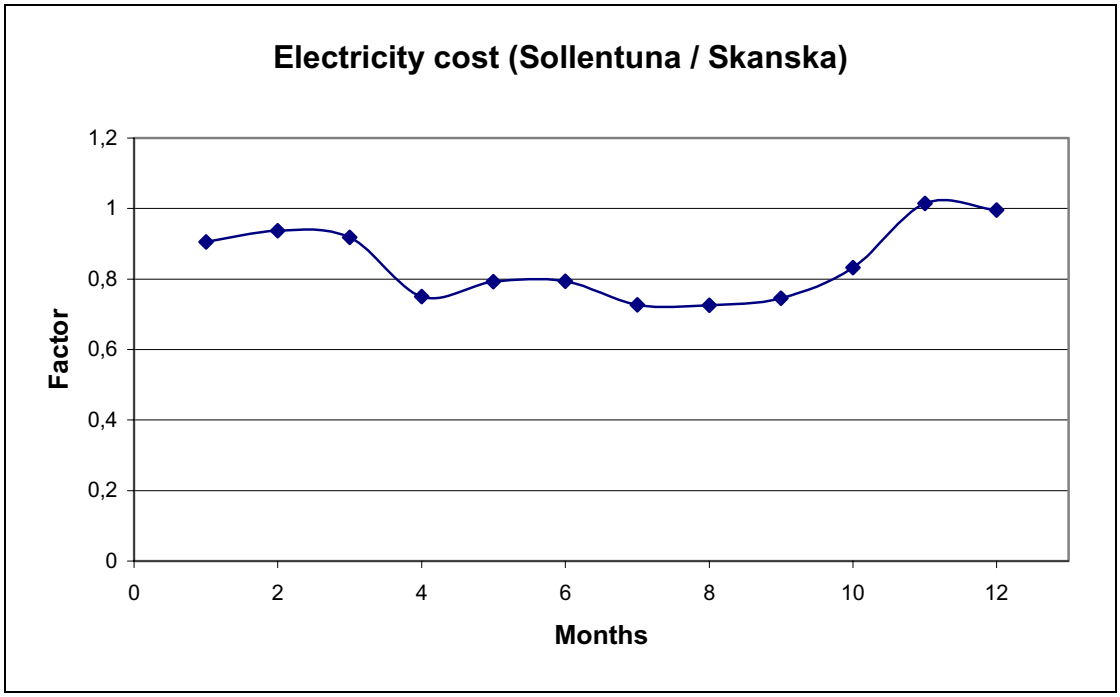

Figure D.4: Sollentuna and Skånska price factor.

c) Flat C

Table D.5: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	332	3	2	2	2,33
February	337	3	3	2	2,67
March	349	3	3	3	3,00
April	331	4	3	3	3,33
May	266	2	2	2	2,00
June	254	2	2	2	2,00
July	263	3	2	2	2,33
August	279	3	2	2	2,33
September	305	3	3	3	3,00
October	291	3	2	2	2,33
November	234	2	2	2	2,00
December	343	4	3	3	3,33

Table D.6: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	191,25	184,26	**375,51**	211,31	212,18	**423,49**
February	208,75	187,04	**395,79**	212,24	215,26	**427,50**
March	226,25	193,70	**419,95**	214,48	222,64	**437,11**
April	156,25	183,71	**339,96**	211,13	211,57	**422,69**
May	121,25	147,63	**268,88**	199,04	171,59	**370,63**
June	121,25	140,97	**262,22**	196,81	164,21	**361,02**
July	130,00	145,97	**275,97**	198,48	169,75	**368,23**
August	130,00	154,85	**284,85**	201,46	179,59	**381,04**
September	147,50	169,28	**316,78**	206,29	195,58	**401,87**
October	130,00	161,51	**291,51**	203,69	186,97	**390,65**
November	173,75	129,87	**303,62**	193,09	151,91	**345,00**
December	243,75	190,37	**434,12**	213,36	218,95	**432,31**

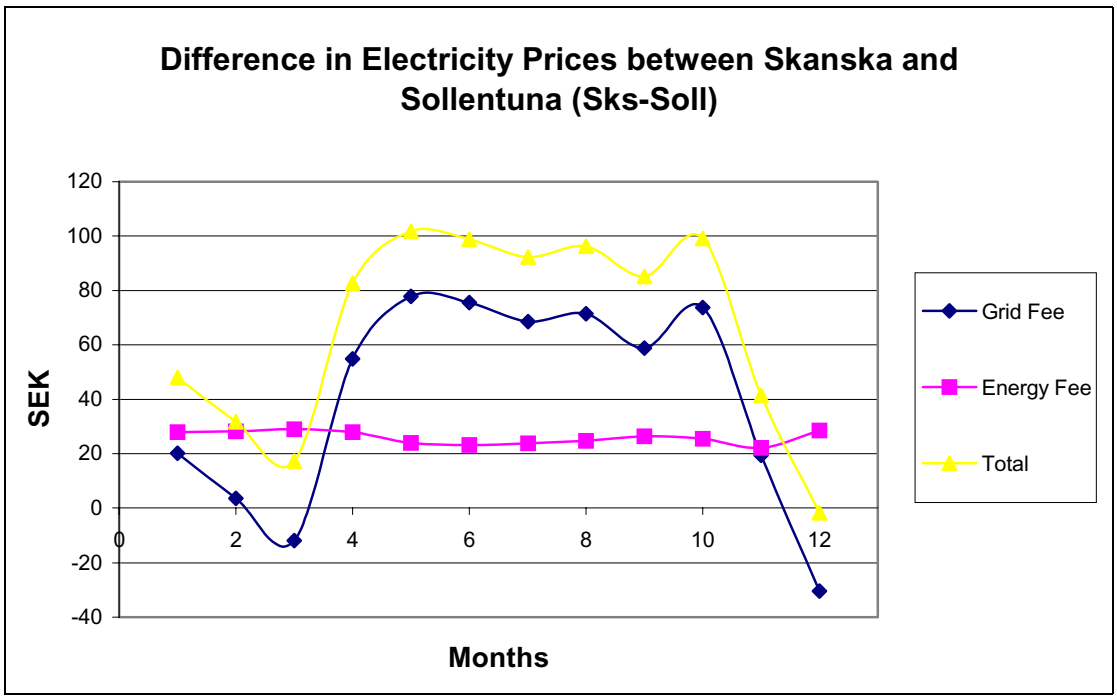

Figure D.5: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

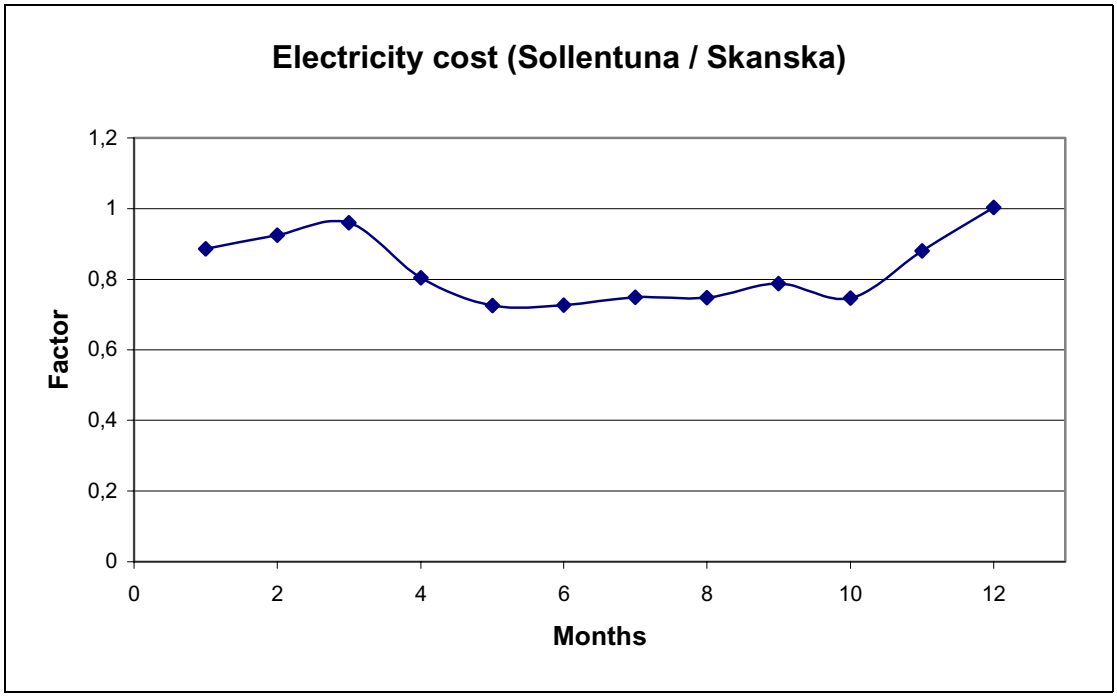

Figure D.6: Sollentuna and Skånska price factor.

d) Flat D

Table D.7: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	230	2	2	2	2,00
February	184	2	2	1	1,67
March	174	1	1	1	1,00
April	159	2	1	1	1,33
May	165	2	2	1	1,67
June	148	2	1	1	1,33
July	160	2	1	1	1,33
August	194	2	2	2	2,00
September	200	3	2	2	2,33
October	247	3	3	3	3,00
November	238	3	2	2	2,33
December	232	2	2	2	2,00

Table D.8: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	173,75	127,65	**301,40**	192,34	149,45	**341,79**
February	156,25	102,12	**258,37**	183,79	121,16	**304,95**
March	121,25	96,57	**217,82**	181,93	115,01	**296,94**
April	103,75	88,25	**192,00**	179,14	105,79	**284,92**
May	112,50	91,58	**204,08**	180,25	109,48	**289,73**
June	103,75	82,14	**185,89**	177,09	99,02	**276,11**
July	103,75	88,80	**192,55**	179,32	106,40	**285,72**
August	121,25	107,67	**228,92**	185,65	127,31	**312,96**
September	130,00	111,00	**241,00**	186,76	131,00	**317,76**
October	147,50	137,09	**284,59**	195,50	159,91	**355,41**
November	191,25	132,09	**323,34**	193,83	154,37	**348,20**
December	173,75	128,76	**302,51**	192,71	150,68	**343,39**

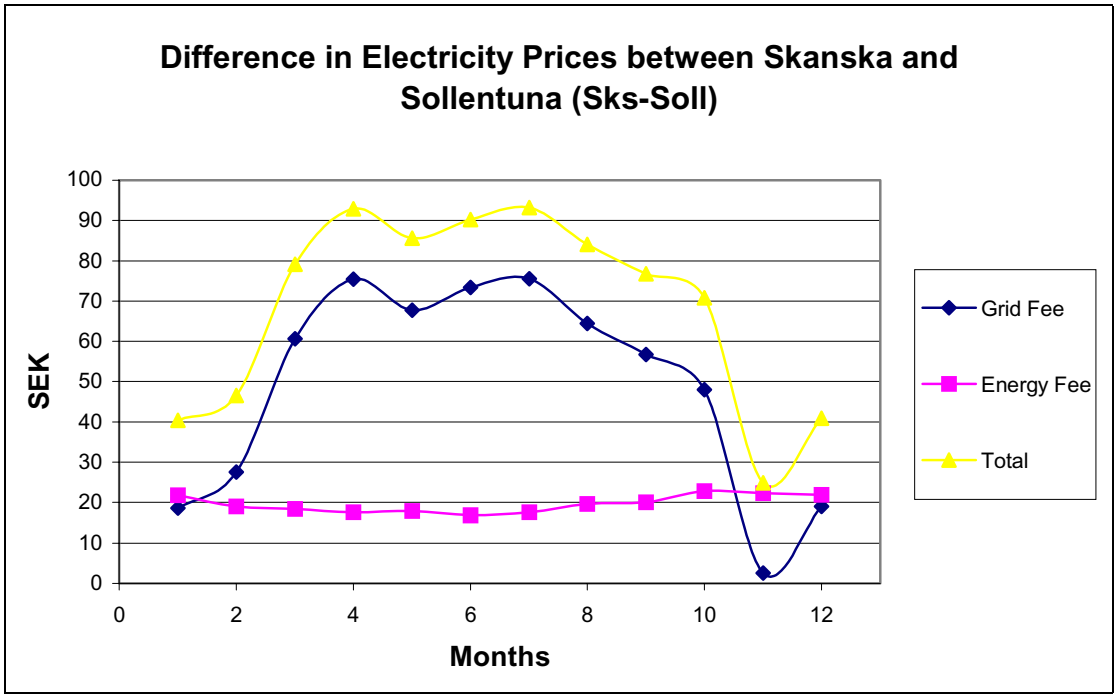

Figure D.7: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

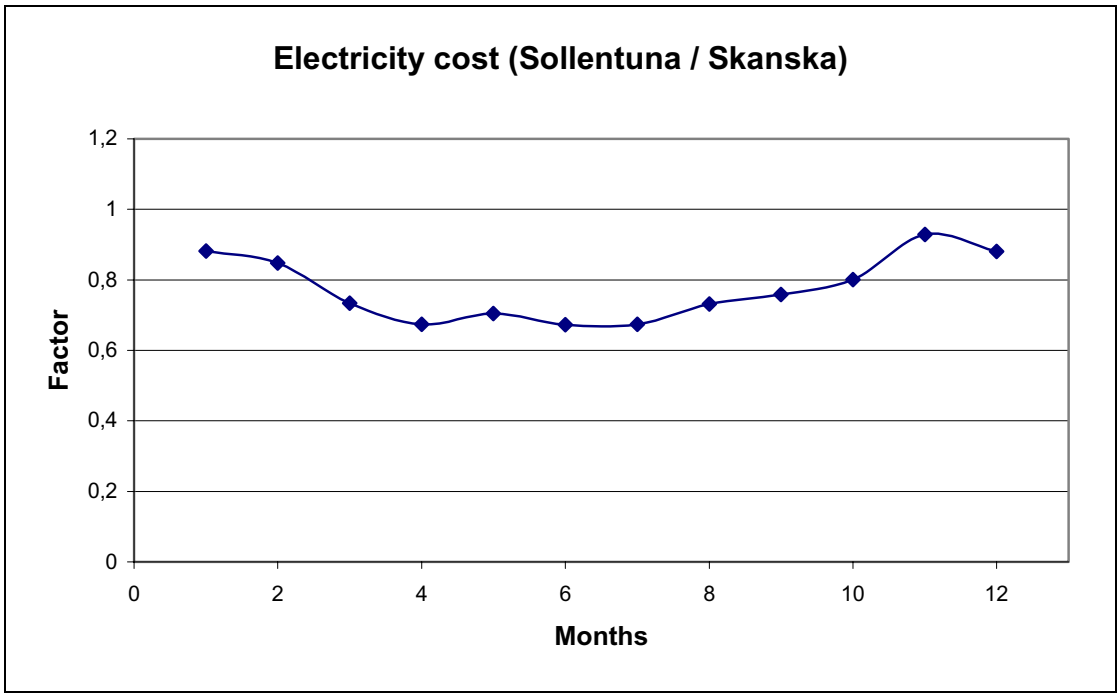

Figure D.8: Sollentuna and Skånska price factor.

e) Flat E

Table D.9: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	153	1	1	1	1
February	138	1	1	1	1
March	133	1	1	1	1
April	130	1	1	1	1
May	130	1	1	1	1
June	130	1	1	1	1
July	150	1	1	1	1
August	139	1	1	1	1
September	119	1	1	1	1
October	130	1	1	1	1
November	141	1	1	1	1
December	150	1	1	1	1

Table D.10: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	121,25	84,92	**206,17**	178,02	102,10	**280,12**
February	121,25	76,59	**197,84**	175,23	92,87	**268,10**
March	121,25	73,82	**195,07**	174,30	89,80	**264,10**
April	95,00	72,15	**167,15**	173,74	87,95	**261,69**
May	95,00	72,15	**167,15**	173,74	87,95	**261,69**
June	95,00	72,15	**167,15**	173,74	87,95	**261,69**
July	95,00	83,25	**178,25**	177,46	100,25	**277,71**
August	95,00	77,15	**172,15**	175,42	93,49	**268,90**
September	95,00	66,05	**161,05**	171,70	81,19	**252,88**
October	95,00	72,15	**167,15**	173,74	87,95	**261,69**
November	121,25	78,26	**199,51**	175,79	94,72	**270,50**
December	121,25	83,25	**204,50**	177,46	100,25	**277,71**

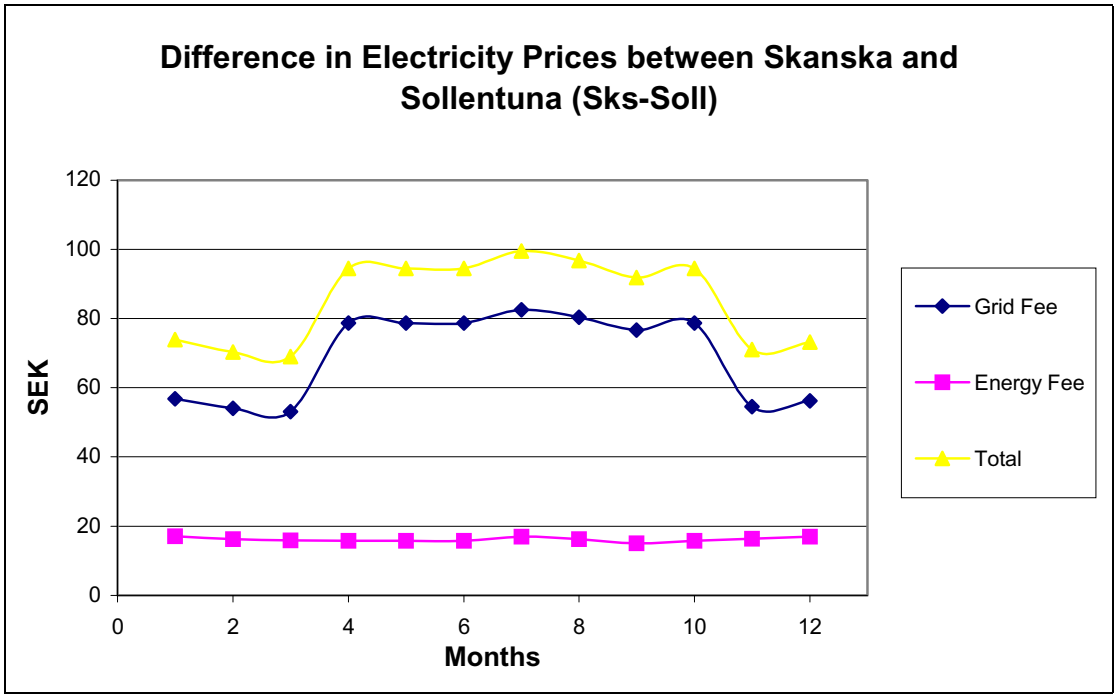

Figure D.9: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

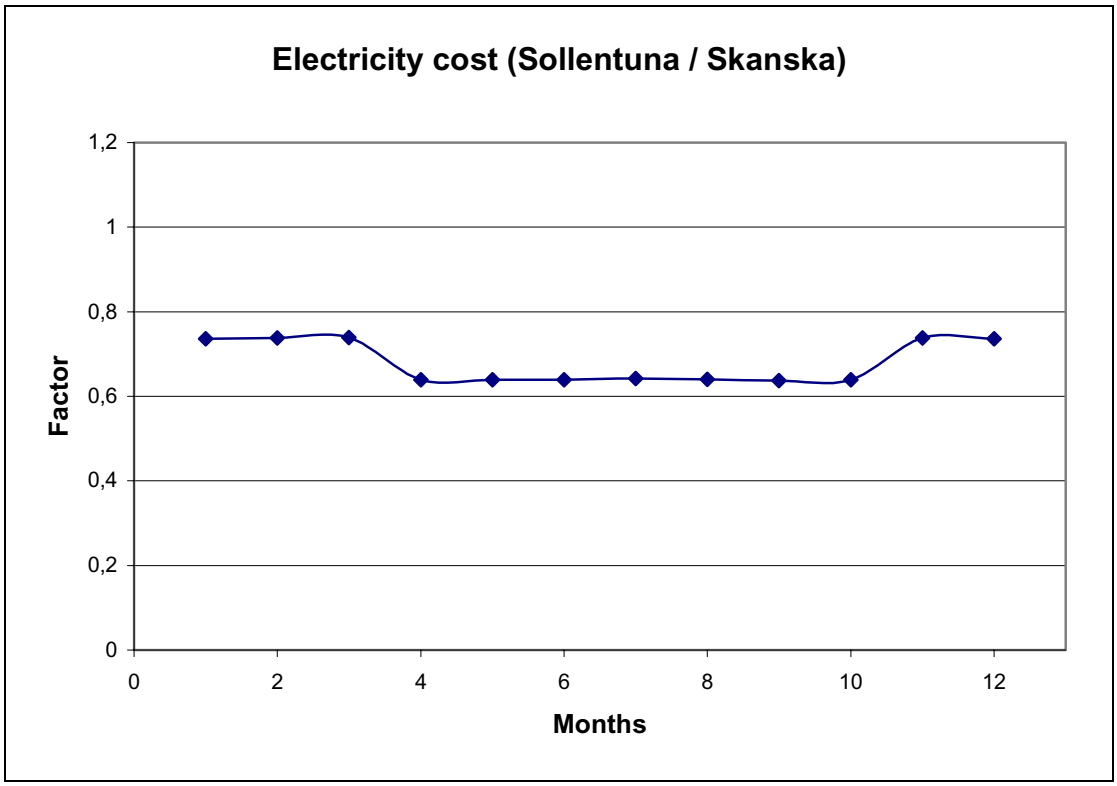

Figure D.10: Sollentuna and Skånska price factor.

D.2 VILLAS (with electrical heating)

a) Villa A (16 A)

Table D.11: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	2826	9	9	9	9,00
February	2604	9	9	9	9,00
March	2770	11	9	8	9,33
April	1998	7	7	7	7,00
May	686	8	8	6	7,33
June	356	2	2	2	2,00
July	201	1	1	1	1,00
August	236	3	2	1	2,00
September	720	8	6	6	6,67
October	1632	6	6	6	6,00
November	2355	9	8	8	8,33
December	3478	9	8	8	8,33

Table D.12: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	578,75	1568,43	**2147,18**	708,70	1745,99	**2454,69**
February	578,75	1445,22	**2023,97**	667,41	1609,46	**2276,87**
March	596,25	1537,35	**2133,60**	698,28	1711,55	**2409,83**
April	290,00	1108,89	**1398,89**	554,69	1236,77	**1791,46**
May	298,75	380,73	**679,48**	310,66	429,89	**740,55**
June	158,75	197,58	**356,33**	249,28	226,94	**476,22**
July	132,50	111,56	**244,06**	220,45	131,62	**352,06**
August	158,75	130,98	**289,73**	226,96	153,14	**380,10**
September	281,25	399,60	**680,85**	316,98	450,80	**767,78**
October	263,75	905,76	**1169,51**	486,61	1011,68	**1498,29**
November	543,75	1307,03	**1850,78**	621,09	1456,33	**2077,42**
December	543,75	1930,29	**2474,04**	829,97	2146,97	**2976,94**

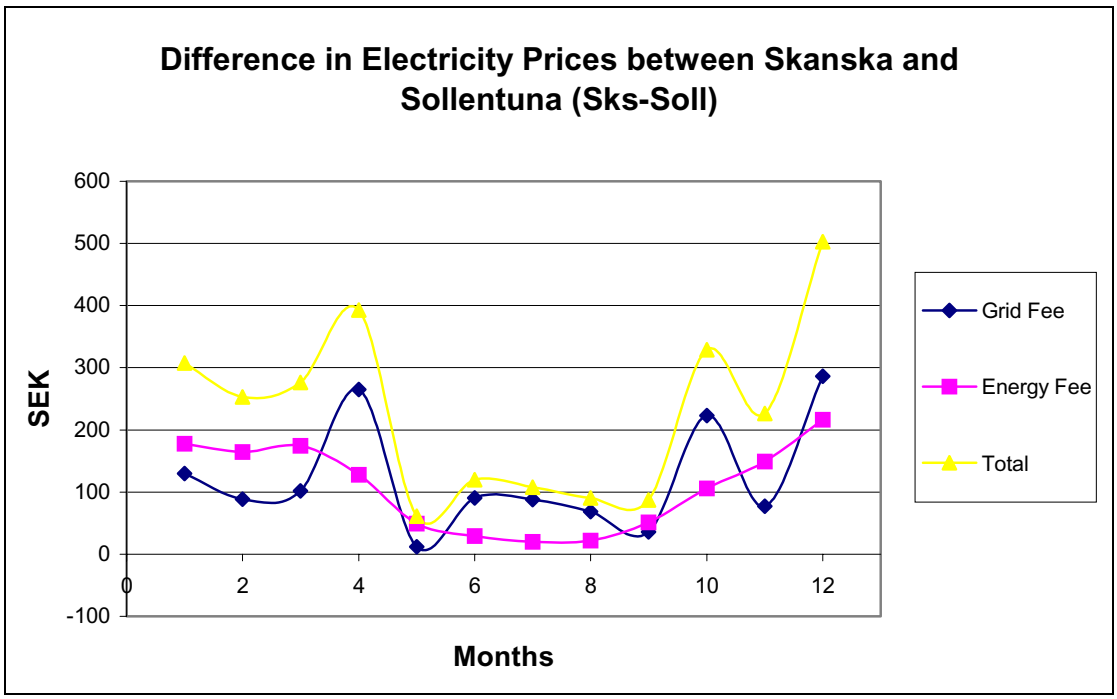

Figure D.11: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

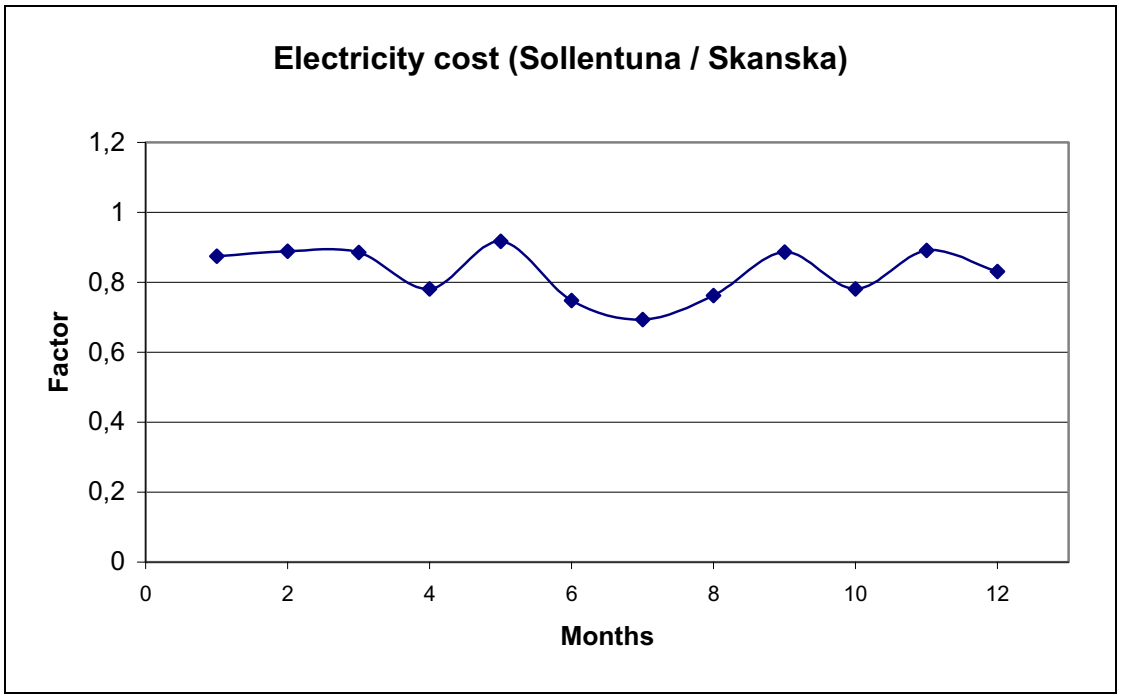

Figure D.12: Sollentuna and Skånska price factor.

b) Villa B (16 A)

Table D.13: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	3314	9,00	9,00	9,00	9,00
February	2749	9,00	8,00	8,00	8,33
March	3069	9,00	8,00	8,00	8,33
April	2287	9,00	8,00	7,00	8,00
May	1340	6,00	5,00	5,00	5,33
June	1135	10,00	6,00	5,00	7,00
July	716	7,00	5,00	5,00	5,67
August	790	6,00	5,00	4,00	5,00
September	1349	6,00	6,00	5,00	5,67
October	1727	7,00	6,00	6,00	6,33
November	2453,17	9,72	8,55	7,33	8,53
December	3149,14	10,02	9,15	8,75	9,31

Table D.14: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	578,75	1839,27	**2418,02**	799,47	2046,11	**2845,58**
February	543,75	1525,70	**2069,45**	694,38	1698,64	**2393,01**
March	543,75	1703,30	**2247,05**	753,90	1895,44	**2649,33**
April	316,25	1269,29	**1585,54**	608,44	1414,51	**2022,95**
May	246,25	743,70	**989,95**	432,30	832,10	**1264,40**
June	290,00	629,93	**919,93**	394,17	706,03	**1100,20**
July	255,00	397,38	**652,38**	316,24	448,34	**764,58**
August	237,50	438,45	**675,95**	330,00	493,85	**823,85**
September	255,00	748,70	**1003,70**	433,98	837,64	**1271,61**
October	272,50	958,49	**1230,99**	504,28	1070,11	**1574,39**
November	554,25	1361,51	**1915,76**	639,35	1516,70	**2156,05**
December	594,85	1747,77	**2342,62**	768,80	1944,72	**2713,52**

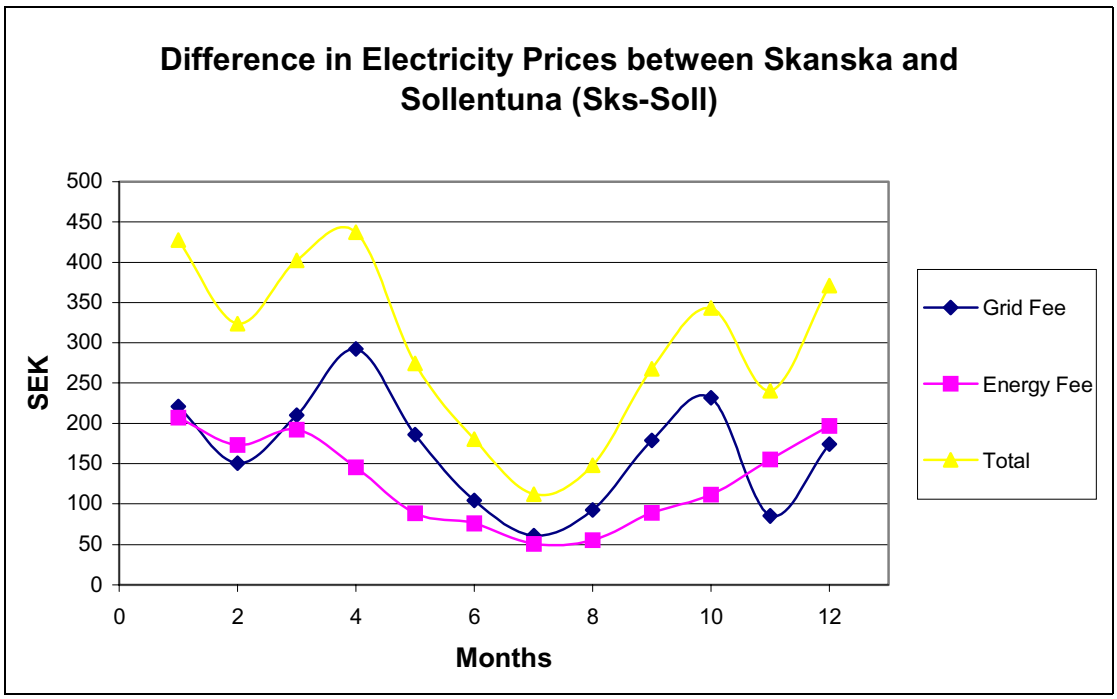

Figure D.13: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

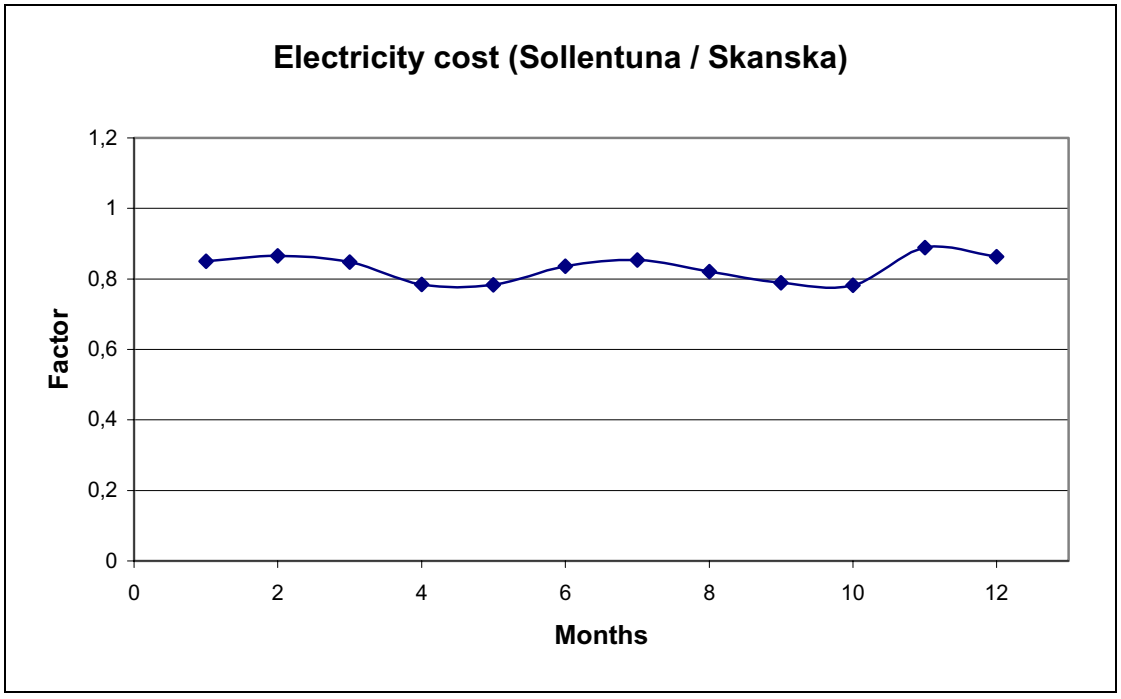

Figure D.14: Sollentuna and Skånska price factor.

c) Villa C (20 A)

Table D.15: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	3530	9	8	8	8,33
February	3465	9	9	9	9,00
March	3457	8	8	7	7,67
April	2546	7	7	6	6,67
May	1159	5	5	4	4,67
June	783	4	3	3	3,33
July	577	3	3	3	3,00
August	580	3	3	3	3,00
September	1041	4	4	4	4,00
October	1731	6	5	5	5,33
November	2967	7	7	7	7,00
December	3948	9	9	8	8,67

Table D.16: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	543,75	1959,15	**2502,90**	883,14	2178,95	**3062,09**
February	578,75	1923,08	**2501,83**	871,05	2138,98	**3010,03**
March	508,75	1918,64	**2427,39**	869,56	2134,06	**3003,62**
April	281,25	1413,03	**1694,28**	700,12	1573,79	**2273,91**
May	228,75	643,25	**872,00**	442,14	720,79	**1162,92**
June	193,75	434,57	**628,32**	372,20	489,55	**861,75**
July	185,00	320,24	**505,24**	333,88	362,86	**696,74**
August	185,00	321,90	**506,90**	334,44	364,70	**699,14**
September	211,25	577,76	**789,01**	420,19	648,22	**1068,40**
October	246,25	960,71	**1206,96**	548,53	1072,57	**1621,09**
November	473,75	1646,69	**2120,44**	778,42	1832,71	**2611,13**
December	561,25	2191,14	**2752,39**	960,89	2436,02	**3396,91**

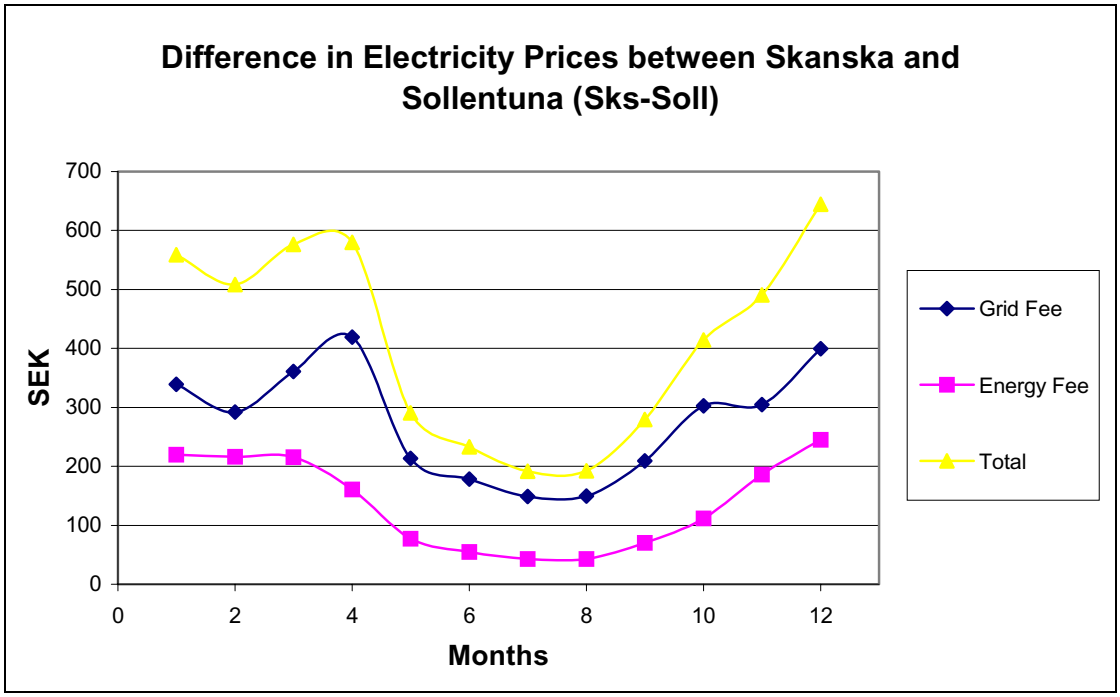

Figure D.15: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

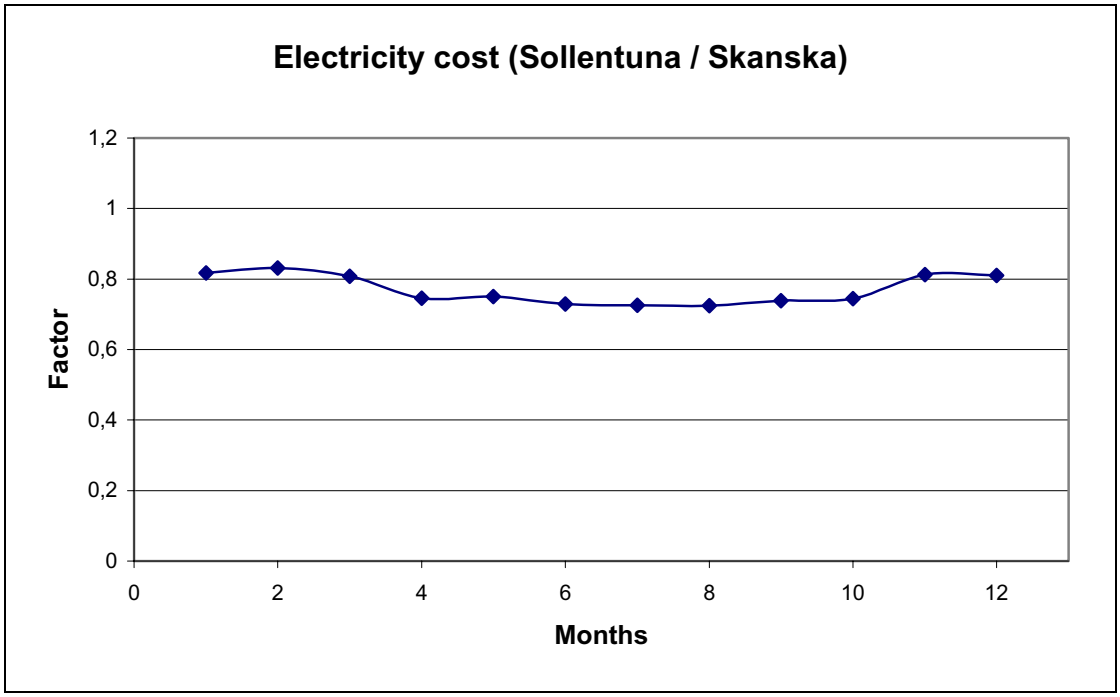

Figure D.16: Sollentuna and Skånska price factor.

d) Villa D (20 A)

Table D.17: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	3271	7	7	7	7,00
February	3084	8	8	8	8,00
March	3174	8	7	7	7,33
April	2277	6	6	6	6,00
May	966	4	4	4	4,00
June	835	5	4	4	4,33
July	596	3	3	3	3,00
August	605	3	3	3	3,00
September	1163	5	5	5	5,00
October	1600	6	5	5	5,33
November	2747	7	6	6	6,33
December	3759	8	8	8	8,00

Table D.18: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	473,75	1815,41	**2289,16**	834,97	2019,67	**2854,63**
February	526,25	1711,62	**2237,87**	800,19	1904,66	**2704,85**
March	491,25	1761,57	**2252,82**	816,93	1960,01	**2776,94**
April	263,75	1263,74	**1527,49**	650,08	1408,36	**2058,44**
May	211,25	536,13	**747,38**	406,24	602,09	**1008,33**
June	220,00	463,43	**683,43**	381,87	521,53	**903,40**
July	185,00	330,78	**515,78**	337,42	374,54	**711,96**
August	185,00	335,78	**520,78**	339,09	380,08	**719,17**
September	237,50	645,47	**882,97**	442,88	723,25	**1166,13**
October	246,25	888,00	**1134,25**	524,16	992,00	**1516,16**
November	438,75	1524,59	**1963,34**	737,50	1697,41	**2434,91**
December	526,25	2086,25	**2612,50**	925,74	2319,79	**3245,52**

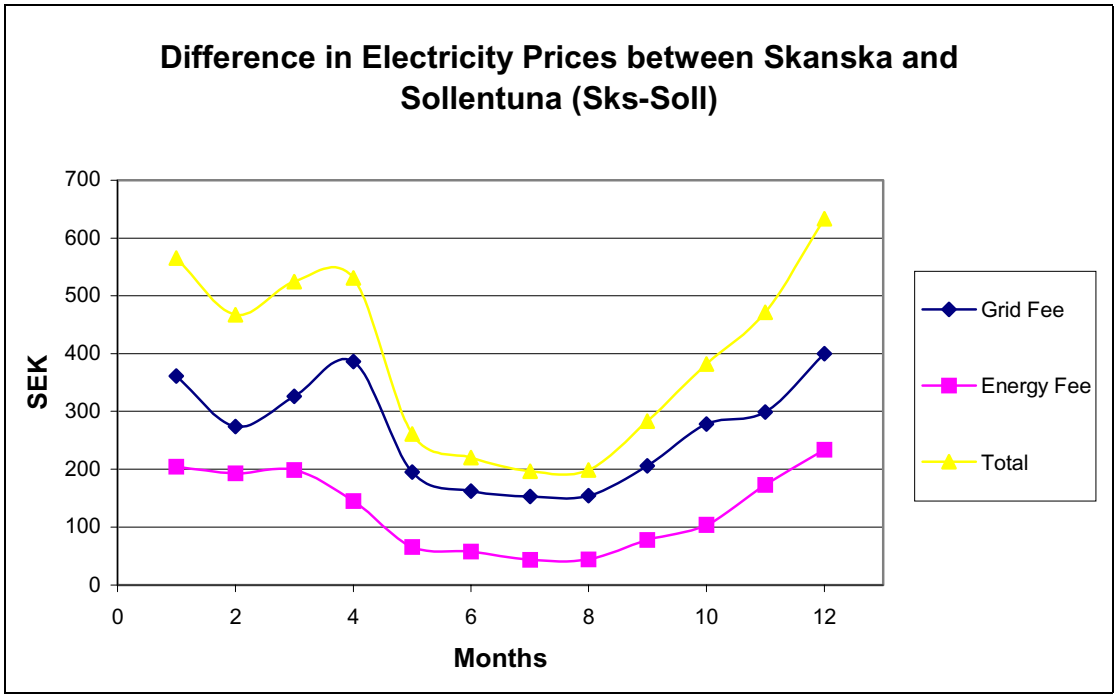

Figure D.17: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

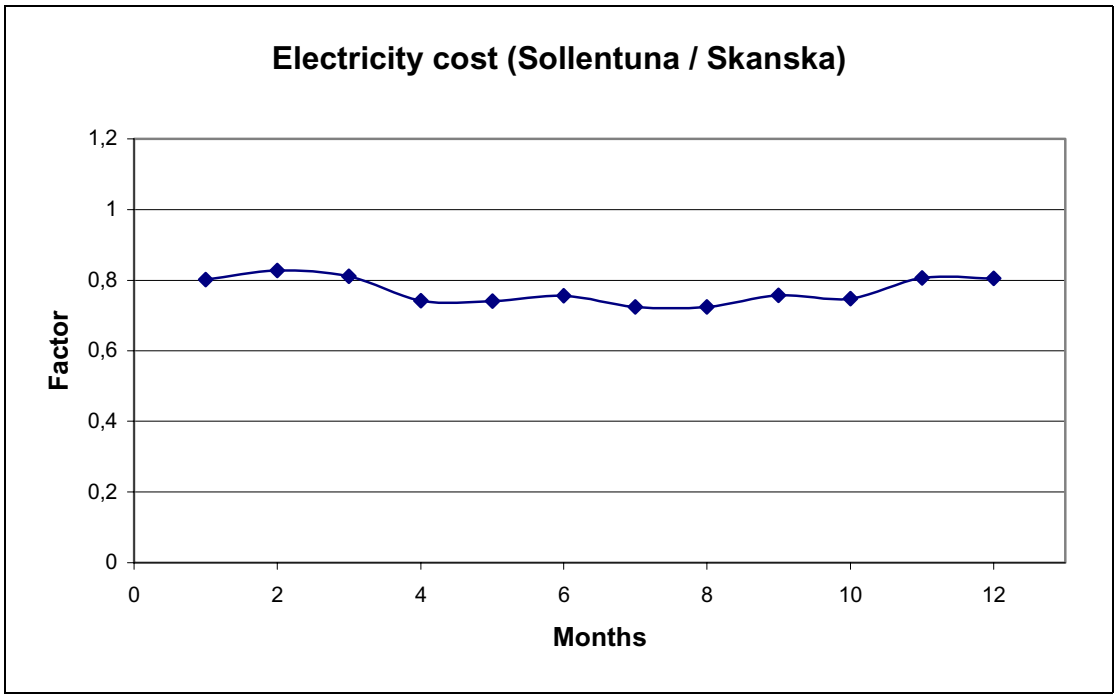

Figure D.18: Sollentuna and Skånska price factor.

e) Villa E (20 A)

Table D.19: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	2381	8,00	8,00	8,00	8,00
February	2392	10,00	8,00	8,00	8,67
March	2052	8,00	8,00	8,00	8,00
April	1163	7,00	5,00	4,00	5,33
May	723	3,00	3,00	3,00	3,00
June	632	3,00	3,00	3,00	3,00
July	586	3,00	3,00	3,00	3,00
August	561	3,00	2,00	2,00	2,33
September	710	4,00	3,00	3,00	3,33
October	823	4,00	3,00	3,00	3,33
November	1150,24	4,99	4,29	3,95	4,41
December	1483,77	6,74	6,37	6,23	6,45

Table D.20: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	526,25	1321,46	**1847,71**	669,43	1472,32	**2141,74**
February	561,25	1327,56	**1888,81**	671,47	1479,08	**2150,55**
March	526,25	1138,86	**1665,11**	608,23	1269,98	**1878,21**
April	246,25	645,47	**891,72**	442,88	723,25	**1166,13**
May	185,00	401,27	**586,27**	361,04	452,65	**813,69**
June	185,00	350,76	**535,76**	344,11	396,68	**740,79**
July	185,00	325,23	**510,23**	335,56	368,39	**703,95**
August	167,50	311,36	**478,86**	330,91	353,02	**683,92**
September	193,75	394,05	**587,80**	358,62	444,65	**803,27**
October	193,75	456,77	**650,52**	379,64	514,15	**893,79**
November	337,78	638,38	**976,16**	440,51	715,40	**1155,90**
December	444,70	823,49	**1268,19**	502,54	920,52	**1423,06**

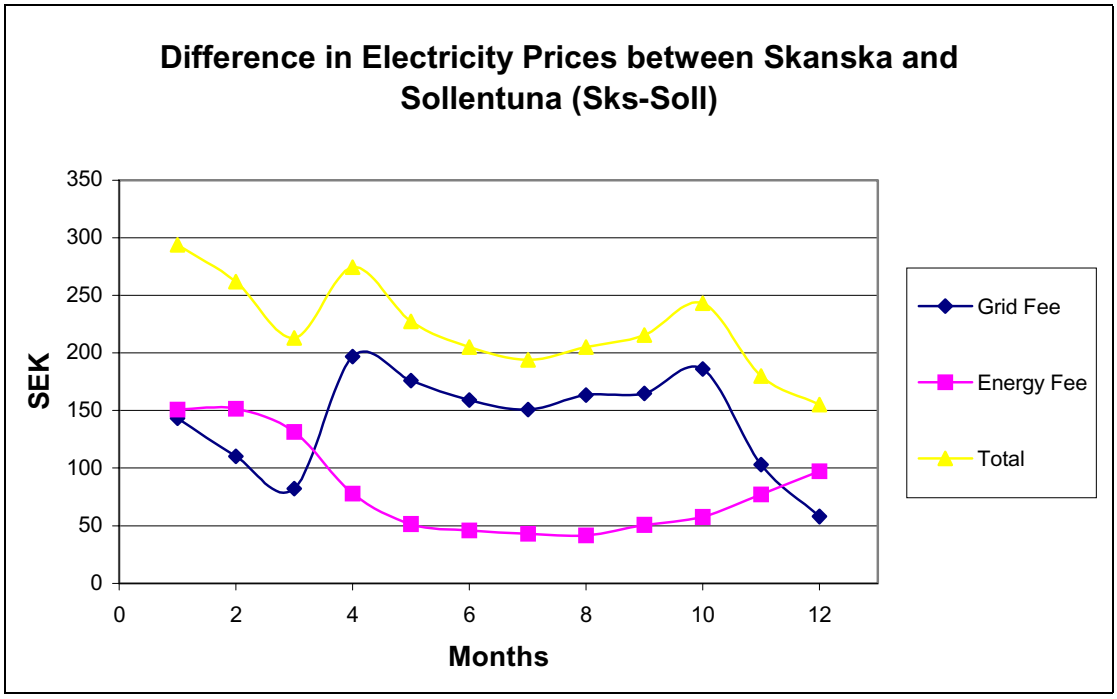

Figure D.19: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

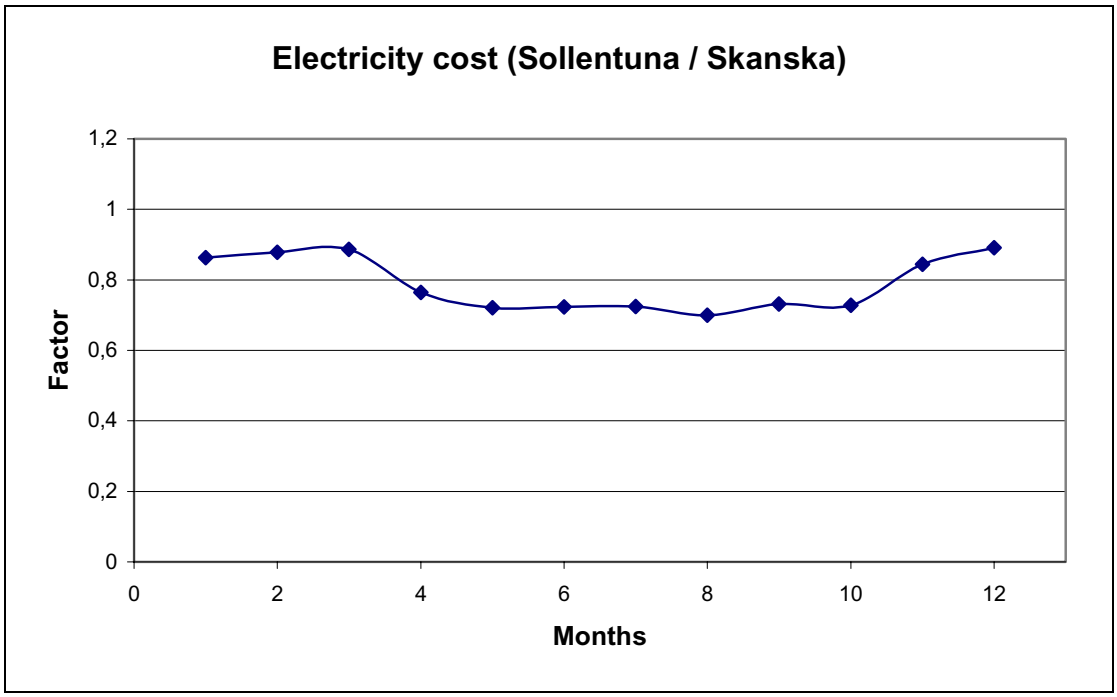

Figure D.20: Sollentuna and Skånska price factor

D.3 BIGGER USERS

a) Bigger User A (50 A)

Table D.21: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	8146	24	24	23	23,67
February	5813	23	22	22	22,33
March	6369	23	21	21	21,67
April	5460	21	20	20	20,33
May	6623	25	24	24	24,33
June	6948	24	24	24	24,00
July	6444	23	22	22	22,33
August	8028	28	26	26	26,67
September	7154	28	28	28	28,00
October	6595	24	24	24	24,00
November	6543	24	24	23	23,67
December	5811	25	24	24	24,33

Table D.22: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	1530,00	4521,03	**6051,03**	2059,22	5017,79	**7077,01**
February	873,75	3226,22	**4099,97**	1625,28	3583,00	**5208,28**
March	1425,00	3534,80	**4959,80**	1728,70	3924,94	**5653,63**
April	821,25	3030,30	**3851,55**	1559,62	3365,90	**4925,52**
May	926,25	3675,77	**4602,02**	1775,94	4081,15	**5857,09**
June	917,50	3856,14	**4773,64**	1836,39	4281,02	**6117,41**
July	873,75	3576,42	**4450,17**	1742,65	3971,06	**5713,71**
August	987,50	4455,54	**5443,04**	2037,27	4945,22	**6982,49**
September	1022,50	3970,47	**4992,97**	1874,71	4407,71	**6282,42**
October	917,50	3660,23	**4577,73**	1770,73	4063,93	**5834,66**
November	1530,00	3631,37	**5161,37**	1761,06	4031,95	**5793,01**
December	1565,00	3225,11	**4790,11**	1624,91	3581,77	**5206,67**

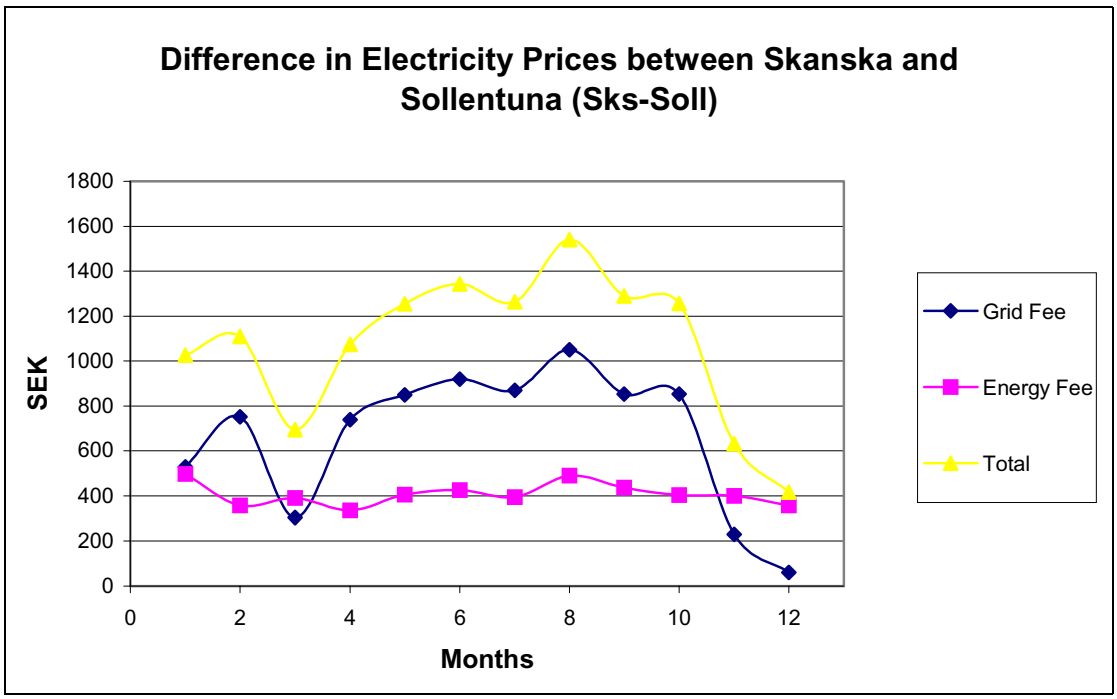

Figure D.21: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

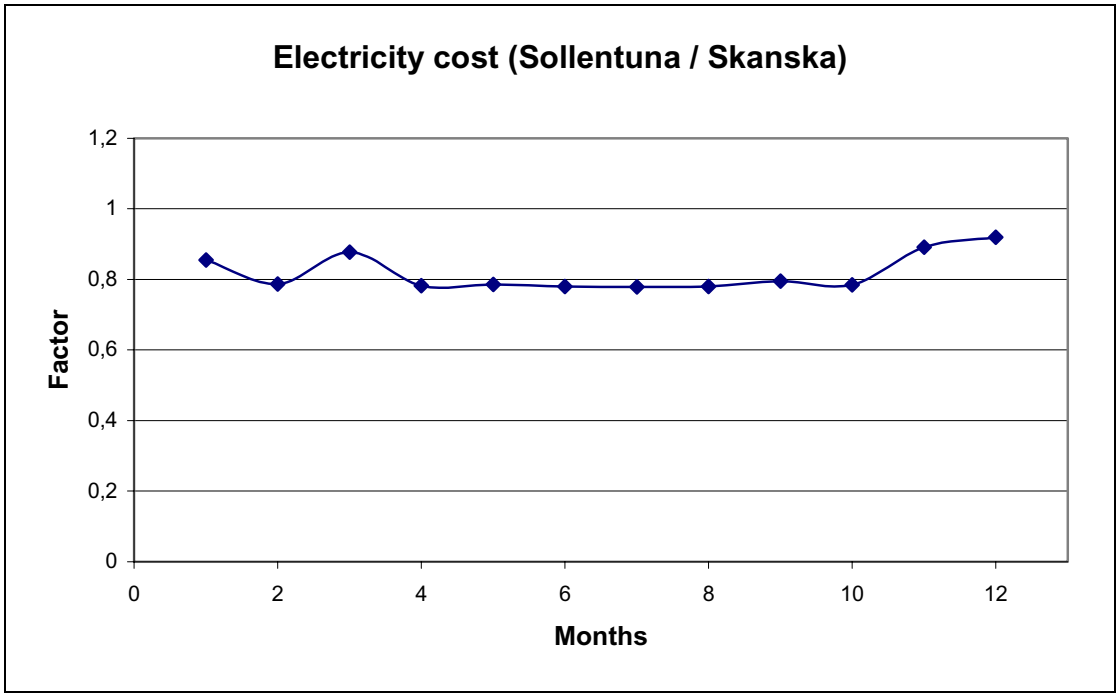

Figure D.22: Sollentuna and Skånska price factor.

b) Bigger User B (50 A)

Table D.23: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	10657	21	21	21	21,00
February	9740	22	21	20	21,00
March	9767	20	20	20	20,00
April	7385	21	18	18	19,00
May	6437	17	15	14	15,33
June	6297	15	14	14	14,33
July	6761	15	15	15	15,00
August	6632	14	14	14	14,00
September	5999	18	14	14	15,33
October	6572	19	18	15	17,33
November	8253	18	18	18	18,00
December	8870	18	17	17	17,33

Table D.24: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	1390,00	5914,64	**7304,64**	2526,26	6562,06	**9088,32**
February	1390,00	5405,70	**6795,70**	2355,70	5998,10	**8353,80**
March	1337,50	5420,69	**6758,19**	2360,72	6014,71	**8375,43**
April	786,25	4098,68	**4884,93**	1917,67	4549,78	**6467,45**
May	690,00	3572,54	**4262,54**	1741,34	3966,76	**5708,10**
June	663,75	3494,84	**4158,59**	1715,30	3880,66	**5595,96**
July	681,25	3752,36	**4433,61**	1801,61	4166,02	**5967,62**
August	655,00	3680,76	**4335,76**	1777,61	4086,68	**5864,29**
September	690,00	3329,45	**4019,45**	1659,88	3697,39	**5357,26**
October	742,50	3647,46	**4389,96**	1766,45	4049,78	**5816,23**
November	1232,50	4580,42	**5812,92**	2079,12	5083,60	**7162,72**
December	1197,50	4922,85	**6120,35**	2193,88	5463,05	**7656,93**

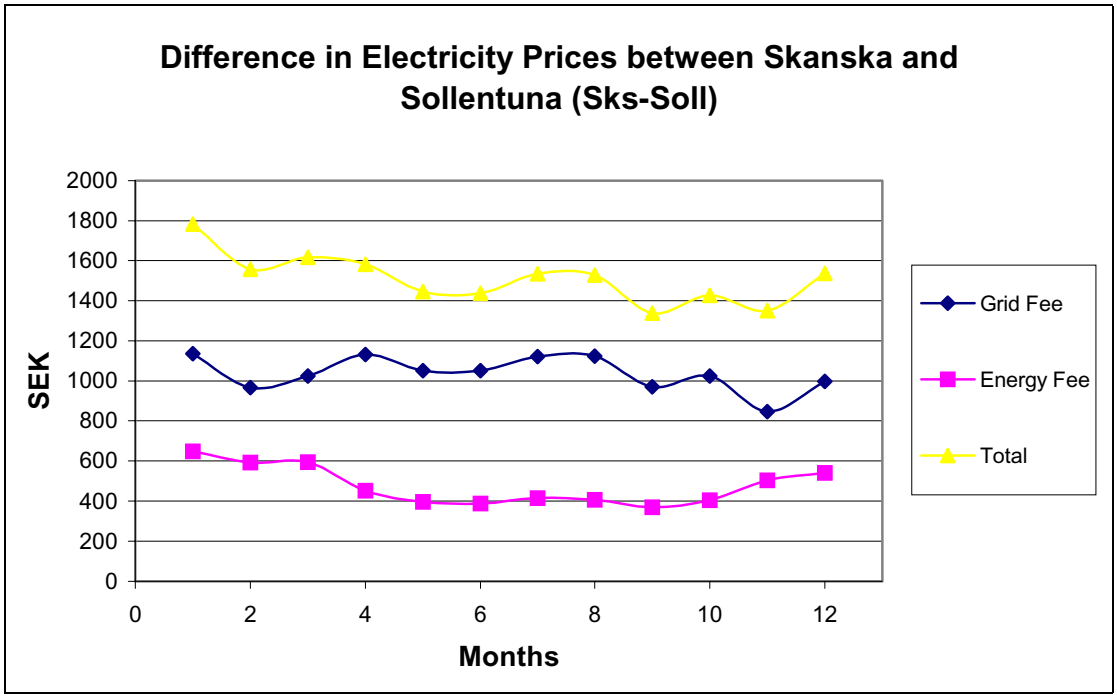

Figure D.23: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

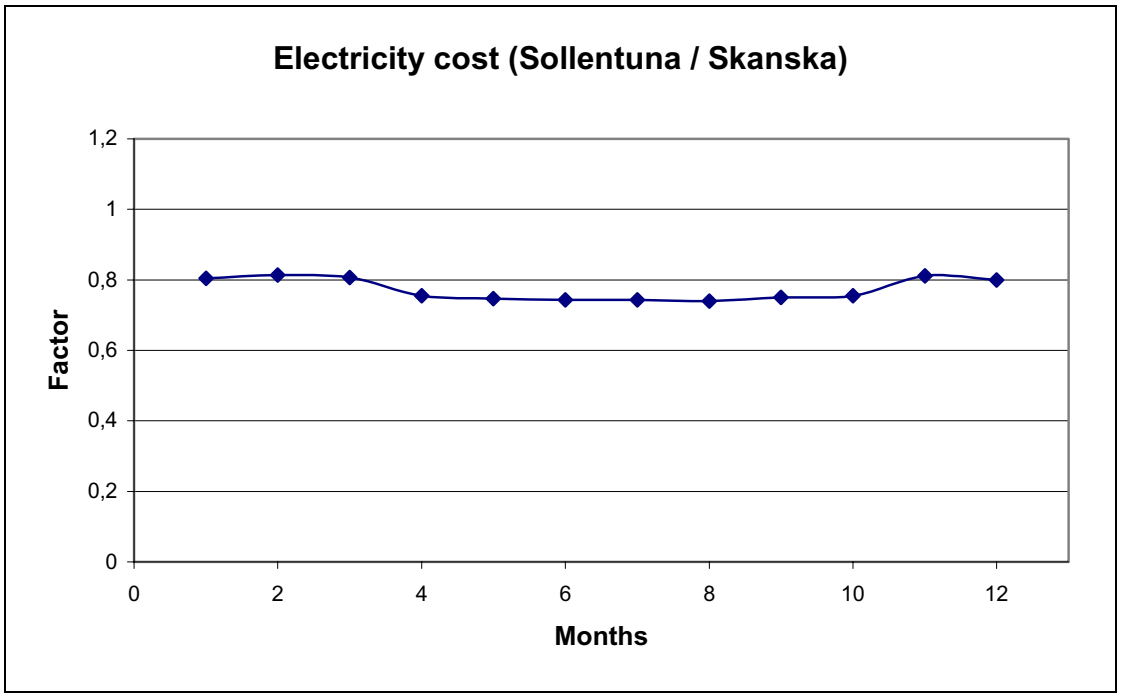

Figure D.24: Sollentuna and Skånska price factor.

c) Bigger User C (100 A)

Table D.25: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	36267	60	60	59	59,67
February	33403	84	79	76	79,67
March	34003	60	60	60	60,00
April	24770	45	44	44	44,33
May	13814	35	34	32	33,67
June	13075	33	31	31	31,67
July	5740	13	13	12	12,67
August	5984	19	18	18	18,33
September	11117	30	28	27	28,33
October	17012	36	35	34	35,00
November	27916	63	57	54	58,00
December	35359	65	61	61	62,33

Table D.26: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	3705,42	20128,19	**23833,60**	7811,64	22312,21	**30123,85**
February	4755,42	18538,67	**23294,08**	7278,94	20550,85	**27829,78**
March	3722,92	18871,67	**22594,58**	7390,54	20919,85	**28310,38**
April	1736,67	13747,35	**15484,02**	5673,20	15241,55	**20914,75**
May	1456,67	7666,77	**9123,44**	3635,38	8503,61	**12138,99**
June	1404,17	7256,63	**8660,79**	3497,93	8049,13	**11547,05**
July	905,42	3185,70	**4091,12**	2133,62	3538,10	**5671,72**
August	1054,17	3321,12	**4375,29**	2179,00	3688,16	**5867,16**
September	1316,67	6169,94	**7486,60**	3133,74	6844,96	**9978,70**
October	1491,67	9441,66	**10933,33**	4230,21	10470,38	**14700,59**
November	3617,92	15493,38	**19111,30**	6258,36	17176,34	**23434,70**
December	3845,42	19624,25	**23469,66**	7642,75	21753,79	**29396,54**

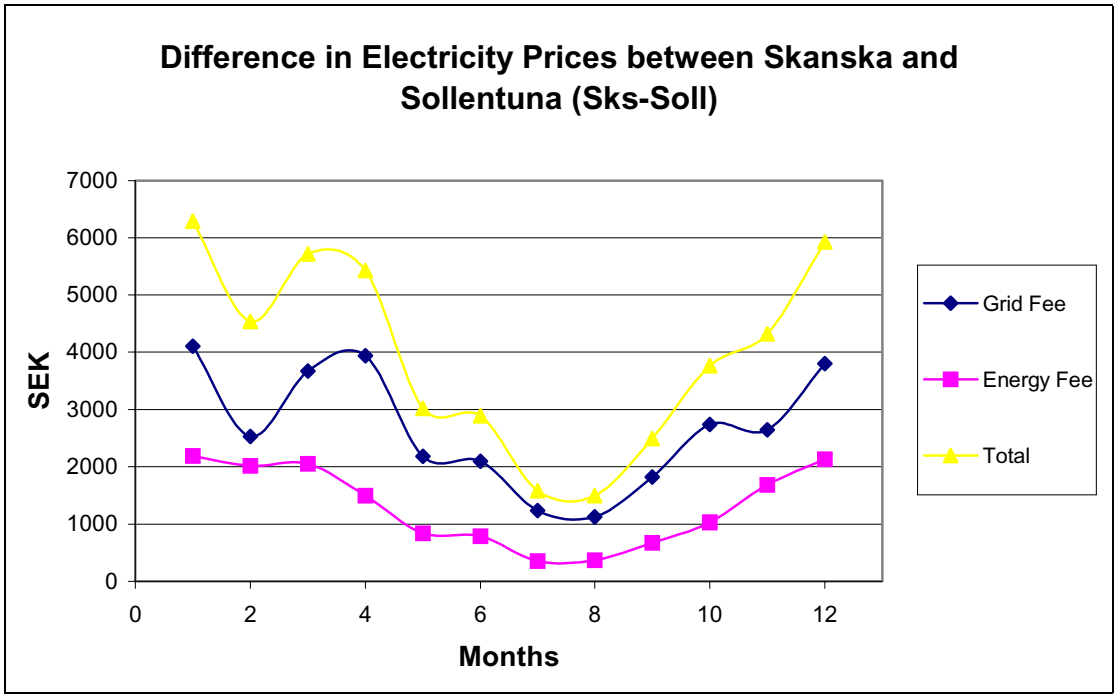

Figure D.25: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

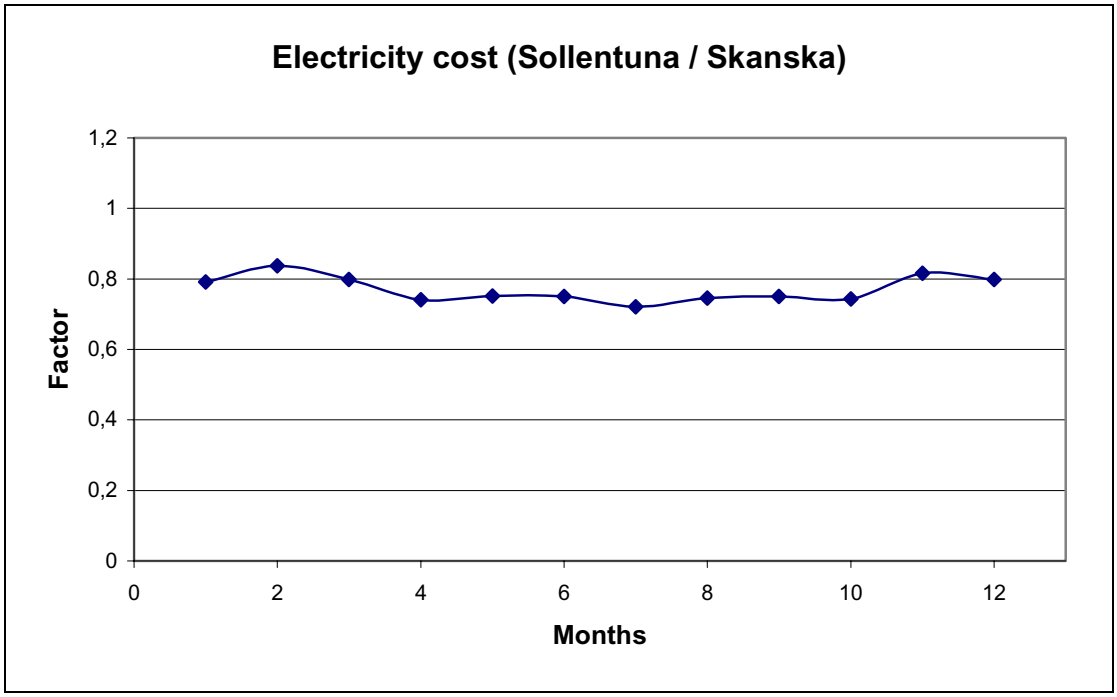

Figure D.26: Sollentuna and Skånska price factor.

d) Bigger User D (160 A)

Table D.27: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	7989	39	38	36	37,67
February	6842	34	33	33	33,33
March	7204	34	34	32	33,33
April	9188	36	35	34	35,00
May	8969	33	33	32	32,67
June	5756	30	29	28	29,00
July	5526	26	26	25	25,67
August	7337	32	30	29	30,33
September	7134	39	36	36	37,00
October	8281	40	39	38	39,00
November	7758	44	43	41	42,67
December	6621	41	40	40	40,33

Table D.28: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	2894,17	4433,90	**7328,06**	3184,18	4921,24	**8105,42**
February	2666,67	3797,31	**6463,98**	2970,84	4215,83	**7186,67**
March	2666,67	3998,22	**6664,89**	3038,17	4438,46	**7476,63**
April	1835,42	5099,34	**6934,76**	3407,20	5658,62	**9065,82**
May	1774,17	4977,80	**6751,96**	3366,46	5523,94	**8890,40**
June	1677,92	3194,58	**4872,50**	2768,85	3547,94	**6316,79**
July	1590,42	3066,93	**4657,35**	2726,07	3406,49	**6132,56**
August	1712,92	4072,04	**5784,95**	3062,91	4520,26	**7583,17**
September	1887,92	3959,37	**5847,29**	3025,15	4395,41	**7420,56**
October	1940,42	4595,96	**6536,37**	3238,50	5100,82	**8339,31**
November	3156,67	4305,69	**7462,36**	3141,22	4779,17	**7920,39**
December	3034,17	3674,66	**6708,82**	2929,74	4079,92	**7009,65**

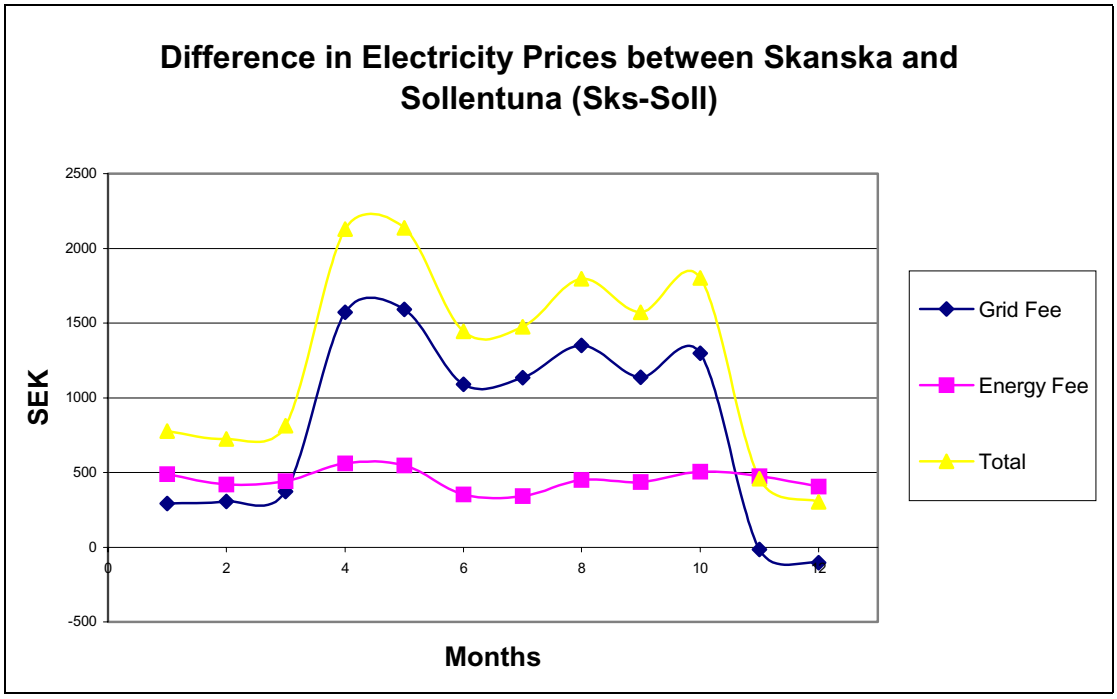

Figure D.27: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

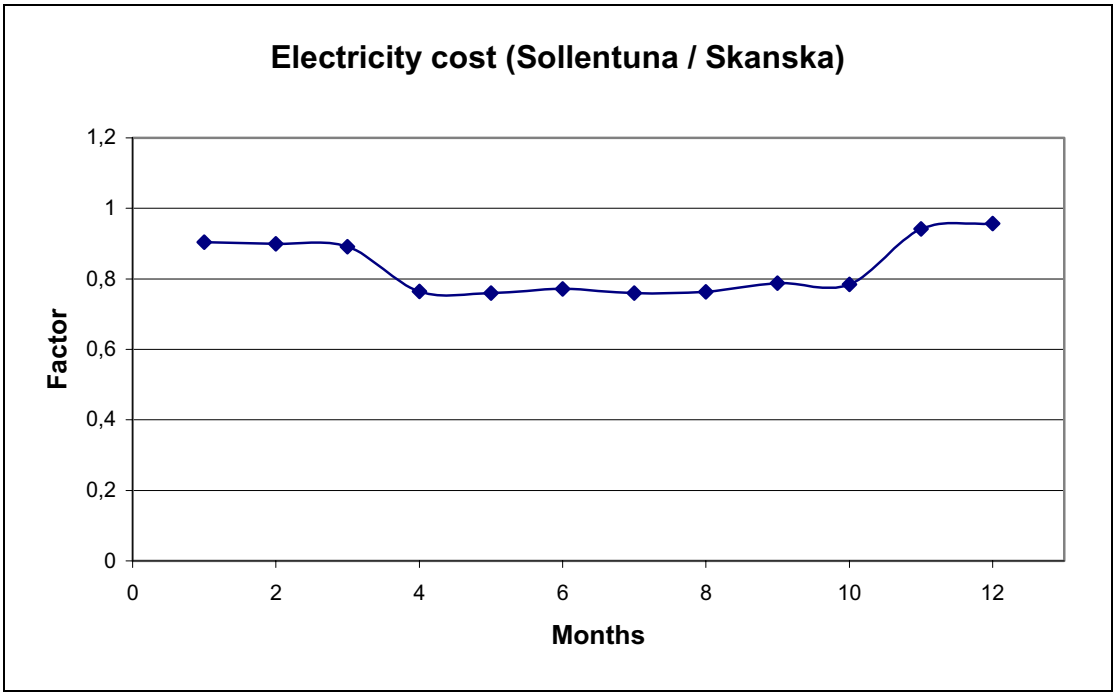

Figure D.28: Sollentuna and Skånska price factor.

e) Bigger User E (50 A)

Table D.29: Electricity use per month and values of load demand used with Sollentuna Energy's electricity tariff.

	Electricity Use kWh/month	The 3 Highest Load Peaks KW			Average Load Peak kW
		1	2	3	
January	5447	28	27	26	27,00
February	4828	26	26	25	25,67
March	5506	27	27	27	27,00
April	4348	25	25	25	25,00
May	4747	26	25	25	25,33
June	4742	28	26	25	26,33
July	1829	20	16	11	15,67
August	5106	25	24	24	24,33
September	4671	25	25	25	25,00
October	5388	26	26	24	25,33
November	5156	27	24	24	25,00
December	4122	25	25	25	25,00

Table D.30: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

	SOLLENTUNA PRICES			SKANSKA PRICES		
	Grid fee	Energy fee	TOTAL	Grid fee	Energy fee	TOTAL
January	1705,00	3023,09	**4728,09**	1557,20	3357,91	**4915,11**
February	1635,00	2679,54	**4314,54**	1442,07	2977,22	**4419,29**
March	1705,00	3055,83	**4760,83**	1568,18	3394,19	**4962,37**
April	943,75	2413,14	**3356,89**	1352,79	2682,02	**4034,81**
May	952,50	2634,59	**3587,09**	1427,00	2927,41	**4354,41**
June	978,75	2631,81	**3610,56**	1426,07	2924,33	**4350,40**
July	698,75	1015,10	**1713,85**	884,26	1132,84	**2017,09**
August	926,25	2833,83	**3760,08**	1493,78	3148,19	**4641,97**
September	943,75	2592,41	**3536,16**	1412,87	2880,67	**4293,53**
October	952,50	2990,34	**3942,84**	1546,23	3321,62	**4867,85**
November	1600,00	2861,58	**4461,58**	1503,08	3178,94	**4682,02**
December	1600,00	2287,71	**3887,71**	1310,75	2543,03	**3853,78**

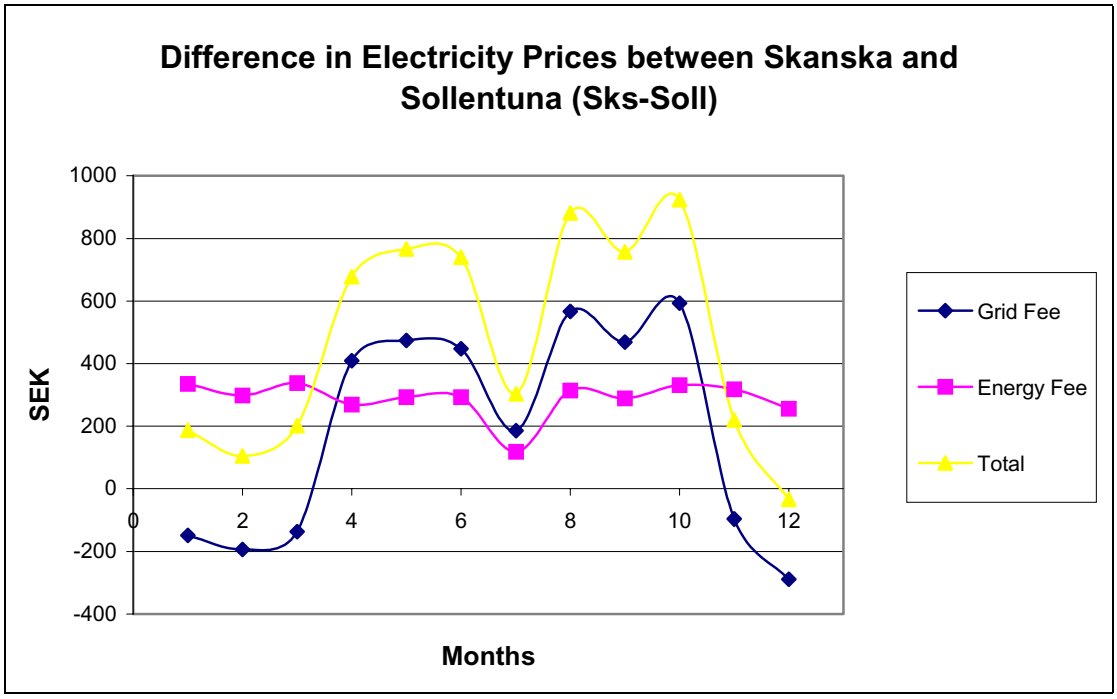

Figure D.29: Electricity prices with Sollentuna Energy and Skånska Energy's tariffs.

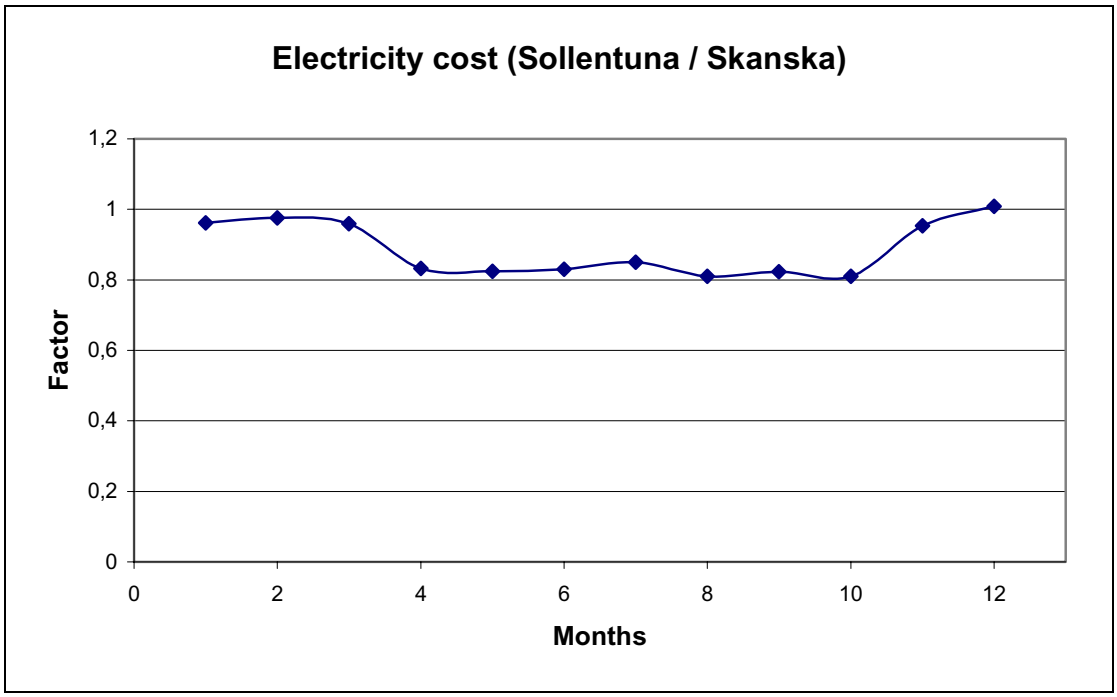

Figure D.30: Sollentuna and Skånska price factor.