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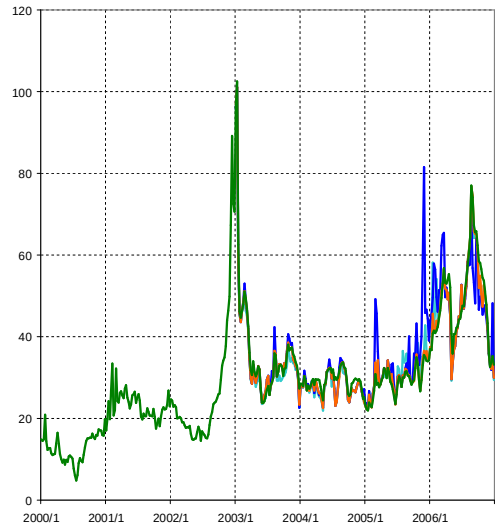

Analysis made for NordREG

Study on cost-benefit analysis of Nordic retail market integration

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Summary

The Nordic retail market integration has been studied by comparing on one hand the current retail prices between the different Nordic countries and on the other hand corresponding retail margins.

The other part of this project is dealing with the costs related to renewal of IT systems as well as the harmonisation needed for operation in the Nordic area.

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Espoo 25.06.2008

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Preface

The cooperative organization NordREG has drafted several reports for the project on Nordic retail market integration. The main objective of this report is to consider the retail prices as well as the retail margin in the various Nordic countries. The costs related to the renewal of IT systems are one important item of the cost-benefit study.

The report has been prepared under supervision of the NordREG working group. The participants in the group are:

Antti Paananen	Energy Market Authority EMV, Finland (chair)
Anu Mikkonen	Energy Market Authority EMV, Finland
Marielle Liikanen	Energy Markets Inspectorate EI, Sweden
Kristin Kolseth	Norwegian Water Resources and Energy Directorate NVE, Norway
Martin Skovgaard Larsen	Danish Energy Regulatory Authority DERA, Denmark

The participants delivered the retail price data and other information concerning mainly the years from 2000 to 2007. Thank you all for the co-operation.

Espoo 25.06.2008

Authors

Executive summary

The objective of this study has been to provide quantitative evaluation of costs and benefits for Nordic retail market integration that would allow weighting the total effects of the integrated market. Some comparisons between countries are carried out. The retail prices and margins in the various Nordic countries were assessed. Two typical small customer groups having the yearly consumption of 5 000 kWh/a and 20 000 kWh/a were considered. The comparison of the prices and customer costs covers the years from 2000 to 2007.

Comparison of the retail prices shows that the differences between the Nordic countries are reasonable. In several cases the difference between the highest and lowest values in one country are of the same order as between the countries. Only public retail prices valid for the time being were compared, even though each country has the pricing practice based on the spot prices, too.

Generally, the Finnish prices are lowest and Swedish values highest, but the order between the Nordic countries has changed during the years under consideration. Some reasons for the pricing can be found from different load profiles and other practices in these countries. In the case of Denmark it was only possible to use regulated prices because commercial prices are not collected in Denmark for statistical use In Finland separate prices for daytime and night-time energy consumption is widely used.

Theoretical retail margins compared in this study are generally low, but there seems to be some differences between the Nordic countries. This indicates that market integration and increased competition could result in decreased retail prices.

Some obstacles in administration were found concerning the operation in the neighbouring countries like some differences in practices in different countries. For example, in Sweden the retail supplier collects the taxes and in the other countries the distribution company is responsible for the collection. Still, some permission is required for the operation of suppliers in a different way in these countries. Announcing of the prices to the customers differs from a written announcement at least 30 days beforehand to a newspaper advertisement about two weeks in advance. Moreover, the operation as a retail supplier in another country requires an agreement concerning the balance with the balance provider of the country in question.

Market integration requires considerable changes in IT systems. The costs of these changes cannot be defined at the time being because the accurate rules for harmonisation of customer switching, data exchange format and content etc. are not defined. However, it seems that these costs could be kept at the reasonable level if harmonisation rules and time schedules are carefully defined and planned: this requires a very effective coordination of different actors like regulators, IT vendors, network operators and retail suppliers.

Some additional benefit from the market integration can be obtained although quantitative assessment is difficult. These are related to larger variety of products and services to retail customers, which can result in decrease of market prices especially in peak load situations and in increased energy efficiency and decreased electricity bills at customer level.

Contents

Preface 2

Contents 4

List of abbreviations....6

1 Introduction....7

1.1 Background....7

1.1.1 A survey of metering requirements, load profiles and data systems 7

1.1.2 The Integrated Nordic End-user Electricity Market....8

1.1.3 Cost and Benefits of Nordic Retail Market Integration 9

1.1.4 Harmonized supplier switching model....9

1.2 Objectives of this study 10

2 Effects of retail market integration on retail prices in the Nordic countries 11

2.1 Background material 11

Comparison of retail prices 12

2.2 12

2.3 Cumulative difference between Nordic countries in pairs 16

2.4 Effect of market integration on retail prices....20

3 The retail margin in various Nordic countries and the possible effects of market integration on it....21

3.1 Comparison of retail margins 21

3.2 Possible effects of market integration on the margins....24

4 Costs related to renewal of IT systems to enable the integrated retail market....25

4.1 IT Systems studied 25

4.2 Definition of the basic common requirements for IT systems and corresponding changes needed in IT systems....25

4.2.1 Harmonisation of supplier switching....26

4.2.2 Harmonisation of the settlement 26

4.2.3 Harmonisation of the messages between the actors 27

4.3 Development of AMR systems in different countries: requirements and status by 2012 27

4.4 Cost assessment of the changes of IT systems on the basis of some interviews 30

4.5 Concluding comments from the interviews....32

5 Discussion on the costs and benefits of market integration....33

5.1 Structure of retailers In Nordic market 33

5.2 Taxation and administrative differences....33

5.3 General benefits from the market integration....34

5.4 Effects of market integration 35

6 Conclusions and recommendations....37

6.1 Conclusions 37

6.2 Proposal for further studies....38

References 39

Appendices:

Annex A Load profiles for small customers

Annex B Interviews of stakeholders

List of abbreviations

AMM	Advanced Metering Management
AMR	Automatic Meter Reading
DERA	Danish Energy Regulatory Authority, Denmark
DR	Demand Response
DSO	Distribution System Operator
EI	Energy Markets Inspectorate, Sweden
EDI	Electronic Data Interchange
EDIEL	Electronic Data Interchange in ELectricity
EMV	Energy Market Authority, Finland
ERM	Energy Data Management
FAT	Functional Acceptance Test
IT	Information Technology
NVE	Norwegian Water Resources and Energy Directorate, Norges vassdrags- og energidirektorat
PRODAT	Product data message
SME	Small and medium enterprises
UTILMD	Utilities master data message
VAT	Value Added Taxes
VTT	Technical Research Centre of Finland
TOU	Time of Use (network tariffs)
XML	Extensible Markup Language

1 Introduction

1.1 Background

The Nordic Energy Regulators, NordREG, is a cooperative organization for Nordic regulatory authorities in the energy field. NordREG has published or ordered several reports on the Nordic retail markets:

- A survey of metering requirements, load profile applications and data systems of electricity retail market in the Nordic countries, VTT 2005 [1]
- The Integrated Nordic End-user Electricity Market – Feasibility and identified obstacles, NordREG 2006 [2]
- Cost and Benefits of Nordic Retail Market Integration, NordREG 2007 [3]
- Harmonized supplier switching model, NordREG 2008 [4]

1.1.1 A survey of metering requirements, load profiles and data systems

The main objective of the VTT report in 2005 [1] was to develop a comparative analysis of the technical aspects of the national power markets in Norway, Finland, Sweden and Denmark. Important was also to identify the obstacles related to the differences and to present recommendations to decrease these obstacles. The focus has been in the metering requirements, the load profile systems and the data systems.

The following recommendations and proposals were given on the basis of the comparisons between the Nordic Countries and obstacles detected:

1. The Nordic electricity retail market will first be opened for hourly metered customer.
2. The mandatory minimum requirements for hourly metering shall be harmonised.
3. Requirements for the interfaces (what, when and to whom) shall be defined.
4. Meter reading data formats for the interfaces shall be standardized.

The different load profiling methods in the Nordic countries require different and tailor made software in handling of profiled customers in the settlement procedure, which increases costs at network companies and costs and risks of suppliers willing to operate in different countries. Different and complex procedures for reaching the final balance settlement are also problematic for suppliers.

The proper metering is required to ensure the functioning of the electricity market, but the costs of replacing existing meters with more sophisticated ones are high. The main differences in metering between different Nordic countries are:

- Definition of the metering point ID is different
- The requirements for mandatory hourly metering are based either on the fuse size or annual electricity consumption.

- The cost of mandatory hourly metering is in Finland paid by customer and in the other countries by DSO
- The frequency of meter reading will be different in the future.
- The timing of AMR installations is different: Sweden is clearly leading, others are lagging

The costs of large scale AMR installations have been decreasing compared to the costs of individual installations, and the number of AMR customers is increasing quite rapidly in different Nordic countries.

1.1.2 The Integrated Nordic End-user Electricity Market

The NordREG report on the end-user electricity market published in 2006 [2] has reviewed the feasibility and identified obstacles to a common Nordic market.

Technically, the focus should be on the most critical issues, namely standard procedures for data communication between the DSOs and the energy suppliers. Attention must also be paid to procedures and practice for switching of suppliers and a unique identification of the metering point.

In order to ensure consistent handling of technical issues related to data and metering systems as well as standardized data protocols, preparation of a proposal for the rules, standards and recommendations in the Nordic countries should be launched.

Especially the following problems related to the data and metering systems should be solved:

- Transferred messages, information and message timing should be harmonised as well as the message format should be decided.
- A common data transmission protocol should be specified. New solutions like web-based solutions should be studied.
- The identification of the final customers' metering point should be harmonised

The identified regulatory obstacles relate to three areas, namely the division of tasks between monopoly and competitive activities, the operation and duties of distribution network operators including how these are regulated, and the legal framework to provide protection for small end-users.

The commercial obstacles are present in the cross-border trade irrespective of the goods traded. However, there are certain aspects related to commercial conditions and customer protection that have specific relevance as regards eventual commercial obstacles.

Availability and access to information on suppliers and prices is important to the proper functioning of the market.

All Nordic countries have well functioning dispute settlements and consumer protection rules. The rules in the Nordic countries are quite similar but are not fully harmonised, because Norway is not a member of the EU. Harmonised rules create good conditions both for customers and suppliers. It is important that the customers have confidence in the market. Despite the lack of fully harmonised

rules, it will probably not cause any major problems in an eventual common Nordic electricity market.

Additional commercial barriers in the way of Nordic end-user market include different price areas, languages and currencies. Even though prices vary between price areas, market participants can hedge against this risk. Even though the Nordic languages with the exception of Finnish are relatively similar, there still seem to be certain differences that from a commercial point of view, and especially when targeting the household sector, are not insignificant.

1.1.3 Cost and Benefits of Nordic Retail Market Integration

In the NordREG report published in 2007 [3] the cost and benefits of the Nordic retail markets were summarized. Further integration seems like a natural step in the general development of the Nordic electricity market. If retail market integration can have an influence on the general retail market development leading to best practise solutions in all Nordic countries, the benefits could be substantial. There is a clear potential for efficiency improvement, and reduction of operational costs and innovation in all Nordic retail markets.

The costs are primarily on the technical and organizational side. Although potentially large, these costs should not be exaggerated. Some of the regulatory and more technical issues generate costs, but harmonisation will also bring benefits. The key issue is the market design of the future Nordic retail market.

On the basis of this preliminary qualitative analysis carried out NordREG considers that the benefits will most likely outweigh the costs by a clear margin. NordREG is willing and prepared to continue work on this area.

1.1.4 Harmonized supplier switching model

The newest NordREG report on Harmonized supplier switching model has mapped the present supplier switching processes in the Nordic countries and proposes a harmonized switching model for the countries, [4].

In connection with making a new contract NordREG suggests that the timetable for the switching procedure could be as short as possible and that the switch could take place any day of the week. NordREG also believes that 14 days should be the maximum time from making a contract to the switch actually taking place. To make the suggested timetable possible it is necessary to establish what kind of information should be given to the DSO when initiating the switch. This information should be determined by regulation.

To initiate the switch the residential or small business customers have to be in contact only with the new chosen supplier. The person making the supply contract being the same person, who has the contract with the DSO, is not a critical point for harmonization at this point. But NordREG recognizes the advantage of this regulation and recommends that this should be harmonized at some point in the future.

It is important that each country has an arrangement for making relevant customer data about their national customers available, and that this information is easily accessible to all the Nordic suppliers without high expenses.

NordREG suggests that there should be only one data format in use, but it is initially up to market actors to decide upon the appropriate format. NordREG also recommends that for ensuring the compatibility of data systems and messages there should be established testing systems for sending and receiving messages of common format preferably between the Nordic countries, or at least at national level at the beginning.

NordREG recommends that the common message format for sending meter reading data should be decided among the industry.

There should be no financial obstacles when it comes to supplier switching and therefore also meter reading. As a result it should not be allowed to have any meter reading fees in this regard.

NordREG suggests also that installation of AMR should be encouraged as well as the objective for more accurate meter readings.

It is important for the market participants that the harmonized regulatory framework exists before they can make changes in their IT systems. This also reduces the costs of implementation. Therefore it is crucial to start the preparation of the changes in regulation in each Nordic country at the end of 2008 or, by latest, at the beginning of 2009. Thus it is possible to have a harmonized regulatory framework by 2010.

1.2 Objectives of this study

This report is continuing the previous work. The objective of this study is to provide quantitative evaluation of costs and benefits for Nordic retail market integration that would allow weighting the total effects of the integrated market. Some comparisons between countries are carried out.

The retail prices and margins in the various Nordic countries will be assessed. Two typical small customer groups having yearly consumptions of respectively 5 000 kWh/a and 20 000 kWh/a will be considered. The comparison of the prices and customer costs covers the years from 2000 to 2007.

The retail margin is estimated by comparing the retail price to the electricity purchasing costs based on the area spot prices. The effect of the market integration will be discussed.

The basic common requirements for IT systems and the corresponding changes needed in IT systems shall be defined in this work. The practical arrangements of retail sale to other countries and its effects on IT systems including VAT, currencies etc. will be considered.

The development, requirements and status by 2012 of the AMR systems in different countries will be assessed.

New products and services to customers like energy savings, especially what customer can benefit from these new services will be discussed.

2 Effects of retail market integration on retail prices in the Nordic countries

2.1 Background material

Two basic typical small customer types will be reviewed: one consuming 5 000 kWh/a, a household with no electric heating and the other consuming 20 000 kWh/a, a household having electric heating. A smooth curve taking into account the seasonal variations has been used as a common load profile: one for 5 000 kWh/a and the other for 20 000 kWh/a, see Annex A. The same curve has been used for all Nordic countries and for each year without temperature corrections. All currencies have been converted into Euros based on the currency rate during the respective time period.

The price data was collected by the NordREG working group members. Denmark reported retail prices for the yearly consumption of 8 000 kWh, electric heating is not commonly used in Denmark. The comparison was made with same price for both 5 000 kWh/a and 20 000 kWh/a profiles. Finland and Sweden gave prices for both consumption values and Norway reported the prices for 20 000 kWh/a.

The comparisons were made with the public retail prices of different Nordic countries. Only the retail prices valid for the time being were compared. They are called the standard or average prices. The prices excluding taxes were compared. The consumer price index has not been taken into account. A variety of yearly, quarterly, monthly and weekly retail prices were given. The comparisons were made with the following retail prices:

a) Denmark, DK: Standard price. It was only possible to use regulated price series from Denmark which are under an obligation to supply scheme. The reason for this is that the public commercial prices are not collected for statistical purposes in Denmark. Therefore this should be kept in mind for the reader when the prices are compared.
b) Finland, FIN: Weighted average price under obligation to deliver, based on the supplied energy of each company. Additionally, minimum, lower and upper quartiles as well as maximum values were given.
c) Norway, NOR: Volume weighted average of dominant suppliers in 24 biggest network areas, standard changeable price contract. This price indicates the average price paid by the main share of household customers on a standard changeable contract. Prices actually offered in the market differ from this price. For instance, smaller suppliers with local customers only or independent suppliers will often offer a lower price. The highest and lowest energy prices were given, too.
d) Sweden, SWE: Average price valid for the time being. The changeable retail prices were given but not included in this study. Also minimum and maximum values were given.

As can be seen from above, the prices are not fully comparable, which has to be taken into account when comparing results.

2.2 Comparison of retail prices

The summary of the comparison of the retail prices and costs weighted with the monthly load curves are given in Figures 1 to 4. Figure 1 and Figure 2 show the weighted energy prices as the average yearly values in cent/kWh for years 2000-2007. The minimum and maximum values are shown as upper and lower limits of the yearly prices. Note: in these comparisons, (Figures 1 to 4) the yearly (SWE), quarterly (DK and NOR) and monthly (FIN) average retail prices have been used. Yearly averages tend to smooth effect of the highest prices.

Monthly electric energy costs have been calculated multiplying the retail price by the monthly consumption. These curves for years 2002 to 2007 are shown in Figure 3 and Figure 4.

It can be seen from the Figure 1 and Figure 2 that the annual retail prices weighted by the monthly energy vary from 0,5 to 1,0 cent/kWh between the different Nordic countries during the years 2000-2002. After that the variation has been up to 2,5 cent/kWh. The national differences between the highest and lowest values are of the same order.

The monthly curves show clearly the variation of energy costs between the winter and summer time. The highest consumption and the highest price occur in winter. So, within one year the highest monthly cost has been three times the lowest value with the consumption of 5000 kWh/year. For the households with electric heating that factor can has been up to ten. The retail prices have not increased continuously, but more or less depending on conditions such as outdoor temperature and water resources when following the spot prices.

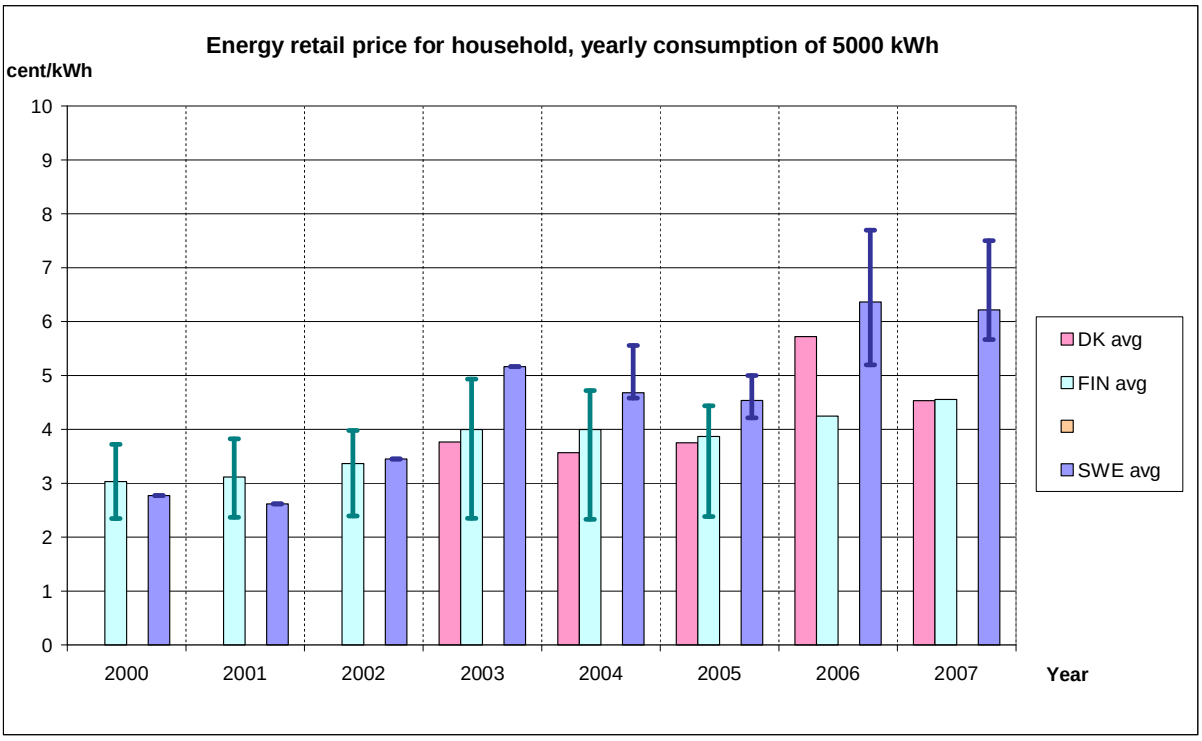

Figure 1 Retail prices [cent/kWh] for households without electric heating, 5 000 kWh/year, upper and lower limits refer to maximum and minimum values.

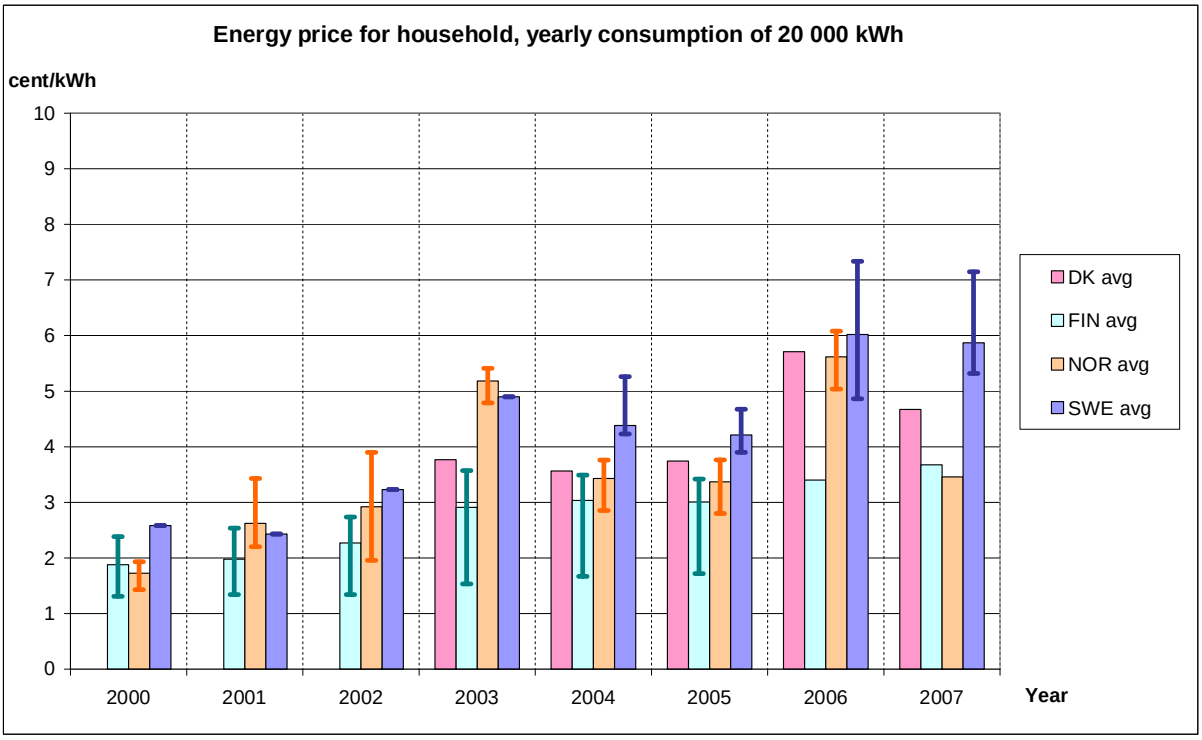

Figure 2 Retail prices [cent/kWh] for households having electric heating, 20 000 kWh/year, upper and lower limits refer to maximum and minimum values.

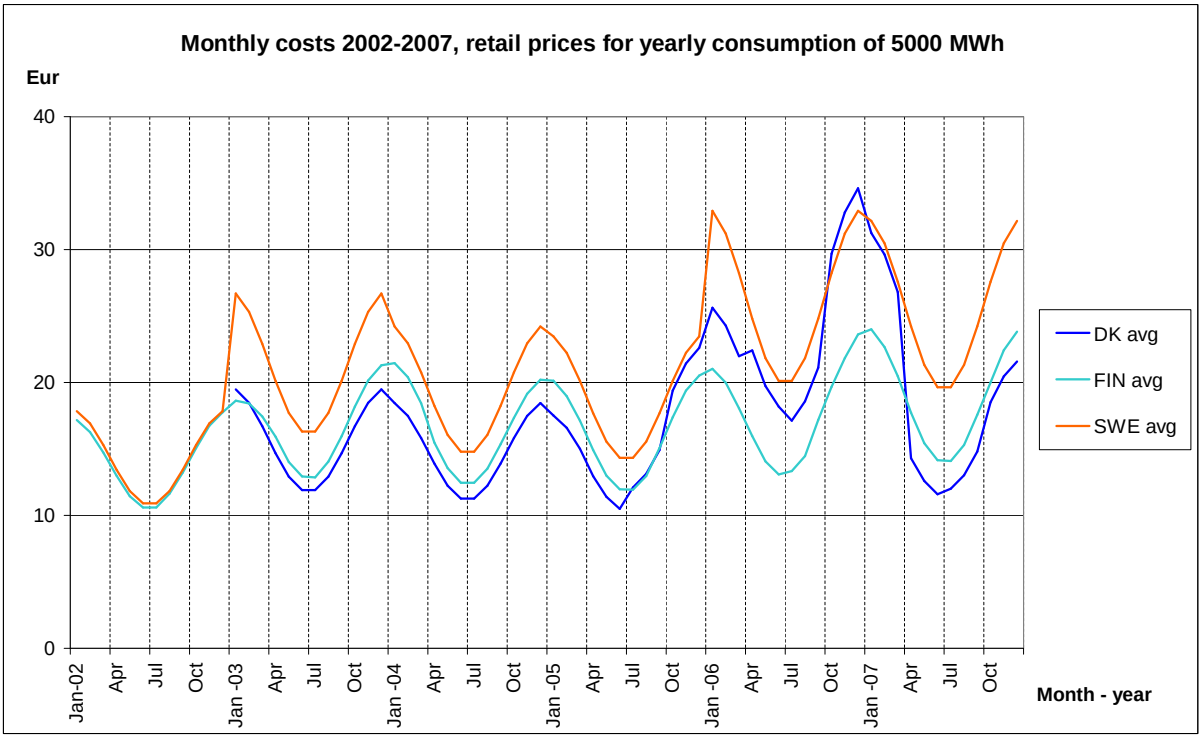

Figure 3 Monthly costs [Euro] for households without electric heating, 5 000 kWh/year.

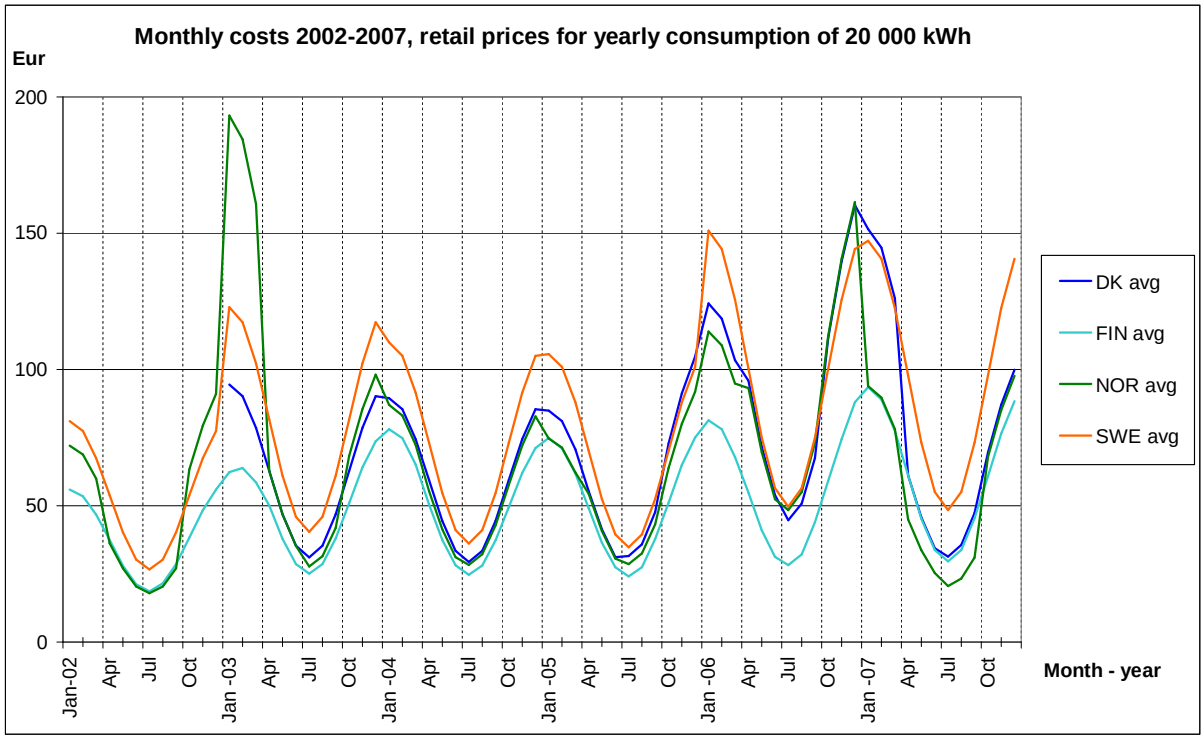

Figure 4 Monthly costs [Euro] for households having electric heating, 20 000 kWh/year.

The retail prices for the two consumption levels are shown in Figures 5 and 6. Note: the prices are the same as previous, except monthly retail prices for Sweden in 2006-2007 have been used in these comparisons. The prices of Norway and Denmark vary in quite a similar way following the variations of the market prices. In Sweden the similar trend can be seen after 2006, when the monthly retail prices were available. In Finland the changes in the prices are smaller than in the other countries as a function of time. Swedish prices are the highest and the other counties have had the lowest prices alternately during the years 2003-2007.

During the studied period a slight sign of the increasing trend of the retail prices can be seen. From January 2003 to December 2007 the yearly average retail price has increased from 1,3 to 1,6 cent/kWh depending on the yearly consumption. The seasonal variations from the yearly average price have been up to ± 2,5 cent/kWh and in one case even + 4,0 cent/kWh during these five years. The yearly minimum or maximum prices in the different Nordic countries differ from 3,2 to 5,0 cent/kWh.

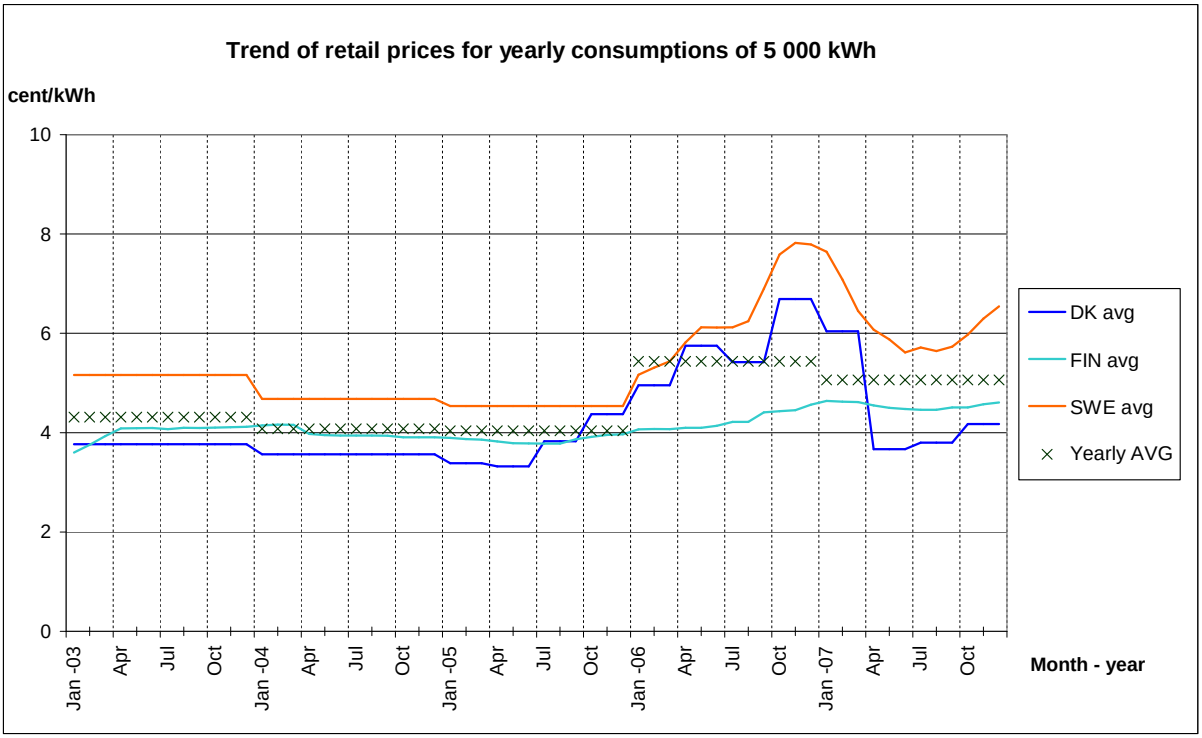

Figure 5 The retail prices in the different Nordic countries for 5 000 kWh/a (DK 8000 kWh/a)

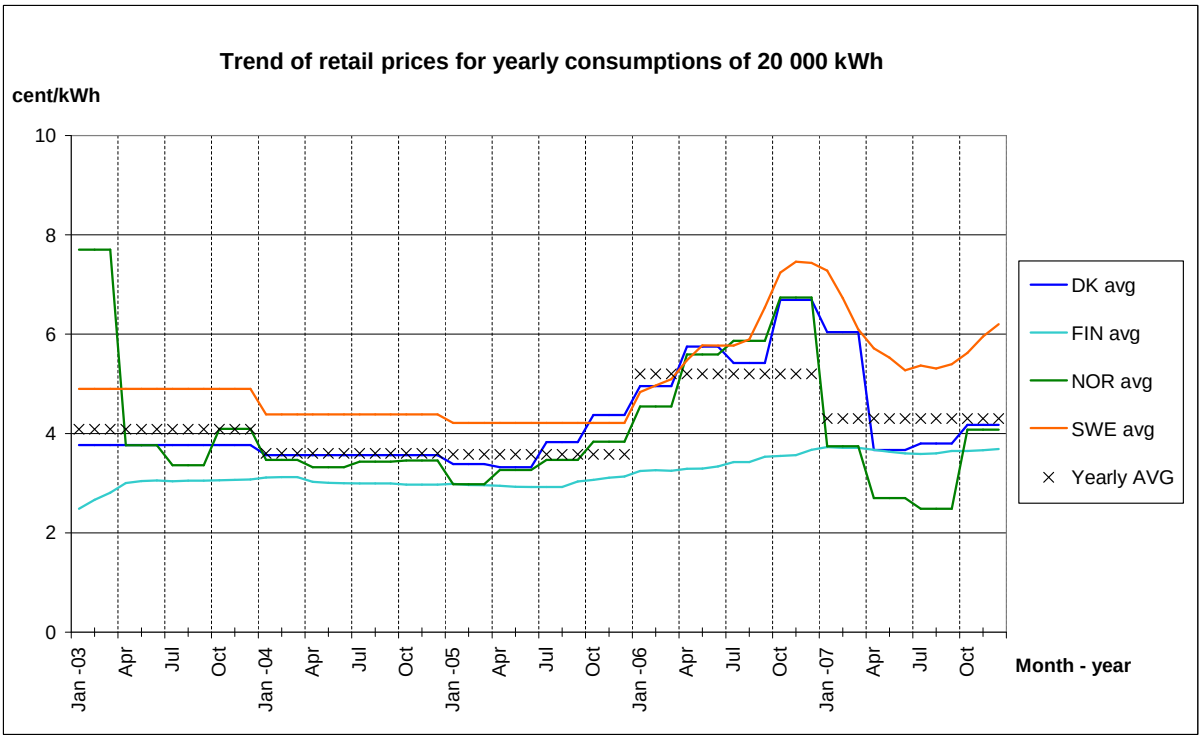

Figure 6 The retail prices in the different Nordic countries for 20 000 kWh/a (DK 8000 kWh/a)

2.3 Cumulative difference between Nordic countries in pairs

In the Figures 7 to 13 the cumulative sum is presented with pairs of neighbouring countries for both 5 000 kWh/a and 20 000 kWh/a. Note: in these comparisons, (like in Figures 1 to 4) the yearly (SWE), quarterly (DK and NOR) and monthly (FIN) average retail prices have been used. The cumulative differences have been calculated for one year at a time for each Nordic country compared to the other countries. A positive cumulative sum indicates that the customer costs in that specific country are higher than those in the compared country. It has to be noticed that the cumulative differences have been studied based on the average prices.

With a yearly consumption of 5 000 kWh the highest differences have been 100 € in one year and during four years under consideration, see Figures 7 to 9. When the yearly consumption is higher, 20 000 kWh, the corresponding difference has been 450 €, see Figures 10 to 13.

Comparison of the cumulative differences of the yearly costs shows that highest differences would have been obtained during the last two years (2006-2007). The lowest costs were in Finland (2006) and in Norway (2007).

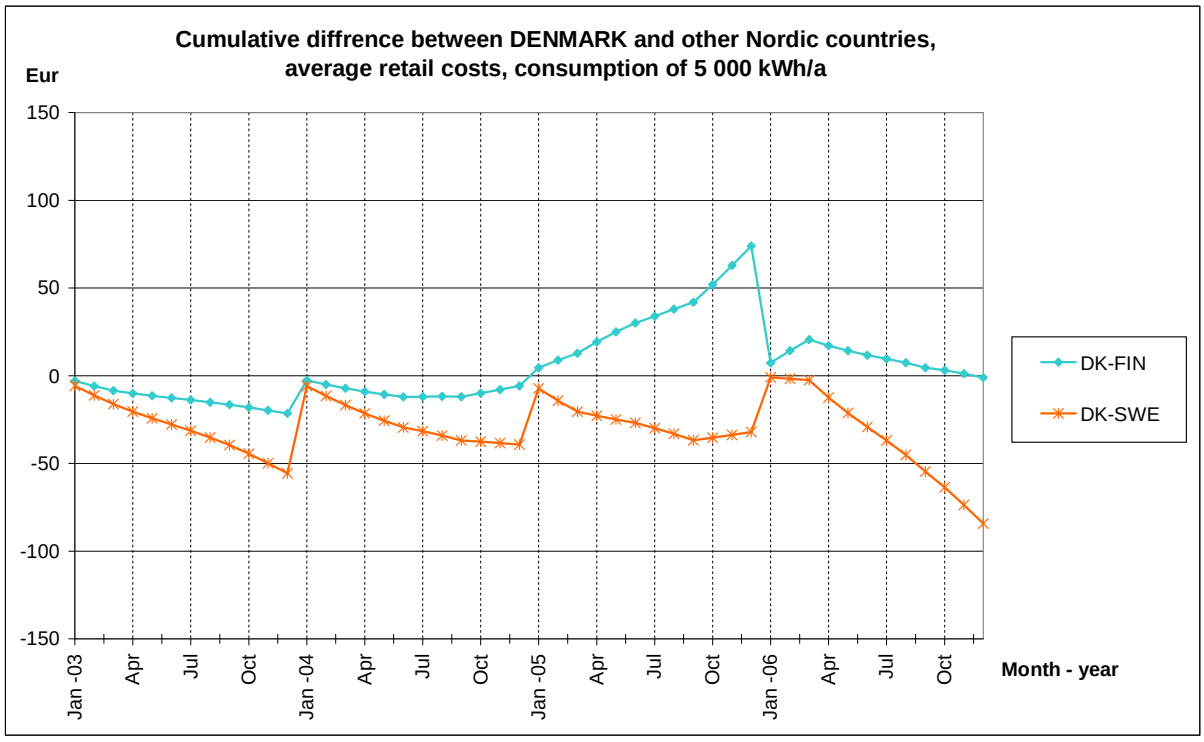

Figure 7 Cumulative difference referred to the retail prices of Denmark, 5 000 kWh/a.

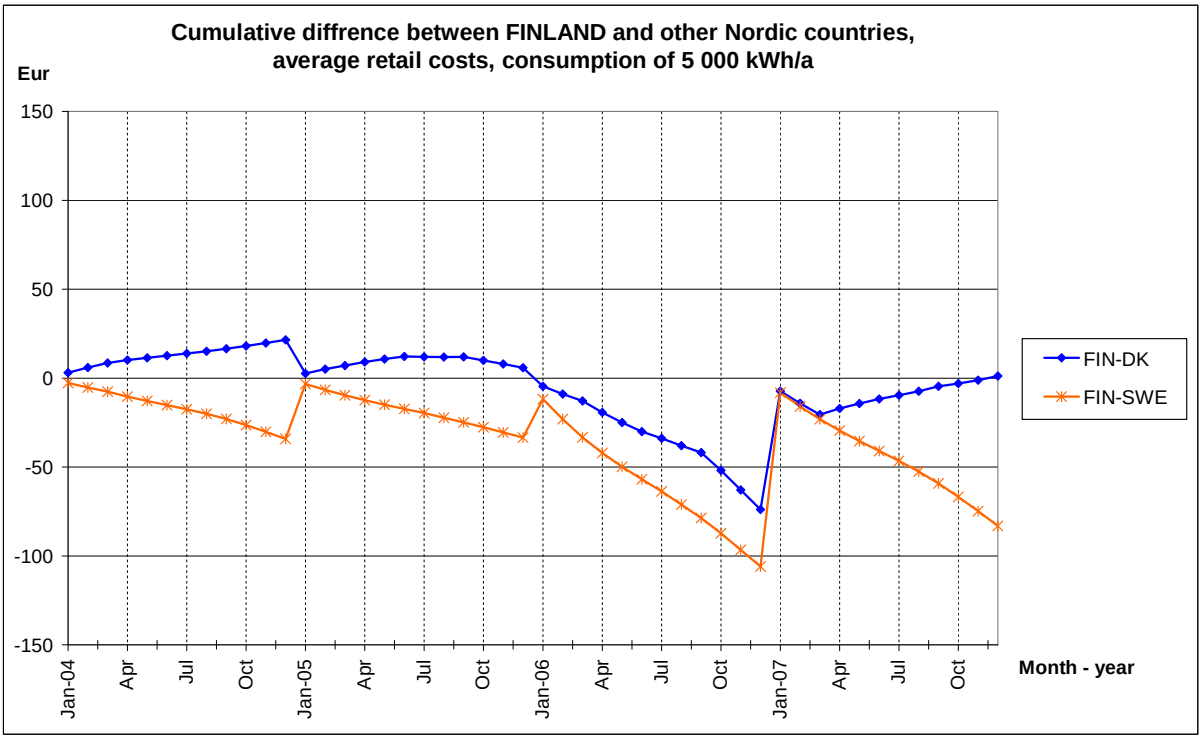

Figure 8 *Cumulative difference referred to the retail prices of Finland, 5 000 kWh/a.*

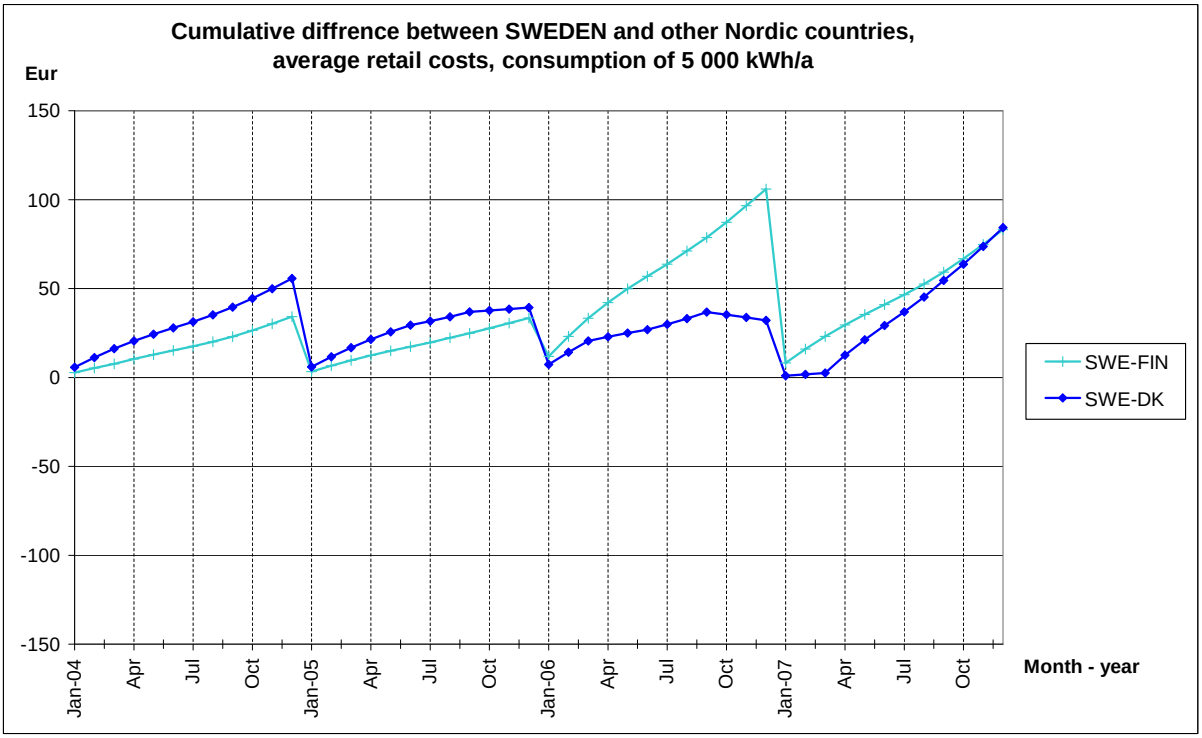

Figure 9 *Cumulative difference referred to the retail prices of Sweden, 5 000 kWh/a.*

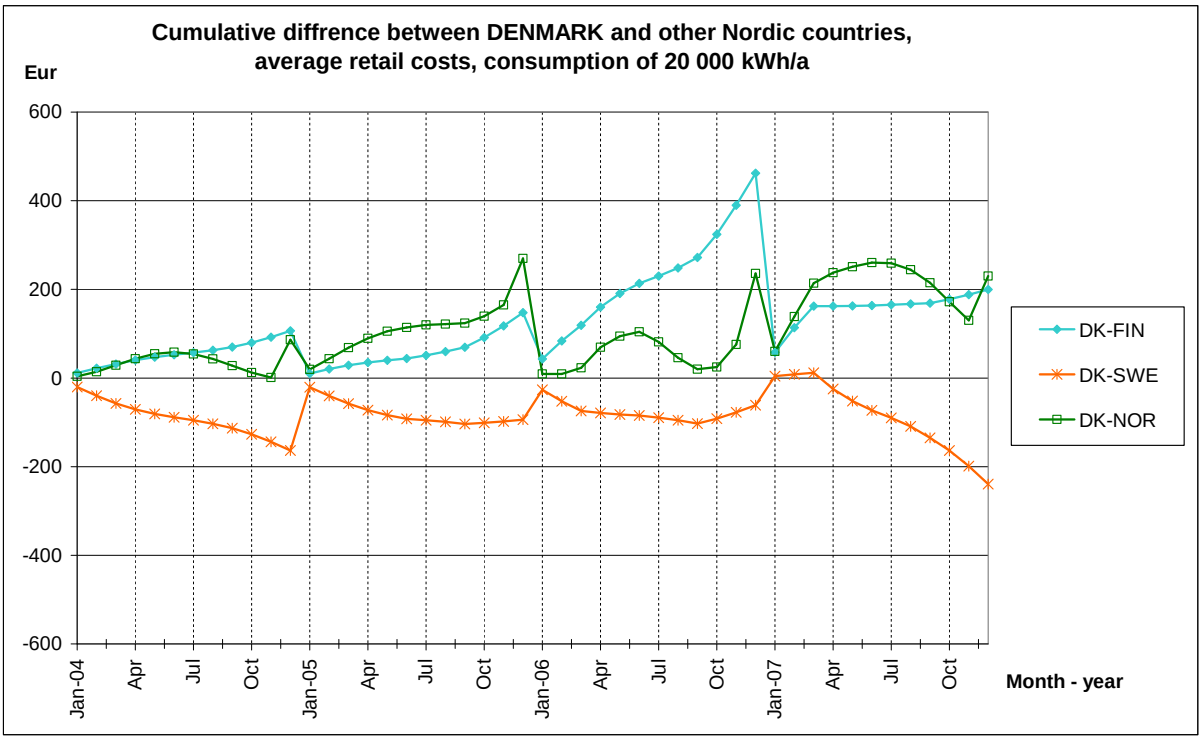

Figure 10 Cumulative difference referred to the retail prices of Denmark, 20 000 kWh/a.

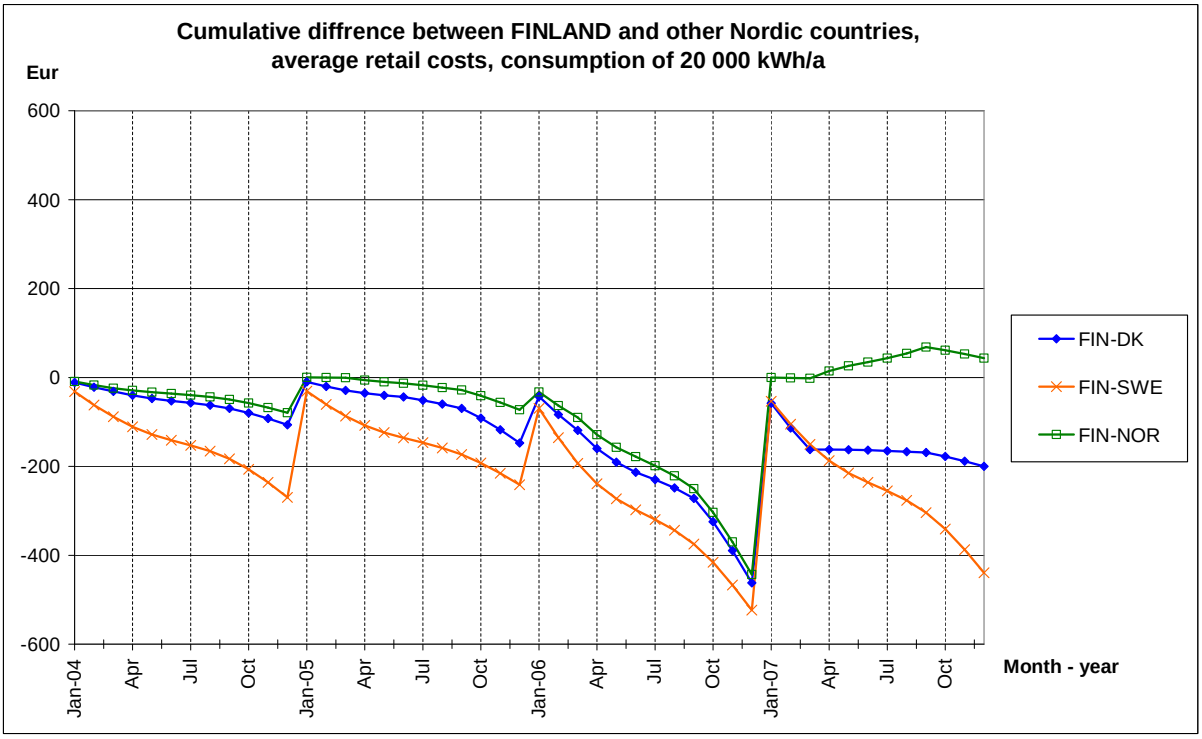

Figure 11 Cumulative difference referred to the retail prices of Finland, 20 000 kWh/a.

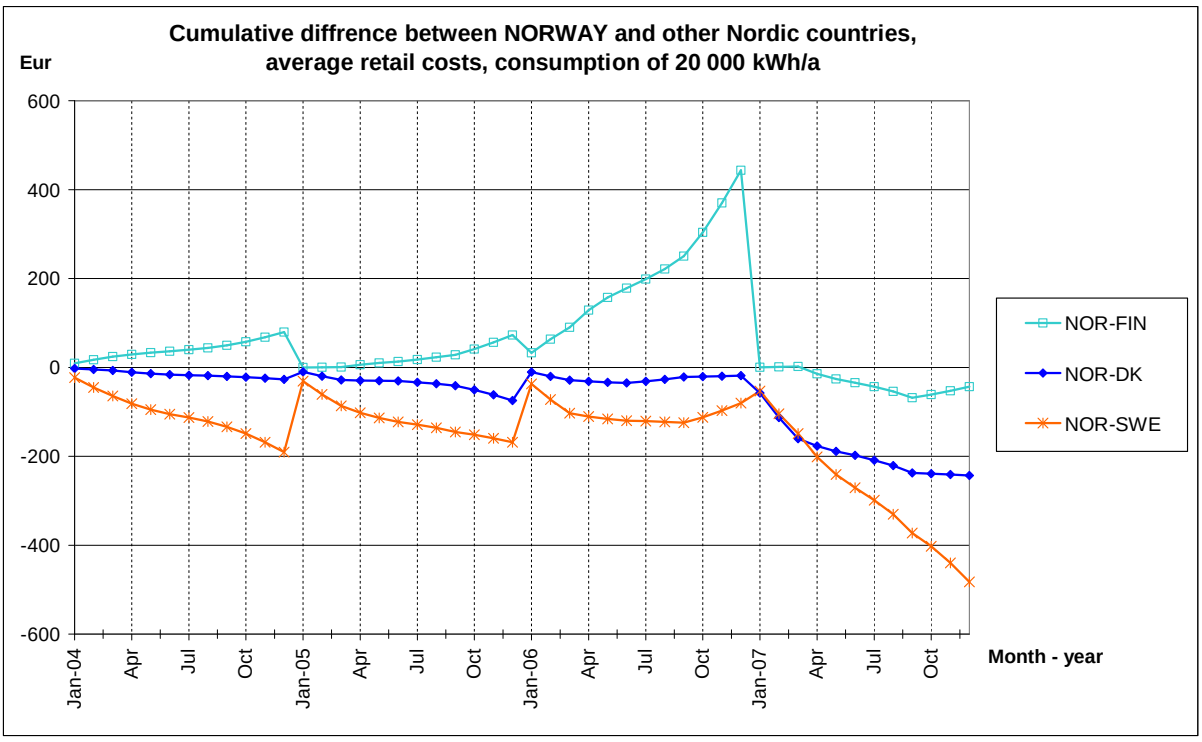

Figure 12 Cumulative difference referred to the retail prices of Norway, 20 000 kWh/a.

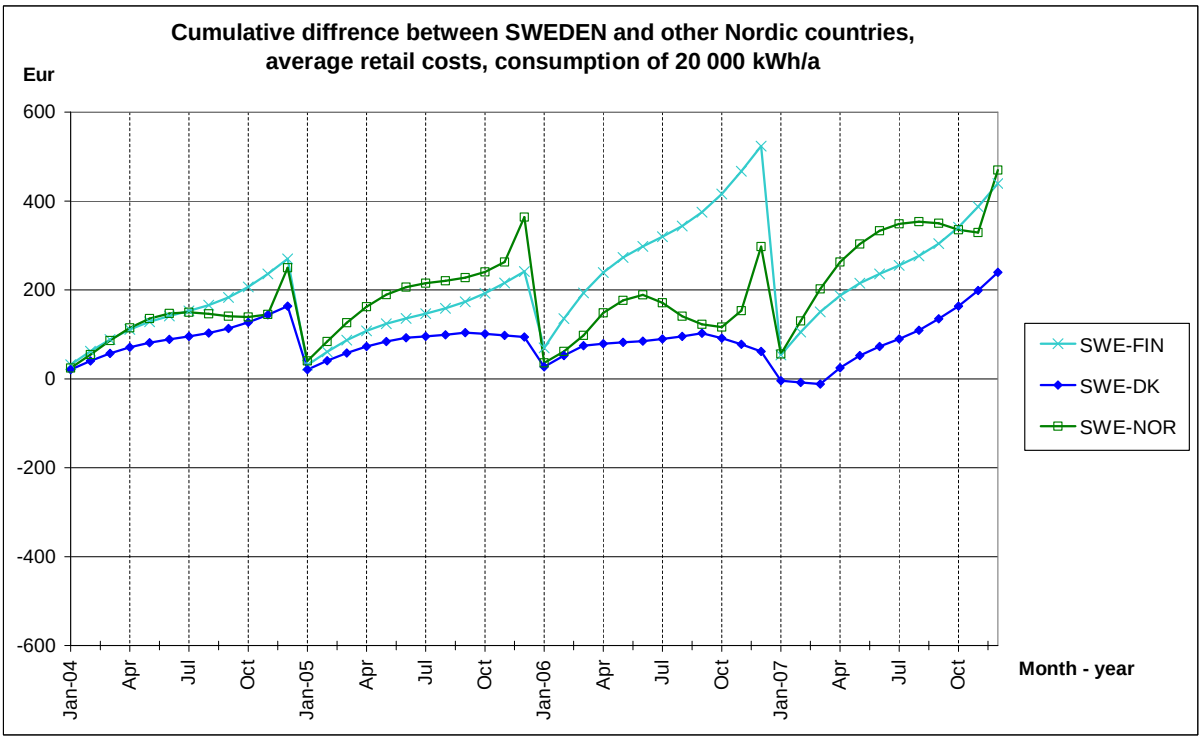

Figure 13 Cumulative difference referred to the retail prices of Sweden, 20 000 kWh/a.

2.4 Effect of market integration on retail prices

Although the above retail prices are not fully comparable, it seems that there are price differences between different countries.

If the retail markets will be integrated the total market area of the Nordic countries, excluding Island, will be 1 155 000 km^2 and the population about 23 million people. The amount of customers will then be three to five times compared to a single Nordic country. More customers and more retailers will lead to increased competition which usually results in more unified prices and reduction of general price level, although in some cases the present price level can also increase.

The larger market and competition also means that new products and services to customers will be developed which also in Finland may result in more market price based products for small customers

3 The retail margin in various Nordic countries and the possible effects of market integration on it

3.1 Comparison of retail margins

The Elspot prices of all Nordic countries are mostly equal, although some differences can be seen in 2006-2007. The weekly values are given without weighting by the energy consumption. The values are shown both in Figure 14. There have been three clear peaks in the retail prices: in the beginning of 2003, winter 2005-2006 and in autumn of 2006. The main reasons for the peaks were that the year 2003 was dry, EU emission trade began 2005 and the prices of CO2-emission rights went up until the price fall in spring 2006, it was very dry in autumn 2006 combined with cold weather.

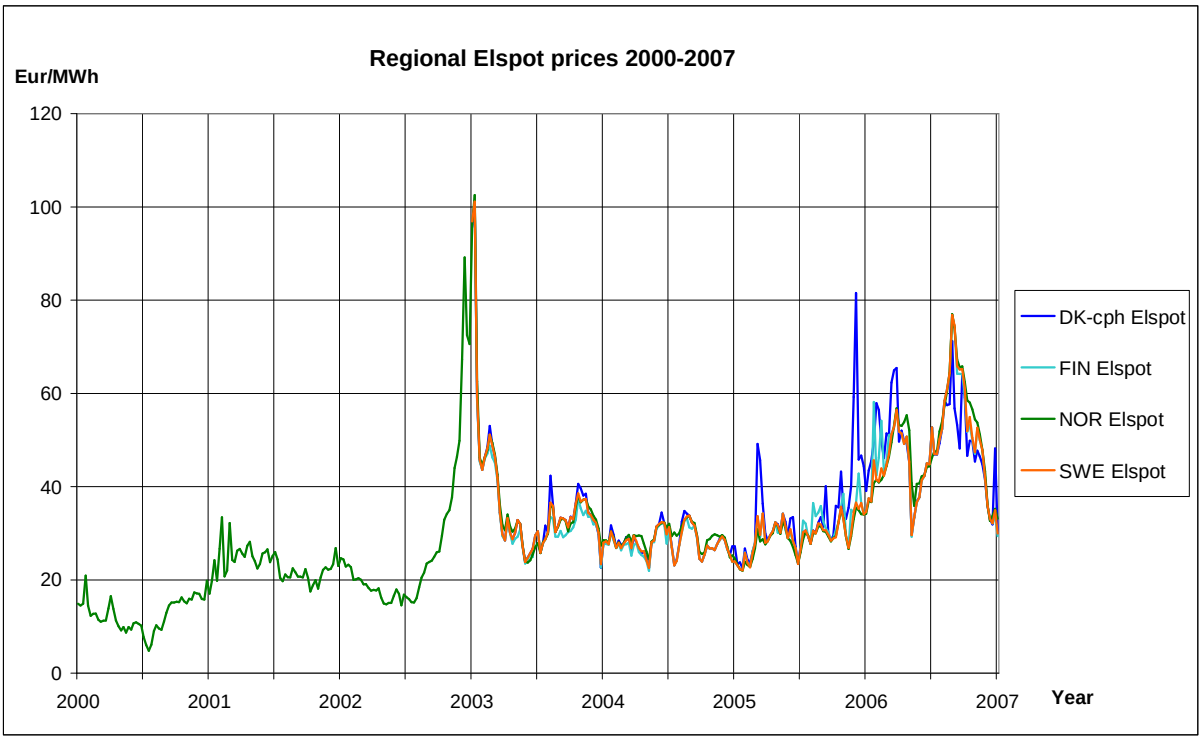

Figure 14 Weekly Elspot prices [Euro/MWh].

In this study, the retail margin is defined as follows: it is assumed that retailers in each country purchase the electricity to specific customers on the basis of Elspot prices and sell it with the average retail prices, the retail margin is the difference between sell income and purchase cost, i.e. Retail margin = Retail costs (to customer) - Elspot costs (to retailer). The value itself is not a correct margin, but it is supposed to give an idea of trends.

In practice, all the energy sold is not necessarily purchased based on the Elspot price or for a single profile type alone. Hedging has not been taken into account here. Different countries have different practices for purchasing the electrical energy. In this study the purchase basis was a load profile of a single user, just to get a common and equal reference for all Nordic countries. The Elspot area prices

used in the assessments for Finland and Sweden are the actual respective area prices. For Denmark the Copenhagen area price was used, and for Norway monthly average Spot Price at Nord Pool based on the previously mentioned 24 dominant suppliers and the energy consumption of 20 000 kWh/year.

The comparison of the Elspot costs and retail costs as well as the retail margins is shown in Figures 15 to 18. The prices were multiplied by the smoothed load values in weekly level, only the values relating to the yearly consumption of 20 000 kWh have been used.

The retail margin values over the four years period show both negative and positive values in different countries. In general, it can be seen from the figures, that in Finland and Denmark the margins have been lowest and reached temporarily also negative values. In Norway and Sweden the margins have usually been positive and in Sweden margins have been the highest. The differences between the Nordic countries are explained partly by the different prices given for the comparison: Denmark - the regulated price; Finland - a weighted average price; Norway - a volume weighted average of dominant suppliers in 24 biggest network areas, standard changeable price contract and Sweden - an average price valid for the time being. One reason for the differences is the period of validity for each price value and what is the energy consumption during that period. In this case differences depend on how much energy or retail price averaging has been done in different countries. The retail prices of Denmark and Norway follow the Elspot prices closely, the Swedish retail price is clearly higher than the Elspot price and the Finnish retail price is mostly lower than the Elspot price.

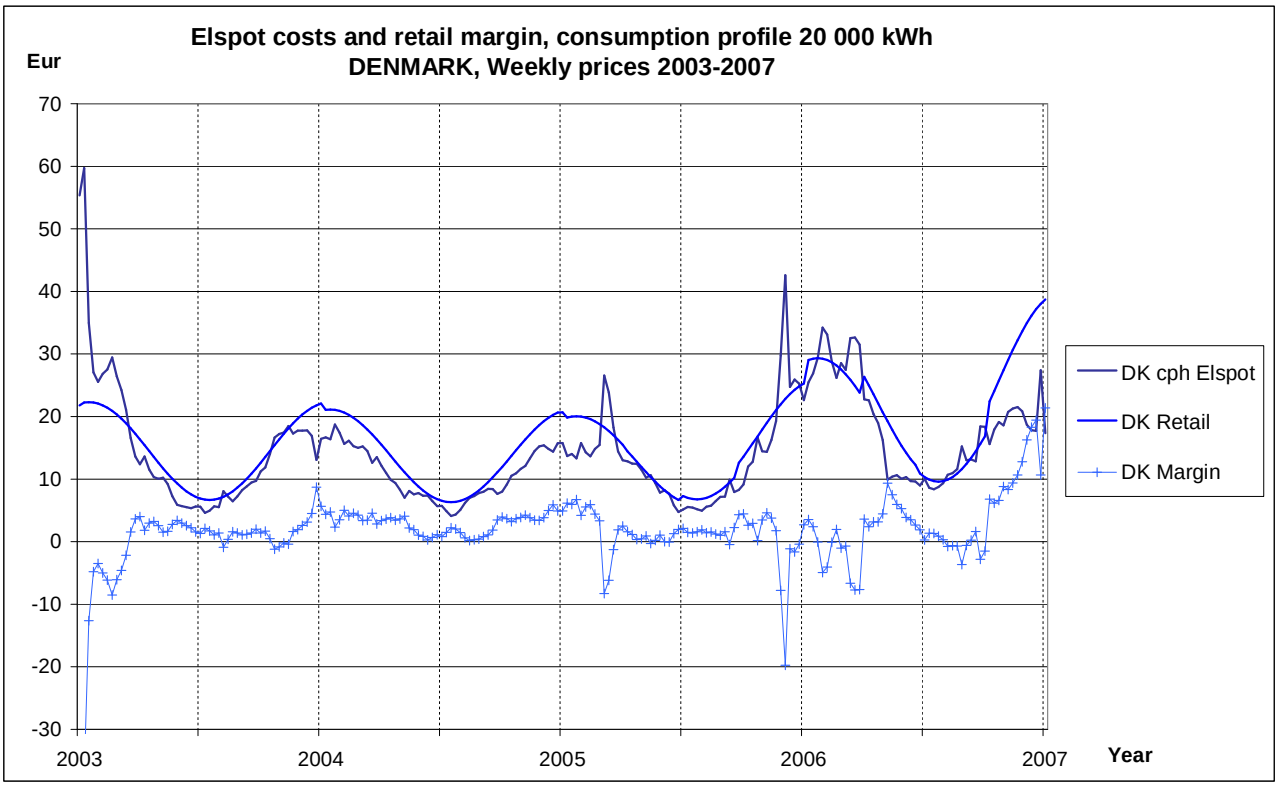

Figure 15 Retail margin in Denmark = Elspot costs subtracted from the retail costs.

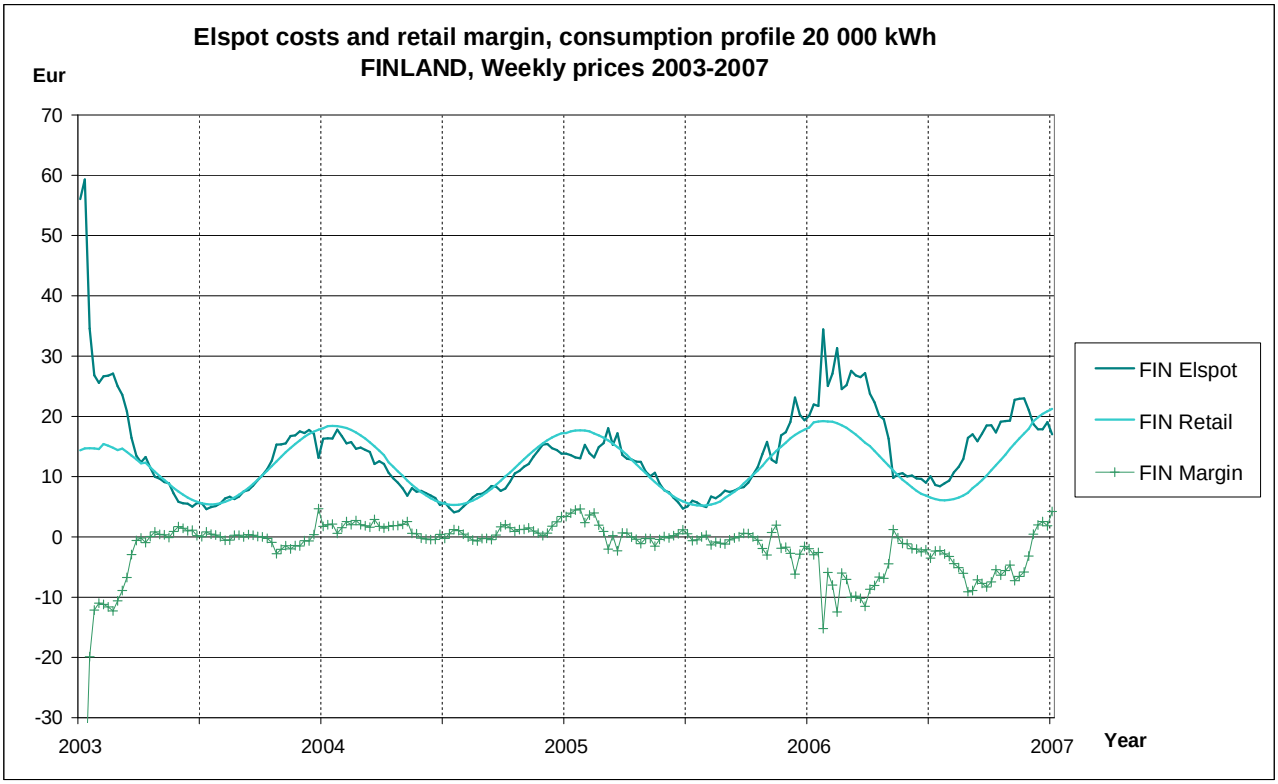

Figure 16 Retail margin in Finland = Elspot costs subtracted from the retail costs.

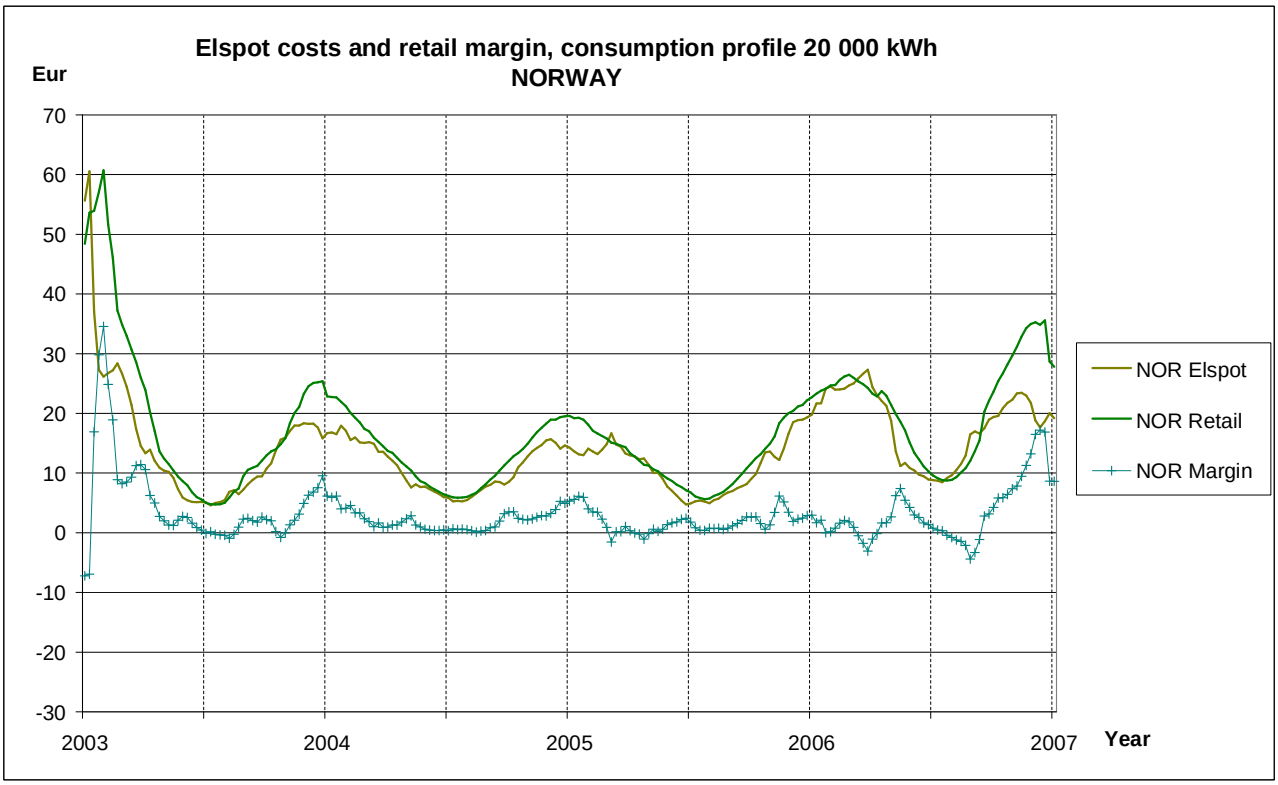

Figure 17 Retail margin in Norway = Elspot costs subtracted from the retail costs.

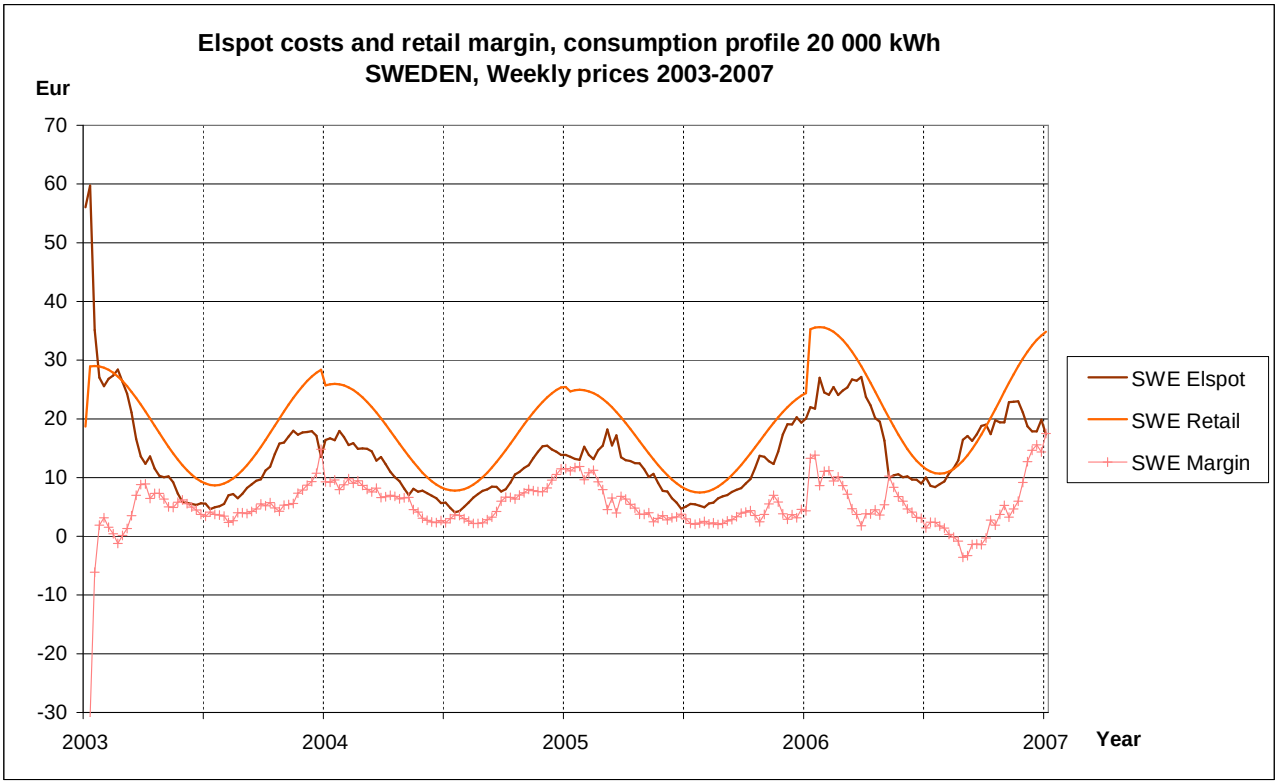

Figure 18 Retail margin in Sweden = Elspot costs subtracted from the retail costs.

3.2 Possible effects of market integration on the margins

As discussed in previous section, the market integration means more competition which should result also in decreased retail margins. This can also mean more market-price based products where risks are lower to retailers/suppliers and slim margins can be accepted.

It may be that the retail market integration affects the retail prices mainly indirectly via enabling or eliminating certain types of retail market products. Thus the impact on the prices may depend much on which kind the new integrated retail market model is. In general retail market models that somehow limit competition can be expected to lead to higher margins and prices than models that allow competition with many different types of retail products. Harmonised retail market makes it more feasible to develop retail market products tailored to certain rather narrow customer segments.

On the other hand, for the retailers the reduction of costs is more appropriate as a goal than reducing margins and the larger market can also give possibilities to it.

Basically the retail market model that encourages customers to switch their supplier at no cost is likely to reduce the profits of the retail suppliers by increasing competition, but on the other hand they may also give pressure to higher prices and margins because the retail suppliers must include the costs and risks associated to the customer switches in their prices.

4 Costs related to renewal of IT systems to enable the integrated retail market

4.1 IT Systems studied

This chapter tries to assess the costs related to renewal of IT systems that are necessary to enable the integrated retail market. The IT system costs are assessed based on the interviews of several vendors in Finland, some of which are active in the other Nordic countries and know the situation there. Nevertheless, it is likely that some possible IT costs in the other Nordic countries are not included in the analysis. The consequent effects on distribution prices of network operators and retail prices of electricity suppliers are also discussed.

Creation of a common electricity retail market may possibly require changes to many IT applications, such as:

- Automatic Meter Reading (AMR) and Advanced Metering Management (AMM) for remotely reading the meter values and managing the meters (DSO in the Nordic Countries)
- Management of Metered Data (DSO in the Nordic Countries)
- Balance settlement calculations (DSO or TSO)
- Management of contracts
- Market communications
- Energy retail (retail supplier)
- Customer information management
- Invoicing and
- User interfaces

In the parenthesis it is shown to which actor the application belongs to. If actor is not indicated, the application belongs both to the DSO (Distribution System Operator) and the retail supplier.

4.2 Definition of the basic common requirements for IT systems and corresponding changes needed in IT systems

Creation of a common Nordic electricity retail market requires common models for:

- switching the energy retail supplier,

- the settlement procedures and

- harmonised messages between the actors.

The changes needed and their costs depend on what the common model is. At this point there are no detailed descriptions of the new common procedures. Nordic Energy Regulators prepared a draft version for public consultation 11.1.2008 on Harmonised supplier switching model, which was later officially published [4]. Ministry of Employment and the Economy of Finland has given a proposal on the legal requirements on electricity trade data exchange and message formats [5]. These are used here as a basis for assessing the needed changes and costs. No harmonised model was available regarding the harmonisation of the settlement model, the customer interaction, and the IT-processes.

The harmonised supplier switching model [4] defines some critical and optional requirements, but on many requirements it only states that a common model will be used without defining what this common model is and what the underlying IT-processes are. The interview answers in Annex B raise specific issues where different interpretations of the undefined issues can lead to very different costs. The common requirements for AMR systems are discussed in the chapter on AMR systems.

4.2.1 Harmonisation of supplier switching

It is necessary to have compatibility in timing, content and format of messages between the actors. Almost full automation of the customer switching processes is necessary. This includes also handling of exceptional situations and errors. The need for human communication should be very rare.

Before the costs of harmonisation can be assessed the harmonisation must be defined so detailed that business processes can be planned. Missing or ambiguous details in the definitions will increase the costs significantly. Requirements that cannot be fully met cause also ambiguity, manual interventions and high costs. The details of customer switching should be planned carefully. Poor harmonisation may increase costs to the customers and the retail suppliers without improving competition enough to result in net benefits for the customers.

In the preparation of the 3rd legislative package of EU a change in the Appendix A of the Energy and Gas Directives is being planned that includes the requirement that the customers get the invoice of the previous retail supplier within a month from the switching of the retail supplier, see [1]. If that requirement becomes binding, the existing timing of settlement and customer switching procedures in Sweden and Denmark must be updated anyway regardless of Nordic retail market harmonisation.

The harmonised supplier switching model [4] is not expected to cause any requirements that would require big changes to new IT-systems in Finland. One cannot be sure about that before more accurate definition of the harmonised processes is available. Possible manual operations for example in exceptional situations must be replaced with automation. Changing of the time limits is easy as long as they do not change the main logic of the processing.

4.2.2 Harmonisation of the settlement

It is very likely that it is not reasonable to require harmonisation of the customer load profile based settlement procedures. Agreeing on a common solution and implementing it would be too costly. In the long term it is also unnecessary, because hourly metering will eventually enable more straightforward settlement procedures and thus make load profile based settlement obsolete. Thus the harmonisation of the settlement procedures has been left out of the main scope of this study, although the differences in the settlement procedures are significant barriers to cross country retail. Especially the settlement procedure for load curve customers in Finland requires detailed knowledge and includes potential risks to outside energy retail suppliers, because it treats the local supplier differently. In

[1] http://ec.europa.eu/energy/electricity/package_2007/index_en.htm

practise it may be that significant cross boarder competition in the retail market can be achieved for hourly metered customers only.

In the interview answers explained later it was pointed out that electricity retail and its harmonisation would be easier, if between the market actors the data regarding load curve customers would be transferred as time series of hourly values and not as load curve parameters etc.

Time-Of-Use metering causes some difficulties in the settlement and in the electricity market. Replacing Time-Of-Use metering with hourly metering is one possible solution to this.

4.2.3 Harmonisation of the messages between the actors

In Finland the national recommendations regarding the messages related to energy have just been updated. Related to that the Finnish Ministry of Employment and the Economy has given a proposal [5] for data exchange and message formats for energy retail. It shows a significant move towards the proposed harmonised model. Thus many differences will be removed anyway. The processes for sending messages related to retail supplier switching in Finland will become legally binding and most deadlines will be changed to match the proposed harmonised model.

There is no proposal for harmonising the types of messages used for data exchange. Thus it seems that different EDIEL-messages will be used for the same purposes in each country. There are also other reasons than Nordic retail market harmonisation to move to XML-based messages. It is difficult to allocate costs between harmonisation and other reasons that may make most of the change necessary anyway.

It will be eventually necessary to increasingly harmonise the data exchange and the messages with those used in Central Europe.

4.3 Development of AMR systems in different countries: requirements and status by 2012

The development of Automatic Meter Reading (AMR) systems affects considerable the market integration. For example, if customers have remotely read hourly meters, the settlement procedures are easier to harmonise, which decreases the need for tailor-made IT-systems in different countries. Also retail pricing can be based more on market-based products thus improving the development of new products and services to customers and accurate feedback from the consumption improve the knowledge of customers on energy saving. Thus the development of AMR/AMM improves the benefits of market integration although the AMR costs are not caused by the integration but by other reasons.

Common minimum requirements on AMR are missing in the Nordic countries. So, there is some uncertainty regarding to how common it is that the limited functionality and interfaces of the AMR systems restrict the possibilities to develop the Nordic retail market. Fast AMR roll without minimum requirements may create barriers to retail market development.

Information in this assessment is from the end of 2007 and based on the following sources ([6], [7], [12]). Here automatic meter reading (AMR) means reading meters remotely. Two way communications between the meters and the meter reading system is here considered as a necessary requirement for all modern AMR systems. AMR systems that have only one way communication are considered obsolete and unsuitable for mass applications and are rarely implemented nowadays. The available statistics regarding the AMR penetration in the Nordic countries does not tell how many of the AMR meters are two-way communicating.

In the Nordic countries AMR will be implemented in large scale. Full AMR coverage cannot likely be achieved without some sort of legislative pressure, because AMR as such is not profitable to some distribution network operators. Except from forcing the very late movers, speeding up the rollout from the present pace is likely to have negative effects on the costs, functionality and interfaces. In stead it is very important to create such common minimum requirements for AMR that it will provide maximum support for the harmonisation of the Nordic retail market and for innovative retail products, energy saving and demand response. Meter reading intervals, recording the readings by hour and adequate communication interfaces with the end customer are such requirements.

The proposal for harmonised supplier switching [4] does not explicitly set any requirements to AMR systems. Removal of the meter reading fees and the increased rate of supplier switching increases the need of AMR systems to some small extent. If the meters can be reliably read any day when needed, the customer switching needs are more than well covered. Some AMR systems that are designed to read meters at least once a month but not daily may need to be updated. Such systems may exist, especially in Sweden. There are also other reasons to update such systems so addressing the costs of replacing them to retail market harmonisation may not be appropriate.

Harmonising the settlement procedures is easiest to do by using hourly meter readings.

It is necessary to have long lifetime of the AMR meters, because visiting the end customer is relatively expensive. In large scale installations the overall cost of recent AMR systems has been within the range 100 € - 300 € per metering point ([7], [8], [9], [10], [11]).

Most cost of AMR cannot be addressed to retail market integration, if the integration is not affecting the roll out speed. AMR will be implemented anyhow to serve mainly other purposes (such as for improving the efficiency of DSO operations and customer service, improving energy efficiency, enabling demand response, etc.).

Norway

Regulation about mandatory hourly metering for all final customers with annual consumption over 100 000 kWh was introduced on the 01.01.2005, and 4 % of all metering points and about 60 % of the whole electricity consumption in Norway are hourly metered today. Additionally, any Final customers can require hourly metering of the electricity consumption from its local DSO, even if its consumption is below the mandatory threshold. For this the Final customer should cover the costs for installation of technology, limited upwards to 2 500 NOK (300 Euro). Even though it is not mandatory, several DSOs have already built

AMR for all their customers, while several big DSOs have already budgeted full-scale implementation of AMR systems within next five years.

In June 2007, the Norwegian Regulator recommended to the Norwegian Government to go for a full scale implementation of Smart Metering in Norway. The Government expressed full support to the Regulators view, and told the Regulator to start working out regulations regarding the implementation of Smart Metering. The Regulators goal is to prepare and set out regulations during the first half of 2009 and that the implementation of Smart Metering equipment should be completed within 2013.

Sweden

From 1 July 2006 the limit for hourly metering was lowered from 200 A to all metering point with a fuse subscription of 63 A. This is expected to increase a number of hourly metered customers by 50 000-70 000. From 1 July 2009 all metering point should be read monthly and the final customers should be invoiced based on their real consumption. These requirements were initiated by consumers' organisations, demanding a better billing from DSOs. The new legislation means in practices that by summer 2009 all Final Customers in Sweden will have AMR. Event though the legislation requires monthly reading, several DSO have already indicated that they will prefer hourly metering and reading.

Denmark

From the 1st January 2003 hourly metering was a mandatory requirement for metering points with an annual consumption exceeding 200 000 kWh/year. After the 1st January 2005 the limit was lowered to 100 000 kWh/year. This means that approx. 9 000 new customers (metering points) have been equipped with hourly metering. At present approximately 30 000 customers have hourly metering and they consume approx. 48 % of the total electricity consumption. The grid companies are allowed to further reduce the declared levels for hourly metering if the company can offer the service to its entire grid area and the service can still be handled by an electronic switch in a simple and secure way.

Self reporting of the yearly electricity consumption is standard for households. Internet and phone systems for reporting are widely used as supplement to mailed reporting. By the end of 2007 six utilities had decided to invest in automatic meter reading systems, corresponding to 13 % of the total number of meters. Many utilities are planning similar projects. The association for grid companies, Danish Energy, has formulated it as a strategic goal that all end-users should have automatic meter reading (with hourly metering) before year 2014. Investments in meters are paid by the grid companies. These companies are closely regulated by the authorities. Investments must be done within the existing economic regulation.

The Danish Parliament 21 February 2008 decided to ask for an investigation into "intelligent electricity meter" to be delivered by 1 October 2008.

Finland

In Finland there are about 3,1 million metering points today. A small number of metering points are connected to the high voltage transmission network and are hourly metered. Hourly metering is required; if the main fuses are larger than 3 x 63 A and the electricity is not bought under the obligation to supply. The retail supplier that has the biggest market share in the distribution area has an obligation to supply to those consumption places that consume at most 100 MWh/year or have main fuse 3 x 63A or smaller. In addition hourly metering

is required for a customer with main fuse above 3 x 63A, if the network connection contract is made after 2004 and the consumption is over 5 MWh/year.

VTT Technical Research Centre of Finland estimated that in 2006 [7] there were nearly 100 000 customers with the main fuse over 3 x 63 A and about 40 % of these were hourly metered. A recent study [12] with 41 % coverage by Enease Oy gave that 5,4 % of customer connection points are 3 x 63 A or over. DSOs are responsible for metering in Finland, but the meter reading can be conducted either by the network operator, the electricity supplier or the customer.

In Finland the AMR systems are developed on a voluntary basis. Increasing implementation of hourly metering becomes more and more relevant in Finland. Compensations for power supply interruptions (over 12 hours) are now included in the billing in Finland. Thus registering of voltage interruptions and perhaps even some basic power quality characteristics may be required for the billing meters of the future. Implementation of DR schemes may also require hourly metering and possibility for remote load control. It was estimated in 2006 that about 25 % of the existing meters should be replaced due to expiring of their lifetime. Currently there are no minimum technical or functional requirements for installation of Smart Metering.

According to the latest survey [8], 44 % of the customer connection points will be remotely read in 2010 and at the end of 2013 the penetration will be 66-75 %. To get full penetration a mandatory requirement will be needed. In 2007 the penetration was 20 % and some of those AMR systems do not include possibility for hourly reading. According to some AMR vendors, hourly reading has been included in almost all AMR systems that have been ordered after that.

15 August 2007 the Finnish Energy Industries gave a recommendation to its members that all remotely readable meters installed after 1.1.2009 should enable continuous and reliable recording of hourly readings, and starting from 2012 the settlement on all customer connections with hourly metering can be based on hourly readings read daily. The recommendation is not binding to the DSOs.

A working group set by the Ministry of Employment and the Economy of Finland has also published on the 14th of March 2008 a report, [13]. The working group suggests that by the beginning of 2014 at least 80 % of the consumption places in each distribution network in Finland should be equipped with the remote metering capable for hourly reading and after the beginning of 2009 all new installed meters should be hourly meters.

4.4 Cost assessment of the changes of IT systems on the basis of some interviews

The cost assessment is based on interviews of four Finnish IT providers, a distribution network company and the Association of Finnish Energy Industries.

The comments relating to the IT costs in this report were mainly made from the Finnish perspective and possible IT-costs in other Nordic countries were not discussed deeply. However, two of the interviewed IT providers are in international market and they considered also other Nordic countries. The language of the interviews was Finnish. Also the notes were recorded in Finnish and translated afterwards into English. NordREG draft on harmonised supplier

switching [4] was used as a basis for the interview, but the scope of the interview was wider. Annex B gives a detailed summary of the interviews.

Accurate cost estimates are not possible because the harmonisation rules are not yet defined precisely. The IT vendors gave some example estimates for the costs and time needed, stressing at the same time that costs heavily depend on the rules of harmonisation:

- *Content of the messages*: About 8-12 man months = 150-250 k€ + FAT-testing per IT-vendor and in addition 30-50 k€ per DSO will be needed for implementation and testing. Notifications and locks will change. If everything is harmonised simultaneously, costs will be saved due to avoidance of intermediate solutions. The effect on the Customer Information System processes is significant. The cost estimates given above are average costs and the cost for a big actor can be multiple. Changes must be made for retail suppliers also, but there the changes and the costs depend on how active the retail supplier decides to be.
- *Format of the messages*: About 4-8 man months = 100-150 k€ + testing per IT-vendor and in addition 20-30 k€ per DSO will be needed for implementation and testing. Notifications and locks will change. Changes must be made for retail suppliers also, but there the changes and the costs depend on how active the retail supplier decides to be.
- *Cancellation message of supply contracts* is new to Finland. Implementing it would cause costs of about 20 k€ per each actor.
- *Parallel customer and billing systems are needed for each currency* as well as some changes in the user (operator) interface. How much this causes costs depends on the approach and can vary between 10 k€ and 100 k€. (Tailored changes - add-on modules - completely parallel systems)
- *Payments to IT providers are only part of the costs.* According to the experience the other costs to the users of the systems are higher and can be 50-80 % of the total costs (specification, purchase, taking into use, training, learning etc.).

It was estimated by the IT vendors that the total time needed for the IT system development and implementation after the definition of market rules is about 25-30 months. At the same time an independent test facility should be established.

The typical lifetime of IT systems is 8-20 years including Customer Information System. The lifetime of Metered Data Management or Energy Data Management (ERM) is typically 5-10 years. The message exchange is often included in ERM. The vendors estimated the lifetimes a little bit shorter than users. Major updates with changes of complete functions are made at 1-2 years intervals according to three interviewed and charged updates are made once in 3-5 years according to one interviewed.

Very rough view of the order of the magnitude of the costs for end customers in Finland can be estimated as follows. Assume costs 100 k€ to 100 actors. That makes 10 M€ divided to 3,1 million customers. That makes about 3,2 € costs per customer on an average. Based on the interview the costs of harmonisation of the messages and customer switching may be 100-300 k€ per actor. That would make about 3-10 € costs per customer. It must be emphasised that with existing information it is impossible to estimate the costs with reasonable accuracy. It is

not possible to separate the costs from the costs of changes that will become necessary due to other reasons. In this connection it should be noticed, that especially small DSOs usually outsource the services so that they are not necessarily buying their own systems.

4.5 Concluding comments from the interviews

The following views can be summarised based on the interviews:

- Harmonisation is needed.
- Harmonisation with the rest of Europe should be the main target. Nordic harmonisation may be an intermediate step. Development of national harmonisation should be replaced by Nordic or European harmonisation.
- The details of harmonisation are not known accurately enough so it is too early to give statements of costs. It is necessary to know the processes.
- The costs will be substantial and depend very much on how the harmonisation is implemented.
- Harmonisation with small steps may be worse and more expensive than one well coordinated big change. Maintaining and interfacing many simultaneous intermediate versions is expensive. It may be better to make a clear decision to either harmonise enough or not to harmonise at all.
- Undefined, unstable or poorly planned details cause high costs.
- The costs can be reduced and the level of harmonisation improved by planning to the detail, giving enough time for implementing and testing the changes, and requiring a very short transition period.
- Experts from all the relevant actors should be represented in the planning of the harmonisation.
- Harmonisation will also cause savings in IT-costs, especially in the long term.
- Many changes are eventually necessary anyhow.
- Quite a big renewal of these IT systems is just now going on in Finland.

5 Discussion on the costs and benefits of market integration

5.1 Structure of retailers In Nordic market

The companies operating in the Nordic retail market: In the whole of Denmark there is about 40 'obligation to supply'- companies and 30 commercial electricity suppliers. In Finland there are 74 electric energy suppliers including four independent suppliers. About 20 – 30 suppliers are selling locally. The number of the suppliers in Sweden is 116 and of these about 10 - 15 suppliers are selling locally. In Norway there is about 170 end-user suppliers, 90 of them are offering a standard changeable contract. In April 2008, 17 suppliers were operating in the whole country; five of them are independent suppliers. Some suppliers have chosen to operate in a limited number of areas, for instance there are 30 suppliers offering a standard changeable contract to households in Oslo.

5.2 Taxation and administrative differences

The prevailing taxation profile differs to some extent from country to country.

Denmark reported the retail prices both excluding and including the electricity taxes. The tax rate in 2007 was 15 cent/kWh with VAT 25 % included

Finland has only the value added tax on the energy price. The electricity taxes are collected by the distribution company. The fee in 2007 have been of the order of 0,74 cent/kWh, VAT 22 % will be added

Norway reported for electricity taxes a consumer tax and VAT. The consumer tax in 2007 has been 1,25 cent/kWh added to the distribution price, VAT 25 % will be added.

Sweden has a tax rate of 2,90 cent/kWh and VAT 25 % on the energy price.

In Sweden the electricity taxes are collected by an electricity retail supplier and in the other countries by a distribution company. In the Swedish model a cross border supplier must collect taxes to several countries and maintain knowledge and systems for that. Thus from the point of view of retail market harmonisation the model where the distribution company collects the taxes is better. Moreover, Finnish VAT 22 %, differs from the other Nordic countries' VAT of 25 %.

There are some administrative obstacles for suppliers to operate in the neighbouring countries. In Denmark a contract with Danish Energy – Net is required. This contract includes the economic preconditions. In Finland and Sweden no permission is needed. In Norway a license from NVE is required for the supplier.

Other administrative or regulative differences exist for instance in the announcing of the prices to the customers. In Finland a written announcement has to be sent to the customer at least 30 days beforehand. In Sweden and Norway a newspaper advertisement about two weeks in advance is appropriate.

Moreover, the operation as a supplier in another country requires a balance agreement with the authority responsible for settlements in the Regulated Power Market in the country in question.

There are several differences in the practical way of operating. For instance, in Finland there is a significant difference between the daytime and night-time retail prices. Another difference is the load profiles used in different countries. These cause additional costs which could be avoided if hourly AMR data is used both for billing and settlement.

Some customers may feel inconvenient the long distance between the company and the customer. The different language and currency may be considered as a barrier. Local language must be used in communication with most electricity retail customers. The customer services in contracts, delivery aspects and complaints will be performed in a new way. In some cases a licence is needed.

5.3 General benefits from the market integration

In spite of the benefits stemming from the possible decrease of the retail prices there are several more general benefits which are difficult to estimate in monetary units.

The customers' interest is in new products or services helping in finding the best contract or in energy saving. Integration of the market should result in the larger variety of products and services offered by the supplies/retailers giving additional benefit both to customers and for society if lower electricity consumption and environmental effects are achieved.

The current energy policy of European Union has a target of achieving 20 % energy savings. It is possible to advance the savings by developing new services to give feedback to customers on their exact energy consumption and by pricing the retail energy to follow the spot prices. Several studies indicate that feedback information to customers has real effect on energy savings, the estimates vary between 3 and 15 % ([10], [14], [15], [16]). If the market integration speeds up the development of these products, it means considerable additional benefits.

The more the customer has to pay according to real-time price, the more he will be interested in energy savings and DSM. On the other hand, highly volatile electricity prices will give rise to uncertainty, which in turn will make investment calculations more difficult to customers.

Products based on spot-prices and/or high price peaks should result also in decrease of peak prices if customer flexibility is used more efficiently: this means in general lower market prices during peak load or disturbance situations and higher security of the Nordic system.

A so called green production may be a reason to change the supplier. Also suppliers may benefit in these cases. The influence of the consumers would be wider and stronger in the integrated retail markets compared to separate regions.

The increased market size can also result in additional benefits due to the economies-of-scale: development of IT and metering products to the larger market should result in lower prices on the long term.

5.4 Effects of market integration

Some general remarks for the benefit can be stated. Bigger market and increased competition should decrease the general price level and decrease margins of suppliers.

However, the recently published Elforsk study ([18], [19]) concludes that “it is not likely that an integrated Nordic retail market will increase the competitive pressure and in that way substantially reduce the retail margins. There might be some possibilities for reducing margins, at least in some countries and for some customer segments but margins are generally relatively small. The price benefits for the customers can thus be expected to be modest.”

In Finland the average retail price has been quite stable during the latest five years. In Norway the average monthly price has even doubled from one month to the next during the reference period. Both in Denmark and Norway the step changes of the monthly average retail prices have lately been up to ± 50 % of the yearly average value. The yearly average retail price of all Nordic countries have varied from 3,5 to 5,5 cent/kWh. In these values the changes of 2-4 cent/kWh are remarkable. The integration of the Nordic retail market should in general unify the price level which means increase of prices in certain areas and decrease in other areas.

In the case of market integration it is probable that the retail prices follow more the spot prices also in Finland and Sweden resulting in more transparency in retail prices and in more demand response from the customer side.

The theoretical retail margins as defined in chapter 3 are varying between different Nordic countries. The table below summarizes the margins in different countries and years: the retail margins in the table have been calculated as the yearly sums of margins for each Nordic country.

Year	Yearly average retail margin cent/kWh			
	DK	FIN	NOR	SWE
2003	-0,21	-0,96	1,35	0,92
2004	0,76	0,30	0,56	1,61
2005	0,28	-0,03	0,48	1,24
2006	0,91	-1,29	0,87	1,40

It can be seen from the table that average margin in Finland is very small and in Denmark also quite a small, but in Norway and especially in Sweden margins are higher. Although these values are neither fully comparable nor true retail margins they may indicate that there are some differences in margins, which means that through market integration and increased competition some benefits could be obtained from the consumer point of view.

However, it may be that the retail market integration affects the retail prices mainly indirectly via enabling the development of new retail market products. Harmonised retail market makes it more feasible and less costly to develop retail market products tailored to certain rather narrow customer segments.

The regular changing of the retailer does not necessarily indicate well operating markets. As can be seen by the margin estimates of the different Nordic countries, a low supplier change rate, as in Finland, doesn't necessarily mean high prices or high margins. An active changing means higher risk to supplier in this electricity purchase and higher transaction costs for all parties: a customer, a retailer and a distribution company.

6 Conclusions and recommendations

6.1 Conclusions

Comparison of the retail prices shows that the differences between the Nordic countries are reasonable although the prices were not fully comparabale. The difference between the maximum and minimum values in one country has been 2,7 cent/kWh and the difference between the highest and lowest average retail prices between countries have been of the same order. So, in the certain circumstances the same effect will be obtained by comparing the national retail prices than by comparing those in different Nordic countries. Only public retail prices valid for the time being were compared, even though each country has the pricing practice based on the spot prices, too. Also contracts with fixed time period with fixed price are used

Generally, the Finnish prices are the lowest and Swedish prices the highest, but the order between the Nordic countries has changed during the years under consideration. Some reasons for the pricing can be found from different load profiles and other practices in these countries. In the case of Denmark it was only possible to use regulated prices because commercial prices are not collected in Denmark for statistical use. In Denmark electrical heating is not applied in the same extent as in the other countries. In Finland separate prices for daytime and night-time energy consumption, with a significant difference in their retail prices, are widely used.

Theoretical retail margins compared in this study are generally low, but there seems to be some differences between the Nordic countries. This indicates that market integration and increased competition could result in decreased retail prices.

No clear obstacles in administration were found concerning the operation in the neighbouring countries although there are some differences in practices in different countries. For example, in Sweden the supplier collects the taxes and in the other countries the distribution company is responsible for the collection. Still, licenses for the operation of suppliers are required in some countries. Announcing of the price changes to the customers differs from a written announcement at least 30 days beforehand to a newspaper advertisement about two weeks in advance.

Moreover, the energy supplier cannot sell electricity from one Nord Pool area to another directly, but has to sell it to and buy it from Nord Pool respective areas, or procure locally produced electricity. In addition, operation as a supplier in another country requires a balance agreement with the authority responsible for settlements in the Regulated Power Market in the country in question.

There are several practical differences between the countries. For instance, in Finland tariff splits for daytime and night-time are very common. Another difference is the load profiles used in different countries. These additional difficulties could be avoided or managed more easily if hourly AMR data is used both for billing and settlement. Difficulties and more costs can also be anticipated due to different languages, currency question, differences in VAT. Even the time

difference between the countries may cause some inaccuracy when the short duration peak load occurs during the highest prices.

Market integration requires considerable changes in IT systems. The costs of these changes cannot be defined at the time being because the accurate rules for harmonisation of customer switching, data exchange format and content etc. are not defined. However, it seems that these costs could be kept at the reasonable level if harmonisation rules and time schedules are carefully defined and planned: this requires a very effective coordination of different actors like regulators, IT vendors, network operators and suppliers/retailers.

Some benefits from the market integration can be obtained although quantitative assessment is difficult. The benefits are related to larger number of products and services to retail customers and resulting energy savings.

6.2 Proposal for further studies

The objective of this study was to give some general indications related to the integration of Nordic electricity retail market. To get more detailed knowledge on the costs and benefits of the integration, some more detailed studies should be carried out.

In the estimation of comparable retail prices and margins more detailed analyses are needed: the methods to estimate retail margins should be further developed, also other prices than those used in this study should be compared and the differences in available retail products (temporary, TOU, fixed-time, spot-price based) and consumption patterns in different countries should be taken into account. The electricity purchase costs of retailers should be defined more accurately. The knowledge and experiences of retailers already operating in different Nordic countries should be utilised.

More time and effort is needed and more information on the status of IT systems and their renewal in the future will be needed to complete this assessment.

- More interviews of electricity distribution systems operators and retail suppliers are needed in all Nordic countries. The interviews should cover different types of distribution system operators. For small distribution operators the benefits may be smaller and the costs for implementing the changes higher relative to company size. The interviews of the retailers should also cover different retailers. The interview of the retailers should also include an interview of the expected benefits of harmonisation and how to best achieve these benefits with the harmonisation. Also IT vendors from all Nordic countries should be interviewed
- Assessment of the changes and costs based on a more detailed common Nordic retail harmonisation model, when and if such a model is available.
- Rough estimation on the effects on the retail and network prices in the various countries (e.g. different scenarios if all, 50 % or 25 % of operators/suppliers are obliged to renew their systems) should be done on the basis of these more detailed cost estimates.

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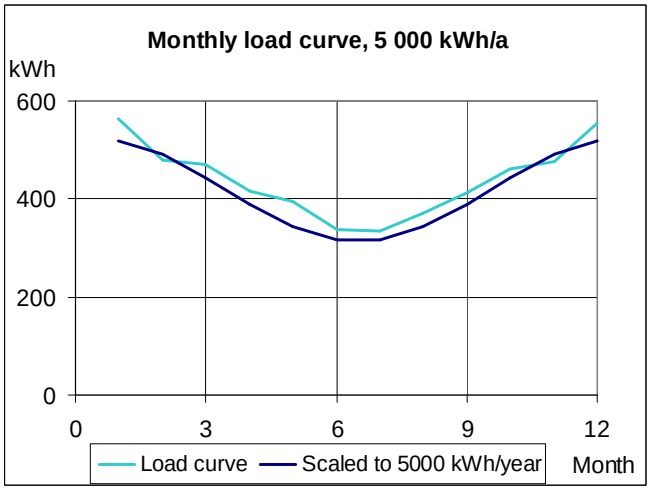
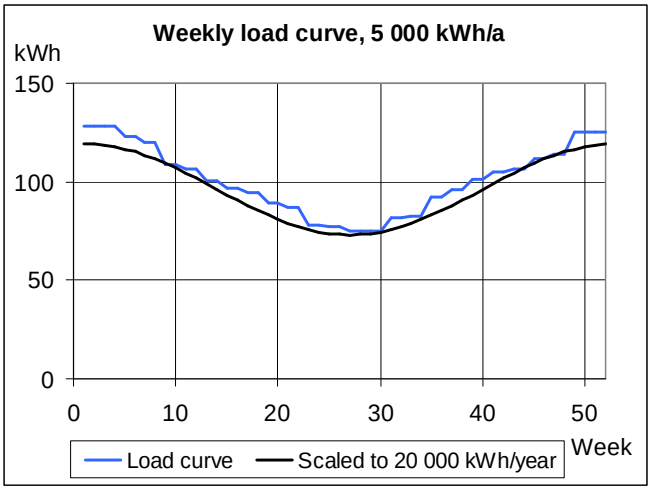
Annex A: Load profiles for small customers

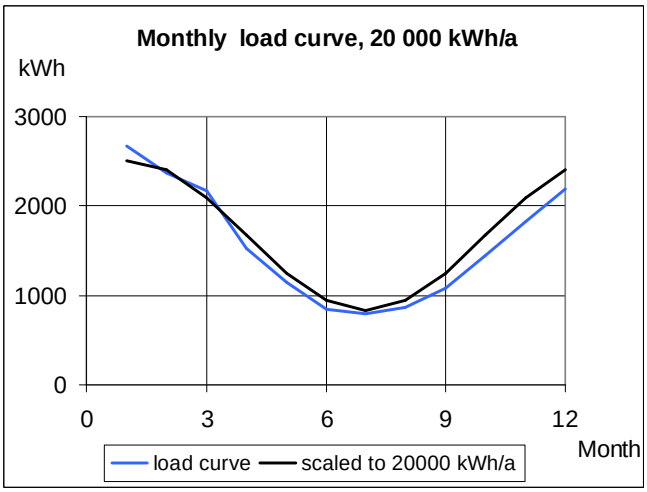
I Profile of a household with no electric heating and consuming 5 000 kWh/a

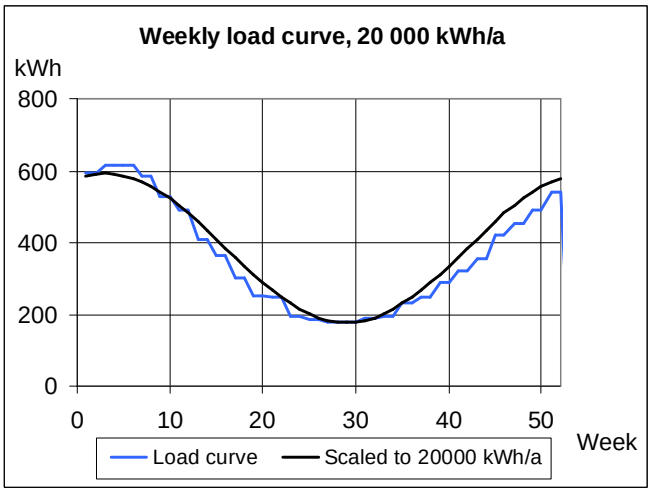
II Profile of a household having an electric heating and consuming 20 000 kWh/a

The typical loading curves were replaced with smooth curves in order to simplify the retail price study. Both monthly and weekly curves are shown below. The curves were scaled for the consumption of exactly 5000 kWh/a and 20 000 kWh/a.









Annex B : Interviews of stakeholders

Interviews of IT providers

The following four IT providers were interviewed within the available time:

- Empower
- Enease
- Process Vision
- Logica (former WM-Data)

The questions and the answers given by the interviewed follow:

Question 1) What IT systems changes are needed and what additional costs will be caused to different actors by the harmonisation of the following issues?

Question 1a) Harmonisation of supplier switching as proposed in the NordREG draft "Harmonized supplier switching model" 11.1.2008

- time limits
- content of the messages
- format of the messages.

Answers 1a) Time limits:

- Changing of time limits will not necessarily cause big changes or big costs. Notifications and locks will change. Much work may be caused to some old systems where the time limits are hard-coded. If everything is harmonised at the same time, temporary intermediated modifications and costs caused by them are avoided. Thus it is important not to change the time limits in small steps.

Content of the messages:

- It is a big effort to agree and harmonise the coding. If coding is not harmonised, the messages will not be interoperable and the harmonisation will fail
-If there is only one message type (e.g. UTILMD), the cost will be moderate.
-About 8-12 man months = 150-250 k€ + FAT-testing per IT-vendor and in addition 30-50k€ per DSO will be needed for implementation and testing. Notifications and locks will change. If everything is harmonised simultaneously, costs will be saved due to avoidance of intermediate solutions. The effect on the Customer Information System processes is significant. The cost estimates given above are average costs and the cost for a big actor can be multiple. Changes must be made for retail suppliers also, but there the changes and the costs depend on how active the retail supplier decides to be. A passive retail supplier must implement functions and messages for handling customer switching to other retail suppliers. An active one must implement much more changes.

Format of the messages:

- About 4-8 man months = 100-150 k€ +testing per IT-vendor and in addition 20-30 k€ per DSO will be needed for implementation and testing. Notifications and locks will change. Changes must be made for retail suppliers also, but there the changes and the costs depend on how active the retail supplier decides to be.

General comments to 1a):

- Cancellation of supply contracts is new to Finland. Implementing it would cause about 20 k€ costs per each actor. (80 DSOs and about 50 retail suppliers.)
- One interviewed thought that the optional requirement "Only the same person can make a supply and network contract to the same consumption place." may cause significant costs in Finland, because it makes it necessary to check in real time who is allowed to make the contract. In Finland there is a national register of consumption points. This is related how the critical requirement "A common way of automatically retrieving metering point IDs is in use in each country" will be implemented. For example changing from the present Finnish practice to the Norwegian practice might cause about 10 k€ costs per each actor. The Swedish practice is the most expensive.
- It should be centrally defined what information must be maintained, how often it will be updated and how it is accessed.
- Costs depend very much on how well and how detailed the common model is defined. Undefined features and processes cause high costs and incompatibility. Transition to well defined processes is much smoother and gives better compatibility and interoperability.
- The proposed switching model is possible to implement with the present once a day batch process that is applied in Finland. The critical requirement "Supplier switching is possible on any weekday of the month" will be expensive to implement in Sweden and possibly also in Denmark.
- As the frequencies of retail supplier switching and meter reading increase the costs increase. Automation becomes necessary and automation can be expensive to small actors.
- It should be strictly forbidden to use messages to purposes different than what has been commonly agreed. For example, bilaterally agreed adjustments tend to cause much trouble and costs when systems are updated.
- The NordREG draft on the Harmonized supplier switching model is good and it describes rather well the national differences. There does not seem to be needs for extensive changes in the IT systems. Changing the time limits is not a big job. Costs cannot be assessed before the common model is defined. Implementing may take 0,5-1 man years or much more. In addition, time is need for testing.
- Will there be a common testing service?
- In Finland there is a national register for consumption point IDs. In practice the retail suppliers have very seldom made clear the consumption point ID. Now this information will become compulsory.
- Every actor would benefit of a common message format, but nobody is willing to abandon his own format.
- EDI is outdated. Transfer to XML-based communication is worthwhile.
- EDI causes many kinds of costs. Better and less expensive methods to transfer information are available.
- National differences SMTP vs. FTP etc. need to be removed.
- Common cryptographic methods should be agreed.

Question 1 b) Changes and costs due to harmonisation of balance settlement and billing (processes and their timing)?

- For hourly metered customers
- For typical customer load curve customers

In general

- In Sweden there are significant other reasons to abandon their once a month calculation model, such as levelling the data processing load and possibly the

requirements of the 3rd legislative packet of EU (The appendix A of the electricity and gas directives.)

For hourly metered customers
- Only small changes are needed due to changing time limits
- Much easier than for the type load curve customers.

For typical customer load curve customers
- The customer load curve approaches are different in each country and difficult to harmonise, but is it necessary to harmonise them for achieving a common market?
- It would make processes and transition easier, if all load curve based consumption data would also be exchanged as hourly values.
- The whole model may need to be replaced especially for possible implementations that assume certain things to be fixed. That will be costly. The common model needs to be agreed and known. The costs cannot be estimated without a separate study.
- It is impossible to assess the costs of harmonising the load curve approaches, because the common model is not known and because we operate only in Finland. It will probably be a bigger effort that harmonising the messages.

Question 1 c) Changes and costs due to different taxes, currencies, languages, etc.?

- It is well known how to handle different currencies. Local currency must be used for the end customers. The management of risks related to exchange rate variations, billing with multiple currencies need to be included. Parallel customer and billing systems are needed for each currency as well as some changes in the user (operator) interface. How much this causes costs depends on the approach and can vary between 10 k€ and 100 k€. (Tailored changes - add on modules - completely parallel systems) More expensive solutions can be better that the less expensive ones.
- Each country has its own language and customers must be dealt with using the local language. This creates costs to cross boarder retail supply. It does not seem likely that the language used in retail supply customer contacts can be harmonised.
- These may cause significant changes and costs if economic information is transferred between the countries. For example, exchange rates vary in real time. Structure and type of taxes between the countries can vary and may require big changes in the systems and thus cause high costs.
- Needed changes could be assessed based on a common model for processing of value added taxes and electricity taxes.

Question 2) How often the ICT systems are replaced or significantly updated?

Completely replaced?
- The lifetime of the IT-systems is about 8-15 years.
- The targeted lifetime of AMR systems is close to 15 years.
- Customer Information Systems are used 8-12 years before being completely replaced.
- Start up, training and learning of a new system takes typically one year. Otherwise 3-5 year lifetime would be reasonable due to develop of the IT-systems.

Major updates?
- *Major updates with changes of complete functions are made at 1-2 years intervals according to 3 interviewed*
- *Charged updates are made once in 3-5 years according to one interviewed.*

How many systems need to be replaced within the next 3 years?
- *Now about 50 % of the distribution system operators (in Finland) have either new systems or they are purchasing one. Many companies, especially small ones, have not yet purchased a system. Within the next 3 years new systems may be installed roughly so much that they cover about 10 % of the customer connection points.*
- *It can be expected that rather many systems need to be replaced if and when the soon available AMR data will be utilised and when so called complex retail contracts will be increasingly applied. It is difficult to say if this happens within the next 3 years.*
- *Now many new IT systems are being purchased at least in Finland. After three or four years it will slow down.*

Question 3) What do you recommend regarding further actions such as a more accurate study?

What should be done?
- *A detailed description of the processes to be harmonised is needed. Then a cost benefit analysis can be made and based on that some iteration done to the harmonisation model before testing and implementing it.*
- *Models of the other processes are needed in addition to the supplier switching model. Te switching model covers only a part of what happens between the retail supplier and the DSO. What will be done later? How information will be exchanged? How moving of customers from one connection point to another are handled?*
- *First the legislation should be prepared adequately. It should be decided whether to harmonise or not. If there is not enough commitment to harmonisation then wasting to the development of inadequate harmonisation can be stopped. Long term costs can be saved with adequately complete harmonisation. Poorly coordinated or too small harmonisation steps may only increase costs, e.g. opening of the electricity market in Germany. Political decisions should be made as soon as possible. The new rules must be prepared and completed first before implementation time limits are fixed. When the new rules of the game are fixed, implementation takes about one and half years and costs money, but after that the market will work based on the rules defined in the legislation.*
- *It is likely that harmonisation takes effect with a very short transition period. The transition should happen everywhere simultaneously including both messages and the balance settlement. Before that the capability to the new model in addition to the old one should be implemented in the systems.*
- *Compatibility within the EU should be considered also. Incompatible solutions should not be unnecessarily developed.*
- *It is not enough to have recommendations. Requirements should be binding.*
- *Time table should be planned.*

By whom?
- *A task force should be formed consisting of IT-providers, market actors, authorities, etc. All this consultation work should be paid but not necessarily highly (Normal rate - 20% could be reasonable.) This work should not be given*

based on competition. Instead the members should be invited. The society is supposed to benefit from this and it should also invest to it. Or will there be enough of those who spend their free time to voluntary work from which mainly the others benefit?
- The Finnish Energy Industries and the EDI users group have considered the different use cases thoroughly and they should be taken to future studies.
- EDIEL - Nordic Forum was useful but could not achieve compatible solutions. A Nordic group is necessary for the harmonisation.

Question 4) What else do you want to say on this topic?

On information on the harmonisation needed for the cost assessment
- Details of harmonisation are not known accurately enough so it is too early to give statements of costs. It is necessary to know the processes.
- In order to estimate the IT system costs it must be defined how the data exchange will be harmonised. Will it be XML or does it mean that all countries start to use the same EDIEL messages instead of the different ones applied now? In both cases it is also necessary to define what will the common protocols, contents and formats and the underlying processes be.
- It is important to know what the target is and what is wanted to be replaced in the harmonisation. Based on this the practical details and the benefits to each actor can be assessed. What will be better and who will benefit can be estimated. Differences in this can multiply the work and costs needed.
- Payments to IT providers are only part of the costs. According to our experience the other costs to the users of the systems are higher and can be 50-80 % of the total costs (specification, purchase, taking into use, training, learning etc.). Thus it is important to clarify what costs are taken into account.

On the motivation of DSOs
- The cost goes to the DSOs and the benefits of harmonisation to small DSOs are small and come with long delays. It is important that DSOs have incentives to make the required changes within the required time frame. The introduction of new requirements should not be too high and too fast to be manageable for small and medium size DSOs.
- Large international DSOs benefit more from the harmonisation than small local ones.
- Suppliers and concerns benefit from better and more harmonised IT systems of the distribution system operators. When the supplier belongs to the same concern the benefit goes to the same concern. In addition, the unbundling of retail market processes is not complete.

On how to harmonise
- Let us harmonise or we will be behind other Europe. The Netherlands are now ahead of us in some respects so it may be a good idea to consider their solutions.
- Hubs for converting messages (for example Finnish EDI hubs) are a cost place in the long run.
- The format should not be decided upon by market parties => Ready 2020+
- Please note: EU harmonisation! Netherlands is far ahead of the Nordic countries.
- Nordic test facility should be started from the very beginning.
- Metering issues are OK.
- Development of the regulator framework should start immediately and the IT-system implementation should follow it with adequate delay:

- *Rules: day 1*
- *MPID Format ready: + 2 months*
  - *XML*
  - *Content*
  - *Types (Coding)*
  - *Formats*
- *Formats ready and agreed by Authorities: + 4 months*
- *Tests + 4-6 months: Independent body*
  - *MPID Test Ready*
  - *Common PRODAT/UTILMD test facilities on Nordic + 4-6 months: Independent body*
- *Updating system + (4-8) months*
- *Real life tests + (3-6) months*
- *Everyone MUST have systems ready + 4 months*

- In the draft report there is: "Costs of implementation are mainly caused by the necessary changes in IT systems of market actors. These costs could be substantial for individual actors. On the other hand, due to the development of the electricity market, there is reason to believe that the IT-systems will be updated regularly anyway."
Comment: Prerequisite for updates due to Market change is that someone (NOT vendor) will pay those. (Otherwise there should be unlimited amount of free energy to vendors to survive. There is no place for subsidization of monopolistic DSO business by IT vendors.

- In the draft report there is: "The requirement on how soon a harmonized platform for the common Nordic end-user market shall exist affects also the cost of implementation. Costs could be reduced by creating the harmonised regulatory framework first. Thus the market actors will have clear rules before they have to start making changes in their IT systems and supplier switching processes."
Comments: 1) To minimize the cost, please stop the national hobbies and put all efforts to the Nordic market. Or be prepared to double or triple costs. 2) For the retail market harmonisation it is important to have I/O to Metering Point ID Hub harmonised for the Nordic market and a harmonised ID policy.

Interview of a DSO

The following views were presented by one medium size DSO:

Question 1) What IT systems changes are needed and what additional costs will be caused to different actors by the harmonisation of the following issues?
Question 1a) Harmonisation of supplier switching as proposed in the NordREG draft "Harmonized supplier switching model" 11.1.2008

- time limits
- content of the messages
- format of the messages.

- Compulsory harmonisation of consumption point IDs in the messages should be required in the first place, because it will save costs. Local IDs are still used in messages because IT-systems do not yet support the national IDs and that causes unnecessary work.
- Binding requirements on message content, format, coding and timing are necessary. In order to keep the costs reasonable it is important to minimise the amount of software bugs and detect them as early as possible. Unnecessary iteration should be avoided. Thus it is important that all the changes go via a test system. There should be one independent Nordic test site or service that is used by all.
- The harmonisation of the switching processes has a big impact on customer service processes. Changing these causes also costs. For example, in Finland there are no rules on what to do when a retail contract terminates. Remote meter reading needs to be taken into account. The rules must be the same. For example rules regarding remotely connecting and disconnecting customers should be the same in all the countries.
- EDIFACT starts to be outdated. Size limitations that are fixed cause unnecessary trouble.
- Acknowledgement messages are increasingly important. If some system ignores acknowledgements or does not give detailed acknowledgements detailed enough, it is necessary to make telephone calls to solve the matter. When there are very many messages, this kind of manual approach becomes difficult and expensive.
- There should be a minimum time between switching of the supplier so that the switching process can be either completed or cancelled before a new switching process of the same customer is started.

Question 1 b) Changes and costs due to harmonisation of balance settlement and billing (processes and their timing)?

- For hourly metered customers
- For typical customer load curve customers

- Estimated billing will eventually be finished which will simplify the settlement and billing.
-It may not be cost efficient to transfer hourly readings of each individual customer to the retail supplier. That would increase the amount of messages.
-What is the effect of separate bills or a common bill to the energy customer from the retail supplier and the DSO? Must every retailer know all the products available in the distribution network in question?

Question 1 c) Changes and costs due to different taxes, currencies, languages, etc.?

Question 2) How often the ICT systems are replaced or significantly updated?

- We will soon have a new Customer Information System and new Metered Value Management.
- Typically lifetime of Customer Information Systems is between 10-20 years and it is about 15 years.
- The lifetime of Metered Data Management or Energy Data Management (ERM) is typically 5-10 years. The message exchange is often included in ERM.
- Major updates will be implemented once a year or more seldom.
- In Finland there a big system update round has started. That lasts several years.

Question 3) What do you recommend regarding further actions such as a more accurate study?

- The following things should be done: 1) define the common harmonised solution, 2) assess the benefits of harmonisation to different actors, 3) retail suppliers' benefits and interest in cross boarder retail 4) the benefits the end customers expect to get from cross boarder retail supply and the interest of end customers. Especially SME customers.
- Steps: 1) Why? 2) How? 3) What are the costs and the benefits?
- The end customers do not know enough of the electricity market to be able to answer the questions. Thus results depend very much on how the question is formulated. Is it possible to give the end customers adequate information and education on the electricity retail market?
- In the development and assessment of the common harmonised model all actors should be represented. The Finnish Energy Industries should be involved in collecting the expertise. Actors needed include the regulators (such as the energy market authority in Finland), The Finnish Energy Industries, EDI users group, providers of data exchange services, IT system vendors, researchers that know directions of future development and provide independent expertise, distribution network companies, retail suppliers, end users and experts on the development in Central Europe.
- The IT system vendors have expertise so they must be involved, but they may promote mainly their own interests and not adequately take into account the interests of the other actors.
- The timetable to implement the changes by 2010 is too challenging. When the decisions have been made it will take at least two and half years to implement the changes. Implementing the test system will take at least one year. If some vendor complains, there may be a break of even two years. Testing will take a year. After the verification the installation and installation tests are needed. Everything must be tested. Too tight a schedule will result in a failure.
- Common rules of the game need to be developed.
- The solutions of Central Europe should be taken into account.
- One big momentary change is better and less expensive that running different systems in parallel.
- The project culture is more or less different in each country and may cause additional delays. In Sweden consultants are much used. That may add delays in commenting. Enough time should be reserved.

Question 4) What benefits you expect from the harmonisation of retail market?

- Cost of IT systems can be expected to reduce on the long run. In the beginning the threshold is high, because the needed change is rather large.
- The distribution network company gets only little benefits but much costs. As an example of possible savings is that the common consumption point ID gives some savings to the DSOs.
- If the Nordic wholesale market works, how much additional benefit the common retail market can give?
- The market may be improved more by strengthening the transmission network at its bottlenecks.
- The retail suppliers should be asked about the benefits and how important the retail harmonisation is for them.
- Will the end customer benefit or are most benefits going to the IT system vendors?

Question 5) What else do you want to say on this topic?

- In order to assess the costs it is necessary to know what the new harmonised model is.
- The network company must solve possible unclear issues with the retail suppliers. Different language, different past practices, different expertise and different situation is each country may make this solving labour intensive and thus costly. The interactions need to be automated as much as possible. Still it may not be possible to avoid some human communication. Common language for problem resolving is needed. The human role is nevertheless important.
- As a result of retail market harmonisation we expect the cost of IT systems to reduce on the long run. But the transition to the common harmonised model will be expensive because the change is big.
- To the market efficiency the added benefits from electricity retail market harmonisation are small compared to the harmonisation of the whole sale market.
- It is important to take the harmonisation into account in the regulation of the DSOs. The present regulation model does not support harmonisation. The regulation model should be flexible with respect to harmonisation. Harmonisation causes high costs that do not give any credit in the regulation model. The possible benefits come beyond the regulation time horizon.
- Cost will be caused to every actor. The customer eventually must pay the costs of the harmonisation. It is important to make sure that the customer gets enough benefits.
- Causes more costs for regulation and for the network operator. Changes are eventually paid by the customer.
- Harmonisation of the retail market is a big issue.
- Data exchange service companies can have an important role in enabling cross boarder communication, because especially for small energy companies it can be too expensive to implement the new harmonised messages in their own systems. The possible role of data exchange service should be adequately emphasised and studied. New functionalities for data exchange service may be found.
- There should be a group that charts the future. For example, what AMR means in the future. Are we adequately taking into account the possibilities that AMR may enable? Will future bring such requirements that could be taken into account? Is upgradeability and expandability of the messages and the systems adequate?

- Testing time should be long but there should be practically no transition time at all. Every system must start to use the new messages over the same night and stop using the old messages completely. Data exchange service should be used by those who do not have enough own resources. The transition should be compulsory.
- The ultimate goal should be a common standard in the European scale. Solutions, best practices and mistakes in Central Europe such as the Netherlands, UK and Denmark should be considered and analysed. Nordic harmonisation should not contradict European harmonisation.
- It should be possible to monitor at the consumption point level at the IT systems. Handling of the error situations should be as automatic as possible. Thus when error is detected, it is not adequate to check only the message but also its contents.
-What about Web-services. Are they relevant in this harmonisation? What kind of services the energy company will be required to provide to its customers in the future? What are responsibilities of DSO or retail supplier? Coordination of different reasons to update the systems may save costs.
- Validating data saves costs. Non sensible data should not be sent further.
- Penalties?
- It is important to take into account all costs and not only the IT-system costs. For example, the changes in the customer service processes cause costs.
- The planning of the harmonisation should start from the processes. The IT systems and the messages should be designed based on the processes and not vice versa. The viewpoint of real users and processes should be adequately included and not only systems and messages.
- Common rules of the came are coming and the testing system guarantees compatibility.

Interview of the Finnish Energy Industries

Question 1) What IT systems changes are needed and what additional costs will be caused to different actors by the harmonisation of the following issues?

Question 1a) Harmonisation of supplier switching as proposed in the NordREG draft "Harmonized supplier switching model" 11.1.2008

- time limits
- content of the messages
- format of the messages.

- The present guidelines of the industry will change due to the new tighter time limits (5 working days) and the practice that the DSO will move the process forward after two working days irrespective of the missing of the reply of the retail supplier. As such these changes will not cause changes to the content of the messages. The changes to the practices and the tighter schedules require automatic processing, which is not yet possible for some companies.
- The IT systems as they now are do not support automatic monitoring of the time limits defined in the process. At present the exchange of messages is initiated by a contract or other change, or response to an incoming message. Now this must be automated.
- If one common message format and content will be chosen as a result of Nordic retail Harmonisation, it will cause changes to the systems and message conversions for all the actors. This will mean either updating or renewing the systems. How big the changes are in a specific country depends on the chosen harmonised solution.

Question 1 b) Changes and costs due to harmonisation of balance settlement and billing (processes and their timing)?

- For hourly metered customers
- For typical customer load curve customers

The harmonised model for customer switching does not consider balance settlement and balancing calculations. Obviously changes in these processes will affect the IT systems. It is also clear that especially for load curve customers strong harmonisation of the processes will be necessary to enable Nordic retail market for these customers. The situation has not changed since the report published by VTT in December 2005.
Demand response task force of The Ministry of Employment and the Economy in Finland will publish its report. The report will express a view or a proposal on the increase of hourly metering and the utilisation of hourly meter readings in the balance settlement. Now it seems that this proposal will be on the same lines with the recommendations of the Finnish Energy Industries.

Question 1 c) Changes and costs due to different taxes, currencies, languages, etc.?

- The assumed Nordic retail market means that it is easy for a retail supplier to operate in all Nordic countries from its own country. It does not mean that a Finnish customer can buy electricity from Norway, for example. Thus retail supply to another Nordic country requires always a customer service with the customer's language and following the local legislation on consumer protection, taxation, etc. In an ideal situation these would be harmonised, as well.

- If the central legislation regarding the retail markets is not harmonised, parallel systems and systems tailored to each country are likely to be necessary.

Question 1 d) What is the effect of the schedule of the harmonisation on the costs?

- An extensive change of PRODAT messaging is now going on in Finland. All the actors must either update their systems or purchase a complete new system. After this change there is no immediate need visible to change the messaging. This change is a big effort to the industry branch. It seems unreasonable to implement new extensive changes to the systems within a short period of time.

- It would be reasonable that legislation will be changed first and there will be adequate transition periods for the technical changes. Then the actors have enough time to prepare for the changes and flexibly take them into account when purchasing systems and updates. If the change is done in some other order or with a very fast time schedule, it will likely cause continuous system changes and that will not be reasonable when costs and resource allocation are considered.

Question 2) How often the ICT systems are replaced or significantly updated?

- As it is mentioned above there is an extensive update of PRODAT messaging going on in Finland.

Question 3) What do you recommend regarding further actions such as a more accurate study?

- As we have mentioned in our statement to NordREG [17], it is necessary to define first the level of harmonisation and the regions to be harmonised. After that the market model and the roles of the actors etc. should be described more accurately. Only after that the technical details and their solutions can be considered. When these solutions are known, it is possible to think about the needs for additional studies and clarifications.

- Elforsk has assessed the benefits and costs of the harmonisation of the Nordic electricity retail market. The reports ([18], [19]) have now been completed and are available at www.marketdesign.se.