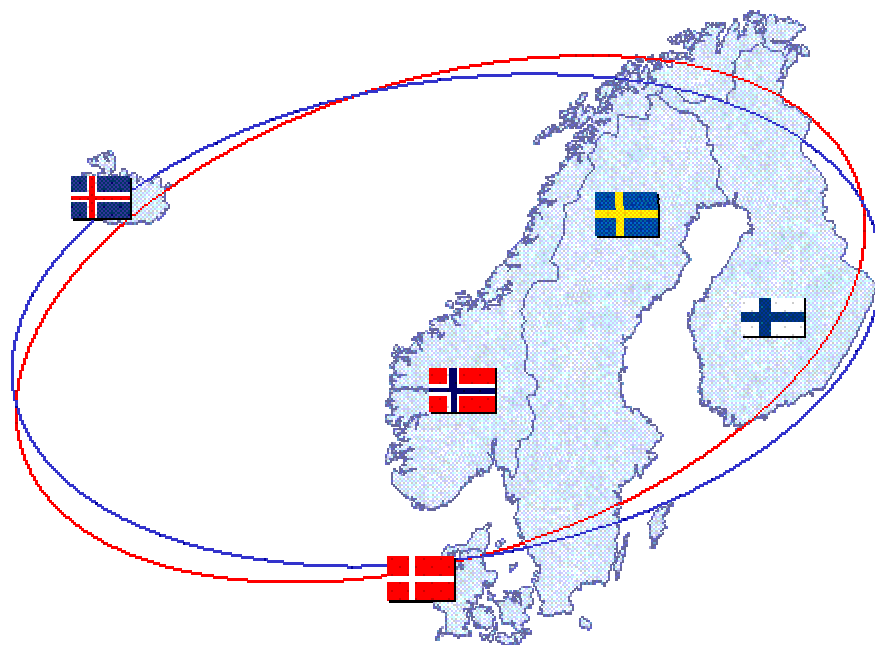


Enhancing Efficient Functioning of the Nordic Electricity Market

Summary and Conclusions



24 February 2005

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1. Introduction

In September 2004, Nordic Council of Ministers (NCM) in their meeting in Akureyri in Iceland assessed the state of the Nordic electricity market. Ministers acknowledged that the market has proved its well functioning in many respects. They emphasized, however, that further development of the Nordic electricity market is needed towards the objective, i.e. a regional market without borders. The Ministers regarded a further co-ordination of the system responsibility and a development of joint Nordic solutions for grid investments as the most important steps towards the objective.

In the "Akureyri-declaration", the Nordic Energy Ministers asked the Nordic Transmission System Operators (TSOs) to study how a further co-ordination of the system responsibility, a joint organizing and financing of the grid investments and a handling of peak load situations can be established in the Nordic countries.

The two main responsibilities of the TSOs are to secure operation of the power system and to enhance effective functioning of the electricity market. In spite of different national energy policy objectives, juristical status of the TSOs and legislative differences, the Nordic TSOs have managed to develop a highly integrated mutual operation to maintain the operational security of the power system i.e. to "keep the lights on". .

In this report, the main focus is on those tasks within the system responsibility that are market-related and may have an effect on the functioning of the market. The report covers the following issues: definition of the system responsibility and role of the TSOs, harmonisation of operational rules and practices in order to improve functioning of the market, TSOs' co-operation in disturbances and shortage situations and joint Nordic transmission investments. In addition, the report summarizes the concrete actions taken by the TSOs in strengthening of the market mechanisms in peak load situations.

During the last years Nordel has made several studies related to market issues /1,2,3/ and has continuously developed co-operation and operational procedures between the Nordic TSOs when updating the System Operation Agreement and when drawing conclusions from the studies on specific issues and taking measures accordingly. In this report Nordel has utilised the outcome of the earlier finalized studies and of the studies done for this particular purpose.

The background reports referred to in the text are available in the Nordel homepage (www.nordel.org).

2. Definition of system responsibility and role of TSOs

In spite of the high degree of harmonisation in Nordic TSO activities, there are differences in how the core TSO duty of system responsibility is defined and how it is executed in different countries. The national differences can be due to legislation and regulations or due to TSOs' own rules and practices

Nordel hired Hagman Energy AB as a consultant to prepare a survey on these issues /7/. In the survey, a number of different activity areas were examined and their role as a part of the system responsibility were analysed. The purpose was to identify these differences and discrepancies, to analyse their impact on the market and to come up with proposals for further harmonisation.

The first and principal question is whether there is a need for a more common definition of the system responsibility and for clarification of the role division between TSOs and the Governments. It is discussed in this chapter. The second, more operative question is what differences between countries need to be harmonised in order to improve functioning of the market. This issue is handled in chapter 3.

2.1 Definition of the system responsibility

In the Nordic countries the national legislations set common objective for TSOs to maintain the operational security of the power system within a specified level of quality in normal circumstances as well as in case of contingences in the power system. To be able to carry out this task the TSOs need to have access to operational reserves and reactive power reserves to maintain the balance between supply and demand. The operational security can also be defined as a momentary security of supply.

Long term security of supply, called also the adequacy of the power system, is an indication on whether the investments in generation and transmission capacity can meet the demand in the long term. All TSOs have the obligation to develop the transmission network to meet the demand in the long term and thus also create pre-requisites for the short term security.

According to the liberalised market model the market players are expected to maintain the generation adequacy. The market mechanism is intended to provide appropriate incentives for the market players to invest in new generation capacity and demand response resources.

When executing their system responsibility the TSOs must contribute to an efficient functioning of the market. The legislation stipulates in each country that the execution of the system responsibility shall be based on equal and non-discriminating terms for the market players, and thus does not create any barrier for the entry of new players. Even though the terms are equal and non-discriminating nationally, differences between the countries can distort the market or even create a barrier for new or existing players that want to develop their businesses in the Nordic market area.

The definition of the system responsibility is of utmost importance in clarifying the roles between the Governments, TSOs and market players. Equally important is to define how the services included in the system responsibility and provided for the market players are fi-

nanced. This is necessary in order to create the right signals and a level playing field for the market players.

There is no general definition for the system responsibility in the EU Directives. Only the denomination Transmission System Operator is used in the Directives including both system responsibility and the responsibility to develop the main grid to meet the needs of the market. A common Nordic definition for the system responsibility could contribute to a possible future common definition on the European level.

In common language there may be differences what is normally meant by system responsibility in different countries. In Finland and Sweden, its scope is limited to the operational security and in addition to that the TSOs have a number of other tasks and responsibilities (e.g. network development, promotion of efficient functioning of the market). In Denmark and Norway, all of these tasks are included within the broad definition of system responsibility. In all countries, these tasks are seen however as an aggregate where all parts support each other. Therefore, it shouldn't be a problem for any country to take the broader scope as a basis for the common definition.

Tasks, which are common in system responsibility for all TSOs, are to:

- ensure the operational security of the power system
- maintain the momentary balance between demand and supply
- ensure and maintain adequacy of the transmission system in the long term
- enhance efficient functioning of the electricity market

These tasks create the common core of the system responsibility in the Nordic countries. The TSOs can also have other duties that are not included in the common core of the system responsibility. There are differences in these duties. The differences can be due to different division of responsibilities between the TSOs and the authorities (see Chapter 2.2.1).

It is important that there is a clear distinction between the transmission services and other services, such as balance service, provided for the market players and that there are no cross subsidies between these responsibilities. The costs should be borne by the parties who get the benefit. Otherwise, the right incentives for the decision-making of the market players disappear.

The TSOs have an obligation to develop and maintain adequate transmission network. That is quite similarly defined in all Nordic countries. One challenge for the Nordic TSOs is how to finance and organise the investments that are needed for the Nordic market and not for one country only. These questions are analysed in Chapter 6.

Recommended actions:

With aim to establish harmonised interface towards the market a common definition for the system responsibility should be defined for relevant core tasks. Nordel is prepared to contribute to the work. The legislation and regulation in the Nordic countries should be harmonised accordingly.

Other duties in addition to the common tasks of system responsibility can be justified due to special national circumstances. These duties must be clearly separated and financed transparently. The costs shall be borne by the parties who get the benefit.

2.2 Clarification of roles and responsibilities between authorities, TSOs and market players

2.2.1 Roles of market players and TSOs in maintaining reliability of the power system

All stakeholders in the market have certain responsibilities and roles to ensure that necessary resources are adequate and available for the functioning of the system and the market. The market players are expected to maintain adequate supply to meet their commercial obligations. The TSOs are responsible to maintain the operational security and momentary balance between demand and supply. The Governments have the responsibility on the overall market design and legislative framework as defined in national and EU legislation.

The corporate forms of the TSOs are different varying from a state agency to a private company. The corporate form together with regulatory regime can have an impact on the roles between the authorities and the TSOs as well as on the cashflow requirement of the TSO, the owners' claim/demand for profit and return on investment.

One of the key issues in drawing a border line between the TSOs and the market relates to ensuring of the peak load capability, Nordel has presented a vision for the market model to secure investments to meet peak demand /2/. The vision is based on market mechanisms, where the market price is the incentive for investments. A pre-requisite for this model is that the roles and responsibilities of the stakeholders are clearly defined.

Nordel recommended that TSOs' responsibility with respect to security of supply should ideally be limited to operational security of the power system i.e. to the momentary balance and operational reserves /2/. Limitation to the momentary balance, which is by nature a short-term on-line operation, involves however a long-term commitment by TSOs to have the necessary capabilities for it at all times. For example, acquisition of the operational reserves can be based on long term contracts between the TSOs and market players.

As to operational reserves there is a need for some further harmonisation and clarification of the acquisition principles as well as for developing acquisition of these reserves towards a more market-based direction. These issues are discussed in chapter 3.4.

Recommended action:

In order to give the right signals for the market, the TSOs' responsibility in maintaining the balance between demand and supply should in principle be limited to the operational security of the power system and for the adequacy of the operational reserves necessary for that task.

2.2.2 Role of Governments and TSOs in maintaining reliability of the power system

In the end, the state authorities have the responsibility on the overall market design and the security of supply with a duty to react in case of market failure.

There are however differences in roles and responsibilities between the authorities and TSOs in maintaining the security of supply. The role that primarily belongs to the state may have been delegated to the TSO. In Denmark, Norway and Sweden the TSOs have been given responsibilities to maintain the system adequacy according to specified rules.

- In Denmark, the TSO has the overall responsibility for the system adequacy covering not only the transmission system but that of the whole power system. So far, there has not been need for applying this responsibility in practice to maintaining of the generation adequacy.
- In Norway, Statnett has recently got a new responsibility which extend its tasks from maintaining of power balance to that of energy balance during exceptionally difficult hydro situations of winter season.
- In Sweden, Svenska Kraftnät has a temporary responsibility to acquire a pre-defined amount of peak load resources that are normally within the responsibility of the market players. This arrangement is based on legislation that is valid until 29 February 2008. The costs are covered by the market players. After the transition period it will be up to the market to ensure peak resources in Sweden.

These types of involvement of the authorities or the TSOs to maintaining of commercial resources gives to market players signals, which can be distortive to the functioning of the market. Therefore, the potential involvement should be the last resort under extreme circumstances and should be carried out in a harmonised way.

If the market fails to provide with sufficient generation adequacy, the authorities can initiate a tendering process according to the EU Directive. In Denmark, the Government can order the TSO to introduce appropriate measures, including a tendering process. In Sweden the above mentioned arrangement, which has been implemented before the EU Directive took effect, has been interpreted to fulfil the requirement of the tendering process. The Norwegian arrangement also aims at similar procedure in a hydro based power system. The Finnish legislation stipulates that the Government may decide on the organisation of a public invitation to tender for new electricity generation capacity or demand-side actions in order to secure the energy supply.

Whoever the responsible party is to initiate the tendering process or any other action with similar purpose, it is important that the implementation procedures are harmonised in the Nordic area and designed to avoid distortions in the market. The procedure could be based

on the proposal presented in the Nordel report /2/. In addition, common Nordic criteria, when to initiate the process, should be developed. The criteria shall be objective, extremely strict and shall be based on a Nordic approach. The criteria shall give the market players clear signals that an interference in the market mechanism will be initiated only under extreme circumstances.

Recommended actions:

Division of roles and responsibilities between the TSOs and the Governments should be kept clear and preferably based on the same above mentioned principles in each country.

Involvement of the authorities or TSOs in ensuring peak resource adequacy in the market should be avoided. If there is, however, a risk of market failure in this respect, any safeguarding action should be transitory and its costs of such resources should be covered by the market players.

A harmonised Nordic procedure and criteria to initiate a tendering process (EU Directive) or any similar safeguarding measure should be developed. The actions should be initiated only in exceptionally tight situations and with endorsement of the authorities and TSOs in the other Nordic countries.

2.2.3 Roles in enhancing effective functioning of the electricity market

TSOs' role as a market facilitator is a part of the system responsibility (see Chapter 2.1) All Nordic TSOs do not have the legislative duty to enhance effective functioning of the electricity market. However, it is a kind of in-built criteria for any TSO business. It needs to be taken into account in all actions by the Nordic TSOs, in the same way as the requirement to be non-discriminatory and efficient.

Another part of market facilitation is the active development of the market design together with other TSOs and all stakeholders at Nordic and international level. The TSOs and Nordel have actively contributed to the Nordic market design /1...6/ and also within EU (ETSO). All Nordic TSOs are also co-owners of Nord Pool Spot, which is the operator of the physical day ahead (Elspot) and intra day (Elbas) markets. Some are also owners of Nord Pool ASA.

It is worth noting that TSOs can contribute to market design and market development only within the powers and means they possess. There should be clear distinction between what on the one hand authorities and the TSOs and on the other hand market players and other stakeholders do.

There are some emerging new areas where TSOs are expected to take a role. Activation of demand response is a measure to strengthen the market mechanisms and enhance efficient functioning of the market is one example. The Nordel TSOs have already within their responsibility taken measures and made action plans for activating demand response (see Chapter 5.1). It is important that the TSOs continue their focus on further development of improved demand side flexibility and demand response to high prices. This is an area where TSOs can be a catalyst but many other stakeholders need to contribute to the development as well.

Market power and ways to avoid its potential abuse are becoming an important issue in further development of the market. The possible role of TSOs in monitoring the market has

been discussed both in Nordic fora and internationally. One reason to consider this is that TSOs have prerequisites for monitoring because of having access to market information. Today, the TSOs are not in general involved in the market monitoring. The Danish TSO is monitoring the market and will give notice to authorities when observing possible abuse of market power.

Market monitoring is fundamentally a task of the competition and regulating authorities and power exchange. It should be clarified what role, if any, the TSOs may have in this context.

Recommended action:

Nordic TSOs' possible role in market monitoring should be further studied and clarified.

2.2.4 Other duties performed by TSOs

In Denmark, the TSO has a legislative responsibility to perform duties concerning cost distribution of environmentally friendly generation and issuing of renewable certificates, research and development activities for environmentally friendly production technologies and energy efficient transmission and distribution of electricity. The Danish TSO shall also execute comprehensive planning for at least 10 years, report on the development of environmental aspects of electricity and monitor that there are adequate fuel storages.

Energinet.dk, Fingrid, Statnett and Svenska Kraftnät are appointed to be the issuer of the guarantee of origin of renewable electricity production. The costs for issuing the guarantees are financed by special fees. This is the case also with the renewable certificates issued and the register operated by Svenska Kraftnät and Energinet.dk.

Svenska Kraftnät and Energinet.dk are assigned as the authority for electricity contingency planning. Svenska Kraftnät has also special duties concerning dam safety in Sweden.

The duties that are not connected with the system responsibility mean additional costs for the TSOs. These costs should be financed by special fees based on the services provided. Otherwise, doubt may arise about distorting effects in the market and cross-subsidies between different TSO activities.

Recommended action:

The duties of the TSOs that are not directly connected with the system responsibility shall be clearly separated from the system responsibility and financed transparently.

3. Harmonisation of operational rules and practices in order to improve functioning of the market

In the following sections (3.1 - 3.5) a number of operational TSO tasks are described and differences between the Nordic countries analysed in detail. The purpose is to identify areas where these differences affect negatively to market development and therefore require further harmonisation.

It is important to notice that differences in performing these activities are not necessarily due to differences in legislation but rather to different national practices of the TSOs. The differences apply to financing of the costs as well.

Important operational TSO tasks, which can affect functioning of the market, include:

- Balance control
- Balance settlement
- Capacity allocation and congestion management
- Provision of system services
- Provision of technical functionality of the power system

As a background it is worth reminding that the common operational and planning principles and practices at the Nordic level have been signed by the Nordic TSOs in the Nordic Grid Code /5/. The Grid Code includes

- The System Operation Agreement, a binding agreement, that aims at joint upholding of the interconnected Nordic power system on a satisfactory level of reliability and quality and contributes to efficient utilisation of existing resources and efficient power trading.
- Connection Code specifies the technical requirements for connecting the facilities to the transmission system on non-discriminating terms. The national requirements may be stricter.
- Planning Code that describes common Nordic requirements, frames, processes and criteria for a joint Nordic planning. It also specifies the necessary information for the planning.
- Data Exchange Agreement that obliges the TSOs to exchange data that are needed for the planning purposes in the simulation models.

Common principles and practices, which are defined in the Nordic Grid Code, have been revisited on a regular basis and updated in order to improve system security and to adapt the rules to market changes and needs. These documents are regarded as international benchmarks for regional co-operation between the TSOs.

3.1 Balance control

The TSOs are responsible for balance control and regulation in order to keep the system frequency within the defined limits by maintaining the national balance between demand and supply by means of operational reserves. The market players are responsible for maintaining their individual physical balances and pay for the imbalances occurred within the operational

hour. The objective of balance responsibility is that the market players maintain their commercial obligations as to supply and demand in balance in all times.

In the report on peak balance issues /2/, Nordel emphasized the significance of the differences in the market players' right to adjust their schedules during a day in order to maintain their balances. The differences in adjustment rights mean different responsibilities between the market players and the TSOs and thus put the market players to an unequal situation leading to different cost allocations and risks between the market players. In Eastern Denmark, Finland and Sweden, Elbas market can be utilised for balancing purposes as an alternative for own resources or bilateral trading. In Western Denmark and Norway, the market players can adjust their balance within a day only with permission of the respective TSO in the bilateral market or utilising their own resources. The difference between the solutions is whether each market player is encouraged to maintain his balance within a day individually or whether the balancing is left to the TSO.

Since September 2002, there has been a common regulation market for the synchronously interconnected Nordic area i.e. all other Nordic regions except Western Denmark. Bids from the market players are activated from a common price list in merit order, if there are no congestions in the transmission grid. Nordel is studying the possibility to include also Western Denmark in the common regulation market.

Actions:

Nordic TSOs harmonise rules of the balance agreements so that the balance responsible parties can adjust their power position up to few hours before the operational hour at least.

Nordel will take measures to include Western Denmark in the Nordic regulation market.

3.2 Settlement of imbalances

The purpose of balance settlement is to settle the imbalances that occur in daily energy trade of the so-called balance responsible parties. In this report, balance settlement is used in a wide sense to cover rules of balance agreements, pricing and settlement principles for imbalances, fee structures, financing of the service costs, routines for measuring and reporting.

Settlement of imbalances is a service for the market players that is performed days or weeks after the operational hour. In principle, the settlement can be done by any neutral body, but it is appropriate that the TSOs do it. In order to ensure the transparency of the service, the functions should preferably be separated in accounting. In Finland and Sweden, there is a legal obligation to keep grid services and balance settlement as two separate businesses with no cross subsidies. In Denmark and Norway the balance settlement is separated in accounts. Differences in the pricing of the balance power lead to different cost allocation between the balance responsables and the grid customers.

Some general guidelines for balance responsibility are set in the legislation, but the details are defined in the balance agreements between the TSOs and the balance responsible parties. There are differences in the whole business process and philosophies of balance settlement: principal design, pricing of the imbalances, fees and fee structures, right for adjustment of

schedules, financing of the costs for balance service and routines for measuring and reporting.

Differences in the balance settlement create a threshold for the market players to expand their activities to other countries. Because of the differences, the market players have to establish different administrative procedures in different countries leading to extra costs. The extra costs may be the barrier for the newcomers and obstacle for the development of a Nordic retail market.

This is contributing one fundamental deficiency of the market; e.g. lack of true Nordic market at retail level. There is a well established wholesale market in the Nordic countries, but the opportunities for medium and small-scale end-users are largely limited to local markets.

To promote competition in the Nordic market two important steps could help the development of the retail market. One is harmonisation of rules related to measuring, reporting and calculation of load profiles. This is largely a task for authorities to carry out further. The second is the harmonisation of rules and practices of TSOs' balance settlement.

As to harmonising of TSO settlement procedures, Nordel has analysed the issue in the study published 2003 /3/. It arrived at two possible alternatives for a harmonised model in calculating the imbalances and pricing of the balance power:

- 1) three balances with one-price settlement for the consumption balance and two-price settlement for the generation and planning balances
- 2) one-price model with a large volume fee for balance power.

Nordel concluded also in the study that harmonisation of cost-base of settlement activity is pre-condition for more equal fees to customers. This relates to how the joint costs of e.g. operational reserves are shared between balancing and transmission services. It has significance as the balancing customers are all in the competitive sector.

Nevertheless, many market players stated in their feedback that for them the Nordic harmonisation was of secondary importance compared with conserving the present national model. The feedback is justified for the market players who are active in one country only. On the other hand, and as argued above, a more harmonised model is essential when developing the Nordic electricity market towards the objective defined by the Nordic Energy Ministers i.e. a true regional market without borders.

Recommended actions:

In order to promote competition the Nordic TSOs support development of a Nordic retail market and recommend the authorities to enhance this development and consider harmonisation of conditions of importance for end-users in the electricity market like rules on measuring, reporting and calculation of load profiles.

The principles of how to share the costs between balance services and network services should be harmonised. The balance responsible parties should, to the extent possible, be liable of their part of the cost without cross-subsidies between different TSO services.

Nordic TSOs reinvestigate a harmonised Nordic model for calculation of imbalances and pricing of the balance power. At least initially, main focus should be put to the further development of a model with similar type of approach as the alternative 1 above. Harmonisation would focus both on the number of balances to be controlled and on the pricing principles of imbalances.

3.3 Capacity allocation and congestion management

In the Nordic system, like in any power system, there are congestions of variable size and frequency. More permanent structural congestions can be removed, if socio-economic benefits are adequate, with strengthening of the network, which is a long-term measure (Chapter 6). At short term (on day-ahead basis), these congestions are handled by splitting the spot market area into price areas. Finally the TSOs guarantee the firmness of the given day-ahead capacity through counter-trade (redispatch) during operations after the spot market is cleared.

The System Operation Agreement defines the principles for determining the transmission capacities before spot trade is fixed and for handling of internal congestions after spot trade is fixed. However, there is a variety of practices related to handling of the internal congestions day-ahead e.g. before the spot trade is fixed. It is important to establish harmonised principles for handling internal congestions and to define under what conditions internal congestions can be moved to the border of Elspot areas.

Nordel has studied how an optimal access to capacity can be ensured and the possibilities for increased counter trade /1/. The purpose of such a measure would contribute to a more stable availability of the trading capacity and hence reduce some of the risks market players associate with market splitting.

Counter trade reduces differences between system and area prices and the risks of the market players, increases trading volumes across the borders and contributes apparently to an efficient functioning as well as credibility of the Nordic market. A drawback of increased counter trade is that the price signals for the market players will not be correct regarding transmission capacity. Counter trade is not considered to be an efficient mechanism for handling of structural congestions.

The measures recommended in the report were a limited increase of counter trade for temporary constraints. This was supported by a majority of the market players with the understanding that the additional costs, due to increased counter trade, need to be paid by the market players who get the benefit. Nordic TSOs should develop system of financing congestion management measures with this principle in mind.

Actions:

- TSOs shall set common principles and practices and increase transparency of these as to determining of trading capacities on borders and solving of congestions inside their own control area.
- TSOs shall further improve timing of planned maintenance outages to minimise the effects on the trading capacities.
- In temporary congestions, the counter trade should be increased to a limited extent to ensure a more stable and predictable trading capacity for the market.
- Procedures should be developed between TSOs and Nord Pool Spot to establish a market place for day-ahead counter trade. Use of Elspot has the main focus, provided that distorting effects for the market can be avoided.

3.4 Provision of system services

System services is a generic term for services the system operators acquire from the market players or provide by themselves in order to ensure compatibility with the operational security standards in each subsystem and to execute the system responsibility. Some of the system services can only be used to solve local problems. Some of them can be traded across the borders. Trading of these services is carried out bilaterally between the TSOs.

System services include for example operational reserves, reactive reserves, black starts and automatic load shedding. The principles of the services are in most cases agreed upon in the Nordel System Operation Agreement. The terms and availability of the services is determined in the agreements with the service providers.

Operational reserves are the tools of the TSOs to execute the system responsibility in maintaining the momentarily balance between supply and demand both in normal and disturbance situations. The differences in acquisition and financing of the operational reserves lead to different cost allocation for the market players. Development of common principles for more efficient acquisition and utilisation of the reserves would result in cost reductions.

System Operation Agreement defines the principles for the amount and utilisation of the manually activated reserves, but the reserves can only be shared as far as the transmission capacity allows for sharing in the prevailing operational situation. So far, the dimensioning and acquisition of the manually activated reserves have been done separately for each country (2 areas in Denmark).

Nordel has been studying a further co-ordination of the dimensioning and use of the manually activated operational reserves. The proposed dimensioning method /8/ is based on separation between three different dimensioning functions (dimensioning fault, dimensioning imbalance, planned counter trade) and takes into account the frequently occurring congestions in the transmission system.

In order to apply market based methods as far as possible, it is proposed /8/ to gradually establish a Nordic market for automatic and manually activated reserves respectively. The present national arrangements are incorporated in the course of time as they expire.

The use of the manually activated reserves is co-ordinated in the regulation market in merit order as far as no congestions limit the transmission between areas in the prevailing operational situation. The peak load resources, which are centrally acquired in Sweden based on a transitional arrangement, shall also be offered as bids in the regulating market based on a charge fixed in advance.

Actions:

Nordic TSOs include the proposed dimensioning and acquisition principles of the operational reserves into the System Operation Agreement.

Nordic TSOs gradually introduce a common market solutions for reserve functions where it is feasible. In addition, common principles of financing the operational reserves and cost sharing between the countries shall be developed.

3.5 Provision of technical functionality of the power system

The Nordic Grid Code specifies the minimum technical requirements to ensure the operational security of the power system. National requirements are set by the TSOs. Differences in national requirements cause different cost allocation for the market players. Especially the requirements for generators are of significance to ensure equal terms for competition in the Nordic market. This may have significance in practice, for example, when large number of wind power plants are being connected to the grid in various parts of Nordic area.

There are differences in the procedures how the TSOs control whether the new installations meet the requirements.

Action:

Nordic TSOs will further develop common principles for connecting facilities to the network and testing whether the new installations meet the requirements.

4. TSOs' co-operation in disturbances and shortage situations

Energy Ministers asked in the "Akureyri-declaration" whether there is need for enhanced TSO cooperation to manage power shortages or other extreme situations.

Principles for the management of shortage situations are defined in the System Operation Agreement. There are not differences that have an impact on the market functioning. The knowledge and capability to manage extreme situations of the Nordic power system has continuously increased and the recent black-outs did not show major deficiencies in Nordic operation practices.

Regardless of the existing good co-operation Nordel has seen it important to continue development in order to ensure high system security. Nordel has already earlier studied these issues and identified some development areas in system operation /10/.

Actions :

Nordic TSOs improve utilisation of an information platform for all common operational information exchange. Common information will help the TSOs especially in case of disturbances and extreme situations.

Nordic TSOs develop supervision of the available operational reserves in all situations by increasing real time measurements and by sharing real time data between control centres.

Nordic TSOs develop common procedures in co-ordinating planned outages of the transmission system as well as in organizing regular training and education of the operation personnel.

5. Actions in strengthening of the market mechanisms in peak load situations

In April 2004, Nordel presented a report on peak load capability in the Nordic electricity market /2/. Nordel concluded that the market will ensure market clearing and investments to meet the peak demand provided that the market mechanism works properly. Nordel proposed several actions to strengthen the market mechanisms and to boost incentives.

In Akureyri, the Energy Ministers called for clarification on what concrete measures the TSOs will take in this area. The measures taken by the TSOs since then are summarised in this chapter. Need for further measures is continuously evaluated by the TSOs.

5.1 TSO actions to enhance demand response

Nordel has seen demand side flexibility and demand response to high prices as a necessity for proper functioning of the market mechanism. Therefore, all the measures activating demand response have a high priority. Demand response is a complex issue. The TSOs have a role of a catalyst in enhancing demand response. Active contribution of the authorities and market players is also needed.

Demand response is an already existing resource for balancing and market clearing. To some extent it is a complement to investments in new power generation and will have an effect on the market price.

Currently, the TSOs have reserved about 2500 MW disconnectable loads to be used as manually activated operational reserves and peak load resources in the Nordic market. These cannot be utilised for market purposes in normal situations, but the corresponding amount of generation resources are then available to the market. In severe peak load situations the TSOs can use the operational reserves to a limited extent.

In addition to the disconnectable loads reserved by the TSOs there is a substantial potential of demand response resources in the market. The TSOs have made concrete actions plans for enhancing activation of the potential demand response /9/. The actions of the TSOs can be grouped in three different categories:

- Measures to enhance demand bidding for operational reserves and regulating market i.e. measures that are within the system responsibility of the TSOs.
- Initiate and finance studies and research & development projects, which are of common interest for market design and power system planning.
- Communication and information measures to encourage market players and other stakeholders to take measures within their responsibility

Currently, there is quite a good understanding of the potential demand response resources in the energy-intensive and other major industry. The focus in the further actions will be more on the activation of the demand response resources in the middle-size end-user group and households with electric heating. The removing of the barriers for demand response in these end-user groups is of vital importance.

In addition to demand response by the end-users other similar operational options to avoid forced load shedding can be found on the generation side (for example reduction of heat production in combined heat and power plants, use of local stand-by generators, use of overload capacity in power stations). The TSOs shall also investigate whether there is technical preparedness for utilisation of these options and willingness to commercial solutions.

The outcome of the activation measures should also be monitored. Nordel has made a proposal for systematic monitoring of the realised demand response (Chapter 5.4).

5.2 TSOs' actions in increasing awareness of the risks in extreme situations

The Nordic market relies on the incentives reflected via market prices. Risk policy and risk management play an important role in the decision making of the market players. Awareness of all the risks is a prerequisite for a proper risk management.

Elspot price is the primary indicator in evaluating market conditions. The tighter the physical situation is the higher the spot price normally is. The physical balances published by Nordel and the authorities will contribute to an increasing awareness of possible future risks.

The demand in Elspot can, if necessary, be pro-rata reduced in order to clear the market. Then, the market players can balance via Elbas in Eastern Denmark, Finland and Sweden or via bilateral trade. If these balancing measures are not enough, the regulation market will be the last resort to meet their commercial obligations. It is not allowed to use balancing power intentionally as a procurement source. The price of imbalances give an economic signal and incentive for ensuring sufficient peak load resources.

If all the available bids in the balancing market are used in the operational hour, the TSOs can utilise the operational reserves to a given extent. If these measures are not enough, only forced load shedding for up-regulation can be ordered to maintain the system frequency.

To harmonise practices and to avoid misuse of market power a common price limit for regulating bids shall be adopted by the Nordic TSOs. The price limit shall correspond to the evaluated costs of the most expensive disconnectable load (Value of Lost Load, VOLL) e.g. 5000 EUR/MWh. An upper limit for the regulating reduces the possibility to abuse market power.

A minimum price for balancing power when forced load shedding occurs shall also be considered. The minimum price shall at least correspond to the evaluated costs of the least expensive disconnectable load e.g. 2000 EUR/MWh. This will be an indication of the minimum cost of imbalance if the momentary balance cannot be maintained without forced load shedding.

Currently there are price limits only in Norway and Sweden.

Action:

Nordic TSOs harmonise the price limits for the regulating bids and balance power. The price limits should reflect the value of lost load.

5.3 Nord Pool's actions in introducing a new financial hedging product

Nordel has recommended introduction of a new financial trading product Contract for Peak Capability (CfPC) for hedging against price spikes in peak load situations. It is anticipated that the introduction of CfPC will result in an incentive for a stronger capacity balance in a market oriented way while the generators will be able to secure more predictable revenue for their investments. For example, Nord Pool ASA has planned to launch a new product during the first quarter in 2005 in Western Denmark, where the price variations have been larger than in the other price areas. Depending on the experiences in Western Denmark Nord Pool ASA will consider introduction of CfPC in the other areas as well. Nordel supports these plans.

5.4 TSOs' activities in analysing physical balances

Analysis of the future physical balances is important information for the market players to assess their future opportunities and for the authorities to monitor the balance between demand and supply and to start the tendering process according to the Electricity Market Directive, if needed.

The Directive requires monitoring of the national balances. Thus, there is a risk that the national balances are not compatible with the prospects in the whole Nordic market. A Nordic approach is needed when analysing the future physical balances and possibilities for efficient utilisation of the Nordic resources. Knowledge on the available transmission capacities between the Nordic regions is also needed in the analysis.

Nordel analyses systematically the Nordic power and energy balances in different regions taking into account also the transmission capacities. Power balance for the coming winter is released yearly in each autumn and power and energy balances three years ahead are released yearly in connection with the Nordel annual meeting.

ETSO, the organisation of the European Transmission System Operators, collects the European regional balances and makes a cross-checking between them in order to ensure their compatibility.

Demand response will contribute to maintaining the balance between demand and supply during peak load hours. Nordel has studied concrete possibilities to develop a systematic monitoring of the realised demand response /9/. Awareness of the realised demand response and the potential demand response resources (Chapter 5.1) will improve the quality of the balance analysis.

Actions:

Nordel and the Nordic authorities should consult with each other to ensure compatibility of the national and Nordic prospects of the market.

Nordic TSOs start a systematic monitoring of demand response as proposed in /9/.

6. Joint Nordic transmission investments

6.1 Nordel's recommendation on prioritised investments

The recognition that the Nordic area constitutes a regional market has led to a closer cooperation in Nordel in setting up a common analysis of the future development of the transmission grid. In 2002, Nordel published the Nordic Grid Master Plan that identified a number of cross-sections which should be prioritised and further analysed. The important feature in this is that the Nordic grid is seen as one entity and assessment takes into account the overall benefits for the market as a whole.

In June 2004, this work was followed by the Nordel report on Priority Cross-sections. The report recommended that the Nordic grid should be strengthened at five locations.. The total investment for these five projects amounts to about EUR 1000 million.

Nordel has a permanent planning activity within the Planning Committee and time horizon for the Nordic Grid Master Plan is set to about 10 years ahead.

In this report Nordel has analysed potential ways of financing and organising common investments in transmission grids /11/. In this context, it is important to note that organisational or financial arrangements between the TSOs are not the only relevant issues for getting new interconnector investments in place. Also the regulatory regimes and licensing procedures need to be such that they make it possible for the TSOs to carry out the Nordic investments.

6.2 Analysis of potential financing sources

There are several possibilities for the financing of the Nordel Priority Cross-sections. Since one source probably is not sufficient for all of the TSOs a combination of the described alternatives should be found. The following **four possible sources** were assessed:

1. Bilateral or unilateral TSO financing (National tariffs)
2. Congestion rents from internal Nordic connections
3. A common Nordic grid fee or trading fee
4. Contribution from EU inter TSO compensation mechanism

6.2.1 Bilateral or unilateral TSO financing (national tariffs)

Until now TSOs have financed grid investments bilaterally or unilaterally. Decision-making and financing for a new interconnection have originated in negotiations between the TSOs directly involved in the project and owning the adjacent transmission network. Each TSO investigates its own benefit of a given interconnection and decides if it will invest in this interconnection. The interconnection is financed via the TSOs' national tariffs.

Only two TSOs are participating in the decision-making. This makes the decision-making simple and efficient provided that the project is feasible.

6.2.2 Congestion rent from internal Nordic connections

The method for handling congestions in the transmission grid results in different price areas within the spot market. The price difference arising when there is congestion leads to congestion rent collected by Nord Pool Spot A/S and distributed to the Nordic TSOs based on principles agreed upon by the TSOs.

Historically, the congestion rents amount to approximately EUR 60 million per year in total, but the annual amount shows a very high volatility due to flow variations in the hydro dominated system. The congestion rents are paid by the market players on both sides of the bottleneck.

Today the congestion rents are used for different measures, like for lowering the grid tariff, for counter trade or for investments as stipulated in the EU regulation. These rents could instead be dedicated for projects relieving the congestions and thereby reduce restraints for the market.

Congestion rent arises due to limitation in transmission capacity and may indicate lack of capacity. The European Commission has also concluded in its latest draft for guidelines that "the congestion rents should preferably be assigned to specific predefined interconnection projects".

The volatility and uncertainty of the actual annual congestion rent may be a challenge when using the rents for financing the common investments. New transmission capacity will alleviate the current congestion but the consequences are hard to forecast since congestion might arise somewhere else owing to increased or changed flow patterns.

6.2.3 Common Nordic grid fee or trading fee

Another way for financing of common investments could be a common Nordic grid fee or a trading fee as supplement to the national TSO tariffs.

The grid tariff concept could be introduced on generation/feed-in (G-element) and/or on load/take-out (L-element). Another option is to introduce a trading fee based on market participation through charging the balance responsible parties, for example, in proportion to their sales to end-users. The new fee can be simple and may represent a stable and predictable source of income.

Possible drawback can be that the distribution of the costs across TSO customers may not necessarily correspond to that of the benefits resulting from the investments. As to practical feasibility, introduction of such a fee would require some time due to regulatory and contractual conditions related to tariff setting of the TSOs.

6.2.4 Contribution from EU inter TSO compensation mechanism

Nordic TSOs have joined the European inter-TSO compensation (ITC) mechanism for transit. New or reinforced connections would possibly host increasing transit flows. Therefore, the compensation which can be related to the invested lines could be taken into account for the financing of the projects.

This may be a transparent, simple and viable mechanism depending on the actual ITC mechanism in force. The compensation is presumably much more stable than congestion rents and it therefore establishes a suitable incentive for long term investments provided the ITC mechanism agreed upon is stable in itself. To constitute such an incentive has, in fact, been one of the main purposes of the mechanism.

6.3 Analysis of organisation models

The way the Nordic TSOs organise and finance infrastructure reinforcements must not be an obstacle to the necessary development. The objective must be to ensure that the common Nordic investments in transmission capacity are made in due time, financed based on a common approach and with transparent information to the market players.

Nordel has analysed four different models for handling investments in the Nordic grid. The models cover both financial and organisational aspects. Both aspects - together or individually - can be further integrated in a Nordic perspective.

1. Nordel bilateral financing (current model)
2. Nordel bilateral financing with earmarked congestion rents (Nordel BF)
3. Nordel grid planning and financing mechanism (Nordel P&F)
4. Nordic grid investment company (NIC).

Congestion rents would be earmarked for financing Nordic investments recommended by Nordel also in models 3 and 4.

6.3.1 Nordel bilateral financing (current model)

The principle of model 1 (current model) is that only the directly involved TSOs agree on an interconnection investment. The involved TSOs will finance, build and own the new transmission capacity. The congestion rents are not earmarked for financing investments. The model does not include any specific incentive for Nordic investments. Therefore there is a risk that the Nordic investments are not implemented, if the investment is feasible on the Nordic level, but not nationally. Nevertheless, it has been the traditional way of implementing interconnections even if not much used after the market was reformed and TSOs became independent. The conditions are not today exactly the same for interconnection investments, as long-term trade arrangements are no more behind the projects.

6.3.2 Nordel bilateral financing model with earmarked congestion rents (Nordel BF)

In model 2 (Nordel BF) the main purpose is to introduce an incentive for common Nordic investments with the help of a joint financial element. Nordic TSOs agree upon an investment package, as e.g. the five priority projects. Congestion rent will be earmarked for financing the investments and a possibility for a third party TSO financing will be introduced. The lines will still be owned and the investment decision will be made by the TSOs in the countries the line is situated. The earmarking ensures that the congestion rents are spent on Nordic investments in transmission capacity. This improves the transparency of how the congestion rent is spent.

Allocation of congestion rents is based on an agreement between the TSOs. The model could be later supplemented with a Nordic grid or trading fee.

6.3.3 Nordel grid planning and financing mechanism (Nordel P&F)

In model 3 (Nordel P&F) the purpose is to emphasize the Nordic grid planning function and separate it from national interests. The same financial elements as for model 2 (Nordel BF) apply, including earmarking of the congestion rents for the common projects. New feature is a Nordel office that, instead of the present planning committee and the TSOs, would be in charge of producing a grid plan for the whole Nordic system. In theory, the investments should be financed by the TSOs in proportion to their national socio-economic benefits of the investment. In practice, calculation of the benefits is a complex issue and the results are not always unambiguous.

The Nordel P&F office requires that the TSOs agree on the planning principles, i.e. a common methodology regarding the socio-economic effects, and agree on giving the authority to the planning office. One condition is that also Governments agree on this transfer of authority with the consequent reduction of national influence.

The Nordel P&F office should deal with internal Nordic interconnections and also consider interconnections to third countries to ensure that investments are assessed in a consistent manner. The planning methods and criteria should be public. The projects proposed by the Nordel P&F office are decided, implemented and financed by the TSOs. The lines will be owned by the TSOs in the countries the line is situated like in model 2. Establishment of the Nordel P&F office would probably require changes in the national legislation.

6.3.4 Nordic grid investment company (NIC)

In model 4 (NIC) the Nordic TSOs establish a Nordic grid investment company. The purpose of the company is to concentrate the decision making and avoid the sharing of costs and revenues between companies separately in each case. A Nordic grid investment company is established by the Nordic TSOs. The company would build and own all the new common investments. NIC should deal with internal Nordic interconnections and also consider interconnections to third countries. The costs would be financed by the congestion rents and later on by a common Nordic tariff or trading fee.

Many issues will need to be analysed and clarified before establishing a Nordic investment company. First of all the Nordic TSOs would need to agree on the same issues as in model 3 (Nordel P&F), i.e. the common methodology to calculate the socio-economic effects. Furthermore, there will probably be a need to harmonise energy policy, not at least because this will mean a transfer of national decision competence from the national TSOs to a pan Nordic organisation reducing the national governments influence on grid investments. In some countries, changes in the national legislation are probably needed. Each TSO could have a veto in investments decisions. Planning methods and results should be openly communicated to all stakeholders.

6.4 Conclusions concerning joint investments

The current, traditional model for organising and financing grid reinforcements on uni- or bilateral basis is still an applicable model. It can continue to form a basis for normal investment activity of the TSOs. Its challenge is, however, to handle projects which may not be in exclusive national interest but would benefit the market as a whole. Difficult issues like sharing of costs arise. Models of co-operation which could incentivise and facilitate decision-making and implementation of Nordic investments are therefore worth examining.

Concluding from the analysis above the Nordic TSOs should commit themselves to the principle that the congestion rents will be used earmarked for financing of Nordic grid investments. The market players, who pay the congestion rents, can later on benefit from reduced costs when the money is used to transmission investments.

The Nordel bilateral financing model with earmarked congestion rents (Nordel BF) is the most feasible one in the short term. It is the simplest extension from the current approach as it builds on the present organisational basis. The involved TSOs make the investment decisions, implement the projects and take care of the remaining financing. Hence it does not require any major structural or regulatory changes and should be possible to be implemented during 2005.

As to other models the Nordic Planning and Financing (P&F) and NIC, they imply more Nordic integration and require transfer of decision making from the national level to Nordic level. This requires political will and decisions by the shareholders accordingly as well as further harmonisation of the legislation in the Nordic countries. This is not feasible in the short-term. Nordic TSOs will investigate establishment of a possible permanent secretariat for Nordel eventually with a planning objectives as described in chapter 6.3.3 above to contribute to efficiency of TSO co-operation and the development of the Nordic electricity market.

Nordel will have a check-point in 2007 for evaluating the efficiency of the development in implementation of the five prioritized cross-sections for assessing possible further steps. In this evaluation process, Nordel will assess whether it would be useful to develop other structures and consider whether interconnections to third countries outside Nordel should be included in the Nordic system planning. The new investment needs may, as such, require new types of organisation and finance.

Actions:

Nordic TSOs commit themselves to carry on the process of implementing the package with the five prioritised cross-sections and use congestion rents as an earmarked source of part-finance for Nordic investments (Nordel BF).

For the above purpose Nordic TSOs sign an agreement on the principles and procedures for the allocation of congestion rents.

Nordel will have a check-point in 2007 for evaluating the efficiency of the agreed measures and for assessing whether a development of common organisational structures would be useful.

7. References

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