ASEAN ENERGY MARKET INTEGRATION (AEMI)

Energy Security and Connectivity:
The Nordic and European Union Approaches

FORUM PAPER

The Nord Pool Market Model

February 2016

Hans-Arild Bredesen
Nord Pool Consulting AS
Hans-Arild.Bredesen@npspot.com

Executive Summary

The Nordic power market has, based on its over 20 years of successful operation of a regional power market, been the blueprint for the development of the European integrated energy market. Its history has shown the need for pragmatic solutions and for allowing for a stepwise approach as the basic method for market development. In other words, progress should be through evolution, not revolution. Having a regulated power market has proven beneficial for the Nordic countries, but with the regulation defining the principles rather than detailed rules and allowing the power exchange to develop its offerings together with its market participants;

Transparency, neutrality and equal treatment (and access) for all parties are key cornerstones of a sustainable market. Stepwise implementation allows all stakeholders to learn as the market evolves, and this is relevant for both the market offerings as well as the geographical expansion. The involvement of the transmission system operators is needed to ensure that the coordination between market and system operation is maintained and developed based on the same principles.

The model has proven robust through implementation in many other regions of the world, from India to Southern Africa.

Introduction

The Nordic power market is viewed as one of the most successful power markets in the world. The market was established in 1993 based on the Norwegian approach to liberalisation and the new energy act of 1991, and has through the years moved from being a Norwegian power market to becoming the Nordic power market in 2000. Following this, it extended growth to include the Baltic States and the UK, in addition to becoming a service provider for other markets in Europe and potentially other parts of the world. Therefore, in some ways, the term "Nordic" as part of the name is still an important heritage and foundation for Nord Pool Spot's market and offerings, but the focus has in recent years become more European-centric, with current developments in the European market framework.

This paper aims to highlight some of the important milestones of this development, and to create a set of "lessons learned" that could be applicable for other emerging markets.

Motivations for Creating an Integrated Power Market

Prerequisites for the Changes in Norway

In the years between 1960 and the end of the 1980s, there was considerable expansion of new hydropower production facilities in Norway. The many small, municipality-owned power companies were responsible for the local power balance and supply obligations, and were therefore entitled to expand or enter into contracts to balance out their power needs and demands in their own area. This led to over-investment, and an overcapacity in Norwegian hydropower production, which subsequently gave rise to low power prices during this period. Investments and potential profits for the companies literally disappeared "straight into the ocean". Excess power was exported to Sweden at a lower price than that paid by Norwegian industry and households. Norway had a surplus situation, with a production capacity that far exceeded power consumption. A big issue was that Norwegian end-users paid a price that had been agreed with the local power company and did not profit from the surplus situation by being offered lower prices.

This organisation and administration of the power industry eventually led to a liberalisation process. The Ministry of Finance, not the Ministry of Oil and Energy, realising that the industry was based on uneconomic principles and operations, therefore raised the question of efficiency. Norway became one of the first countries in the world to discuss liberalisation and competition in the power industry, motivated by the low contribution made by the industry to national value creation as well as uneconomic incentives to invest in new power facilities. Also internationally, there was an increasing interest in reforming the electricity supply. Chile is recognised to be the first country to do a power sector reform followed by Norway.

The challenge was to develop a model tailored to an industry, and a commodity that was produced and consumed at the same time (in real time), and that thus had special prerequisites and requirements. The reform model had to take into account technical production conditions as well as limitations in the power grid's transmission capacity. The power companies' need to optimise production within a robust, efficient marketplace based on sustainable economic principles was a considerable challenge.

The Ministry of Finance, the Norwegian School of Economics and Business Administration (NHH/Einar Hope), and the Ministry of Petroleum and Energy provided important premises in this process. Einar Hope was a business economist who worked at the NHH research foundation, Centre for Applied Research (SNF). His understanding of economic models applied to the physical needs of the power industry proved crucial for subsequent measures taken.

In retrospect, it is clear that the liberalisation of the electricity market encouraged a struggle and manoeuvring for positions between the market liberalisers and the more conservative power industry—without being clear dividing lines between the policies of those involved. Compromise became one of the basic criteria for success in the market. A solution based on economic principles lay the foundation for a reliable operation of the power system, and was/is the main reason for its success.

The Political Process

The Norwegian government first made a proposal for a new Energy Act in the late 1980s. The Brundtland administration introduced a proposal in 1989, but it was met with strong opposition in Parliament. The main objective of the proposal was to rationalise the organisation of the power industry—which at that time comprised as many as 20 regional and vertically integrated power companies (responsible for both generation and distribution)—but to keep the framework for organisation and operation in the hands of the politicians. The largest municipalities in Norway were the main owners of these companies. At the time, up to 1991, the Directorate for State-Owned Power Plants (*Statskraftverkene*) was responsible for the state's production facilities and the main transmission grid.

After the 1989 general election in Norway, the Conservative Jan P. Syse became Prime Minister and leader of a right-wing coalition that led the country until November 1990. This short period of right-wing government proved crucial for the new Energy Act and the liberalisation of the power industry. With Eivind Reiten as Minister of Petroleum and Energy, the new act was prepared, presented and approved by the Parliament.

Eivind Reiten disagreed fundamentally with the proposal from the Brundtland government, so he rewrote the Act and based it on a different framework. The revised proposal still had rationalisation and the efficiency of the power industry as its objective, but included a clearer description of future ownership and responsibility relations in the industry. Unlike the earlier proposal, the reduction of the number of power companies was

not to be enforced by the NVE (Norwegian Water Resources and Energy Directorate), but to be voluntary, using market-based solutions. This implied that, while the aim was still a reduction in the number of power companies, control of the industry's development was left to the market rather than to the politicians. This important decision laid the foundation for Nord Pool and the success of the regional market.

The new Energy Act was passed after a fierce debate in the Parliament. The revised proposal was approved on 29 June 1990 and came into effect on 1 January 1991. It was to have great importance for the power industry's future in Norway—and in the rest of the Nordic countries.

New Energy Act

The new Energy Act required further clarifications and regulations in relation to the future organisation of power production, the transmission grid, system responsibility and operation coordination. Several working groups were established to analyse and recommend alternative solutions for implementation of the Energy Act. The market working group and the grid working group became particularly important for the final solution. The majority in the grid group supported the unbundling of Statskraftverkene, in accordance with the Ministry's view. One of the challenging tasks for the market group was to decide who should be granted the licence to operate the marketplace, which was to be issued by the state.

The Ministry of Petroleum and Energy set up a new project group with a mandate to examine the unbundling of Statskraftverkene, and the assignments and responsibilities of the new grid company. The Ministry of Finance and the Ministry of Petroleum and Energy had laid down detailed provisions in the mandate, and the project group was viewed with a degree of scepticism in the power industry. This working group established itself in an old transformer station, where it was well protected from lobbying and other influences. It cooperated closely with the Ministry of Petroleum and Energy, and a proposed proposition was forthcoming in spring 1991. It suggested a separation of the production and grid facilities of Statskraftverkene, and the establishment of a grid company.

In the summer of 1991, the Ministry concluded that Statskraftverkene would be broken up and that a new grid company, Statnett SF, would be in charge of system responsibility, operation coordination and concessions for the marketplace.

Eivind Reiten, the "father" of the Norwegian Energy Act, and Einar Hope, its "grandfather", were undoubtedly both instrumental in achieving this result. Mr Hope was one of the first to find solutions for a power market design where market concepts from the economists met the technical requirements from the engineers. With his swift handling of the proposition in the Parliament, Mr Reiten demonstrated both political flair and efficiency.

However, the result would probably not have been achieved without an efficient ministry apparatus. Sigurd Tveitereid, who is still active in the Ministry of Petroleum and

Energy, played a key role in the implementation of the Energy Act. He has also been an important partner for Statnett, Statnett Marked and Nord Pool since the late 1980s.

The division of Statkraftsverkene into Statkraft (generation) and Statnett (owner of the main transmission grid and central system operation) marked the end of a long, politically conflicted discussion. In the following period, Statkraft faced major fundamental challenges and organisational changes as a result of the competition principle that was introduced by the new Energy Act. The company's role changed fundamentally from ensuring access to cheap power for all of Norway, to building up an industry that was competitive both in Norway and in the international markets.

Until 1992, there had been considerable resistance towards this development, with many people unwilling to recognise the value of implementing the liberalisation legislation in the Energy Act.

Of course the implementation of the new market model had to not only consider the market itself, but also respect the overarching requirement of security of supply. As the Norwegian power system was (and is) dominated by hydropower, to cater for seasonal variations was also important, and has also played a key role in the expansion of the market model.

Pre-existing Conditions and Pre-conditions at the National Level for Building the Integrated Power Market

Unbundling

As stated above, the starting point of the Norwegian reform was the oversupply of electricity in Norway and the inefficiency arising from this. This reform had two consequences: to allow the Norwegian customers to get access to the lower prices and then also allow for a more efficient (both technically and economically) management of cross-border flows.

One of the key tasks in most power sector reforms is the unbundling of the power companies. Historically, prior to a reform, a country's power sector is dominated by one incumbent, vertically integrated power company. It is important to unbundle this one power company into individual companies that serve the following functions:

- Transmissions system operator: owner of the main grid and also the national system operator. This needs to be regulated as a natural monopoly by the national energy regulatory authority.
- Distribution companies: distribution to end-consumers at a lower voltage level.
- Generation companies: taking care of power generation. This could also be split into several companies.

- Retailers (trading) companies: selling power to the end-consumers; could be part of either a distribution company or generation company.

This unbundling is vital to the creation of a competitive market; it was an important factor in the establishment of the Nordic market. Depending on the situation, there might be other unbundling that is required. If the incumbent company has held full control of the power generation, it must be split (divested) in smaller companies— or join a bigger market.

All the Nordic countries started their reregulation process in the first parts of the 1990s and essentially followed the same process. This allowed for an easy integration of the other countries into the Nord Pool market. The other Nordic countries had similar structures as a starting point, and many of their processes followed the same path as Norway in many respects. The following sections will discuss some of the different requirements for developing the regional power market.

Privatisation: A Potential Tool, but No Requirement

One observation that is important – and one that contradicts a lot of the requirements of some international organisations – concerns the requirement for privatisation. In the Nordic countries (and for that sake Europe), the largest power companies in both generation and distribution are state-owned, either fully or as the majority owners. These companies need to be organised as any competitive company, with a professional management and board structure, allowing them to operate on equal basis as private companies.

For Statkraft—the Norwegian incumbent power company—it took a long time for them to adapt to a "market" way of thinking and a profit-run mentality. As with many other incumbent power companies, Statkraft was "shocked" to discover that its former customers went to newly established traders to buy cheap power traded on the power exchange. Therefore, their management quickly realised that if the company were to survive and continue to produce good economic results for its owners, its strategy and business concept had to change. A new vision was thus formed, and its objective was to intensify market activities and develop product ranges in order to meet the requirements of the customers.

After market liberalisation, the power companies had two alternatives: production could be based (as before) on long-term bilateral contracts, or they could choose to exploit the potential of the new power markets. Their decision needed to be based on risk assessment, since the new power market was starting with limited liquidity and high price volatility. Therefore, it is important to be patient and not expect high liquidity from the start—the market must be allowed to earn trust and, based on this, liquidity will develop.

From the mid-1990s, Statkraft increasingly shifted its trading to the market, motivated by the growth of the market and its development towards an integrated Nordic power market. The organisation had the market advantage of a comprehensive

hydropower-based power portfolio spread out over the entire country, as well as in-depth knowledge of fundamental market drivers. It had also been conducting fundamental analyses of the underlying values of Norway's power industry for many decades. The company had acquired expertise and models that could be employed in trading strategy in the market— with increased potential for good earnings. The case of Statkraft holds an important lesson: instead of limiting and "destroying" the incumbent power company, let it become a national champion in the growing power market. The organisation has held a strong position in the Norwegian market, and its ownership share of the Norwegian generation fleet has remained strong from 1991 till the present. Its ownership in 1991 was approximately 32 per cent of total generating capacity and is, as of 2014, approximately 34 per cent (depending on how this part-ownership of some other Norwegian companies is valued). So Statkraft's dominant role has remained approximately the same, but at the same time the company has grown in size due to its international presence.

The history of large incumbent power companies and how they have evolved together with the market is another clear experience from the development of the Nordic power market. In all the Nordic companies, the large organisations (Statkraft in Norway; Vattenfall in Sweden; Fortum in Finland; DONG Energy in Denmark) have been allowed to grow with the market, and all four national champions have become some of the largest and most successful power companies in both Nordic countries and Europe. Their growth is mostly a result of their becoming more international (first in the Nordic market, then internationally). Hence, it is important to carefully assess any required split of these companies.

Acquisition and consolidation is another method chosen by all these four companies as a way of tackling new competition. With the establishment of Nord Pool in 1996, the market changed and acquired a Nordic perspective. Given the geographical extent of the market including all the Nordic countries, the size of the companies became an increasingly important competitive factor. To allow these firms to sustain their positions, it was crucial for these incumbent state-owned companies to have competitive corporate structures and operate according to sound business rules; and the state was not to have any political influence over the business.

All Nordic countries are presently abiding by EU Competition laws; this includes Norway, though it is outside the EU. As a condition for access to the EU internal market through the EEA (European Economic Area), Norway has implemented the same laws. It is also important for these companies not to be favoured by the state, e.g. when it comes to financing. One could actually argue that for some of these companies there is a disadvantage to be state-owned when it comes to financing, as the profit of these companies to a large extent is directly given back the to the state and the possibility to invest these funds is limited. For instance, in 2013, the Norwegian state took 99 per cent of Statkraft's profit.

These companies have participated in shaping the developments of the Nordic power industry, and have gone from being government-run enterprises to becoming some

of the most innovative power companies in Europe—ones that fully exploit the flexibility of hydropower. In retrospect, it was a sensible strategic decision to have spent time on the necessary changes. The extension of knowledge and competence that has been acquired over many years, while simultaneously adapting to new challenges and steadily increasing international competition, were made possible by this strategy.

Market Liberalisation

The liberalisation of the market needs to be extended to the full market. However, as with all successful power sector reforms, this will have to be done in a stepwise manner. The first task is of course the unbundling, as discussed above. Next, it is important to create an eligibility criteria for the demand side. What has been accepted as good practice is one that has set strict criteria initially that will be gradually relaxed over time to allow more companies to participate.

The same will apply for end-users. Normally, before a power sector reform, all end-consumers have a regulated (and also fixed) tariff. The best practice is to have the same stepwise approach to this—expose end-consumers progressively to competitive market prices—to allow all parties to adapt and learn.

Another related topic that is almost always discussed as part of this process, is the support for vulnerable customers. What is seen in almost any non-deregulated market is that the end-user tariff is not cost-reflective, and kept at an artificially low value to include some support and subsidy element. This is one of the strongest forces against a power sector reform—how not to hurt end-consumers with higher prices.

There are many good examples that show how to implement a power sector reform and still have a scheme to protect the vulnerable consumers. They key is, again, to make these changes in stages, and to allow for learning and adaptations along the way.

Market Regulation and Pricing

One of the key elements of the power market reform in Norway and the other Nordic countries was to have full market opening, or full market liberalisation. However, in Norway, as in any other country facing the same kind of requirement, the implementation process should be gradual. There is no need for the country to have a fully liberalised market from the start.

In Norway, it took two years from the start of the Day-Ahead market for the market to be fully liberalised. In other markets, this process has taken a longer time. The main reason behind the quicker process in Norway had to do with the fact that its power sector was very decentralised from the beginning, and there was no need for any unbundling of companies. However, in other markets such as Turkey and Romania, their power sectors have had to undergo several other reforms and unbundling, and they thus took a longer time to achieve full market opening.

There are several reasons for promoting a stepwise approach. First of all, it is important that all the key stakeholders in the market be allowed to learn. In the initial phase of introduction of a new market, it can expected that there will be relatively small volumes in the market and price formation will be effected by this. With a stepwise approach, the market participants will be allowed to learn and understand the use of the markets as part of the management of their assets. Experience also shows that having a voluntary market will assist in this learning. However, it will be important to have some liquidity-promoting measures in place. One of the most common solutions is to oblige the Transmission System Operator (TSO) to buy all their losses in the main grid from the market. This will ensure that there always will be a buyer in the market. There are many different other mechanisms that could be introduced, which will not be covered in this paper.

As a measure to promote liquidity in the Nordic power market, all available transmission capacity between the different market areas has been given to the market. This means that the market is the only route to cross-border trading. Other measures include either horizontal or vertical obligation to participate, i.e. either certain participants are obliged to be in the market with all or some volumes, or all market participants need to source at least a given percentage from the market.

Grid Connectivity

In the EU, grid interconnection capacity has been a key constraint to developing the single energy market. The Nordic region is an example of how this can be managed over time. Since the introduction of the market in Norway in 1993, and up till the present, the demand for power has steadily increased, but investments in new power generation have not grown at the same rate. This is because, in the Nordics, the interconnection capacity between the countries has tripled in the same period. This can be referred to as "utilisation of the differences in the region", meaning that we have very diversified power generation in the different countries, whereby:

- Norway is dominated by hydropower, offering short-term flexibility and cheap hydropower in wet years.
- Sweden has a more diversified power sector, with hydropower in the north and thermal (including nuclear) in the south.
- Denmark has a high penetration of wind power.
- Finland has thermal resources (including nuclear).

In a season or year with high precipitation, Norway and northern Sweden have excess of cheap hydropower—but in a dryer year, it would like to use the thermal baseload from southern Sweden and Finland. When the wind is blowing, Denmark has a lot of cheap

("free") wind power, but in other times it is reliant on the support of its neighbours. In sum, this means that we have a better utilisation of the power resources in the region, allowing the countries to support one another with reserves in different situations.

This situation will improve with the availability of more interconnections. However, each of these infrastructure projects will have its own business case and the regulatory authority will be responsible for granting the building licences. Normally, the business case will include the sourcing for financing—either through the transmission tariff or by external financing. The TSOs will typically be the ones to build these interconnections. This means that their motivations will include not only purely economic reasons, but they will also consider security of supply and system services in their valuation of the interconnection.

Another reason why TSOs build interconnections is because there is a regulation requiring congestion rent[1] between the market areas to be given to the owners (normally the TSOs). In return, the regulation specifies that all the income from congestion rent shall be used to improve the network. In the Nordic market, all the Nordic TSOs cooperate and use this income to decide the best place for these investments. The Nordic TSOs have all this while had an agency for cooperation: at the beginning this was called NordEl, and after the establishment of ENTSO-e (The European Agency for Energy Transmission System Operators), this has been maintained as one subgroup with regular meetings. The same cooperation has been there for the NRAs (National Regulatory Authorities): NordReg. Based on the history, it can be said that this approach has worked.

Congestion rent is of course the only source of income for the TSOs. In the Nordic countries, there is an ex-ante income cap based regulation where essentially the TSOs will, according to detailed documentation, create a budget that justifies a transmission tariff (for the main grid and system operation) that is approved by the NRAs.

It cannot be said that there is any minimum limit for having a regional market—as soon as there is some capacity, it can be utilised. The market model used in Europe, taken from the Nordic approach, is based on an implicit auction that will ensure that the power between the market areas will always be flowing from a low- to a high-priced area. In addition to internal interconnections between the Nordic countries, there have been built several interconnections to continental Europe, e.g. NorNed between Norway and the Netherlands; ESTLINK between Finland and Estonia; SWEDPOL between Sweden and Poland; and BALTLINK between Sweden and Lithuania.

[1] "Congestion rent" is an expression that relates to the income that is being generated when there is congestion between two market areas that will result in different prices in these areas. The market algorithm will ensure that the flow on the interconnection will travel from the low-priced area to the high-priced area. This will thus mean that all volumes flowing on the interconnection will be bought in the lower-priced area and sold in the higher-priced area, thus generating a surplus of money, i.e. congestion rent.

The Growing Membership of Nord Pool

The history of the Nord Pool market is essentially one of changes and expansion. When Norway started its liberalisation process, it took place at more or less at the same time as that of other Nordic countries. As explained above, Norwegian history is marked by certain visionary individuals who also had the ability to implement the required changes. When Sweden followed the same liberalisation process after three years, it faced some of the same issues as Norway, though it also had a major market power challenge due to Vattenfall's dominant position in the national market. The questions asked were—put in simple terms— *shall we split Vattenfall in smaller entities or shall we join Norway and thereby allow them to be unchanged?* We know the answer: they joined Norway and thus took the important first step towards creating the regional market. This was also thanks to pragmatism from the Swedish that allowed for a simple implementation. The very good interpersonal working relationship between the heads of the Norwegian and Swedish TSOs also facilitated open discussions along the way. This is also an important lesson in the Nordic history: a regional market can by itself be a means to reduce or eliminate dominant market power. The same applies if the countries are small (e.g. the Baltic states): joining a larger market will increase the competition for the national champions.

This first step was extremely crucial, because this laid the ground for how to implement further expansion; the TSOs should be the owners and share an equal position. This has since been the guiding principle for expansion of the Nordic market to all the Nordic countries as well as the Baltics.

Essentially, it took 10 years to build the Nordic market (from the Energy Act in 1991 in Norway to the inclusion of Denmark in late 2000). The process for the initial market launch in Norway and the process of creating the common market with Sweden is described above. When it comes to Finland, their main challenge was the organisation of their market before deregulation. It was a requirement from Statnett and Svenska Kraftnät that the power industry in Finland should have the same structure as in Norway and Sweden, with separate ownership of grid and production.

The Finnish power supply industry was dominated by two companies which also owned a high-voltage power grid. The state-owned company IVO (Imatran Voima Oy) dominated power production with more than 30 per cent of the total production capacity in Finland. The privately owned PVO (Pohjolan Voima) was the second largest company. In principle, the wholesale market was open in the sense that suppliers or industrial users could choose between long-term contracts and construction of their own power plants. In practice, however, the latter was the only a realistic option for a few parties.

Fingrid (the Finnish TSO) quickly realised that cooperation with other northern European countries could help Finnish power supply to become less dependent on Russia. Geographically situated in the periphery of Europe, Finland wanted to orientate itself towards Europe and their partners in the EU. Initially, from the date Finland became

integrated in the market area, Fingrid was given observer status on the board until it became owners with the creation of Nord Pool Spot in 2002.

The liberalisation process in Denmark was fundamentally different from that in the other Nordic countries. While the Ministries of Finance and Energy controlled the processes in Norway, Sweden and Finland, the process of market adaptation of the Danish power industry was run by the industry itself.

Another feature that distinguished Denmark from the other Nordic countries was its power supply which comprised two separate grids. Elsam was responsible for operating the power system in Jutland and on Funen, while Elkraft was responsible for Zealand. There was no physical link between the two. Jutland and Funen were synchronised with the central grid in Europe, and Zealand with the Nordic countries. This physical division in Denmark was not only typical of its electricity supply, but also a general outcome of the establishment of Danish industry over the years. There were strong differences of opinion between these two regions, and this was the reason for the country's integration into the Nordic power market in two steps. However, when Danish politicians finally decided to support the development, the resulting Energy Act was based on the same principles as in the rest of the Nordic countries.

After this, Nord Pool started to support other exchanges that were launched. Both the German and French markets were initiated based on support from Nord Pool, in the form of capacity-building and software. During this process, Nord Pool Consulting (NPC) was established to allow this to be done in such a manner that the internal market operation was not affected by the new services. NPC has over the years supported the market establishment in many regions of the world.

The process of progressively coupling with the EU internal market has been very time-consuming for Nord Pool. There have been many market coupling solutions over time, the main being:

- Nord Pool grew to cover the KONTEK area in Germany, thus allowing implicit cross-border trading between the Nordic area and Germany.
- The European Market Coupling Company (EMCC) was created by the power exchanges, TSOs and National Regulatory Authorities (NRA) in the northwest region of Europe, and it implemented a volume-based market coupling.
- The Price Coupling of Regions (PCR) project created by the largest power exchanges in Europe, which established a common market clearing algorithm to be used by all the power exchanges to allow for a price coupled solution. This went live in 2014, and has been a great success that enables one common implicit auction to cover all countries from Helsinki to Lisbon.

The market process in the Nordic countries as well as in Europe has been driven by the need for more economic efficiency. Without any market coupling in place, it was evident

that the overall utilisation of the power sector resources was not efficient. The object function of the market algorithm, developed first in Norway and evolved both through the Nordic and European market, is based on the *maximising of social welfare* for all market areas.

Transparency

Since the very beginning, transparency has been, and remains, central to sustaining Nord Pool's success. Why? A transparent market—where all participants have equal access to relevant information—is a prerequisite for a well-functioning, competitive and efficient market. It engenders trust, lowers barriers to entry and attracts new entrants, all of which help generate liquidity. This has proved to be true across all of the markets and makes transparency a priority when expanding geographically.

Data provision has been a major contributor to the high degree of transparency created in the Nordic power market. Comprehensive data libraries storing more than a decade's data have been built. These data include prices, capacities, flows, production, consumption, exchange and regulating power data. These are readily accessible for use, primarily by market members, and provide products developed from packaged historical data. Together this data helps keep the market transparent, as participants have equal sight of information that influences prices.

In recent years, anti-market abuse legislation and regulation designed to boost power market transparency in the European Union (EU) electricity markets has added to the amount of data available. The Regulation on Energy Market Integrity and Transparency (REMIT) requires that all EU energy market players publish price-sensitive information, and will enforce the Nordic data reporting requirement for all EU countries. These rules will be implemented in all the Nordic countries, as well as in Norway as a non-EU member. The main portion of REMIT went live in October 2015 and Nord Pool has been a pioneer in establishing the rules and systems for this.

Both regulatory demand and market expectation are driving greater transparency. As a result, there is a focus on continuously developing improved accessibility in how data is presented. There is also an equally important need for transparency in information from the whole market on developments that can affect prices; crucial among them are changes such as power outages or other information that may affect prices significantly if made public. All members are obliged to report such events to REMIT according to the market rules. They must publish information to the market, and are restricted in their trading until they do. Following up on this is the Market Surveillance team at Nord Pool Spot.

The Management of the Market

Since the start of the fully-liberalised market in Norway, the TSOs have had ownership of the physical market. There are several reasons for this. Most importantly, all the markets

for physical power will end up as a schedule that will be sent to the TSO for the ultimate balancing of the power system. Therefore, close cooperation with the TSO will be extremely important to ensure that the overall market concept—including all power markets operated by power exchanges, as well as the internal markets seeing to the TSO's needs—serves a common principle. In other words, all activities in the market are ultimately driven by planning. By having the TSO as an owner, connection and cooperation are ensured directly.

The current ownership of Nord Pool Spot is divided between the TSOs in the underlying markets according to the following shares:

- Statnett (Norway) 28.2%
- Svenska Kraftnät (Sweden) 28.2%
- Fingrid (Finland) 18.8%
- Energinet.dk (Denmark) 18.8%
- Elering (Estonia) 2.0%
- Litgrid (Lithuania) 2.0%
- Latvenergo (Latvia) 2.0%

The ownership shares are a result of the evolution of the markets: Norway and Sweden as the two first owners and the hosts of the financial market have the biggest share; Finland and Denmark have the same share, while the Baltic countries got a smaller share when they joined. The shareholdings are both a result of the process of joining, and that of the increasing value of the market operator itself and the actual cost of buying a share. What is important is that all have a seat on the board.

Nord Pool Spot operates under a licence issued by NVE. This licence comes with several conditions, and the most interesting of these pertaining to the company's operations are:

- The licensee's revenue from the organisation and operation of the marketplace shall cover its costs and provide a reasonable profit through efficient operations.
- The licensee shall have an advisory board with broad representation from the parties in the market—meaning that most of the business development is driven by the market itself.

At the same time, the organisation of the company is based on both having an efficient organisation and also recognising the characteristics of the region. Therefore, Nord Pool Spot today has offices in all the countries it covers. There are differences between the employees in each country, and each office has its own functions. The main office is still in Norway where approximately 50 per cent of its staff are based. In addition, Finland has the second largest office which houses Nord Pool Spot's IT department where the IT

organisation is located. In Stockholm, the CEO has their office in addition to some of the resources on business development. In the other countries, Nord Pool Spot has teams that see to market functions (e.g. sales and communications).

Nord Pool Spot is at present a rather small organisation with a headcount just exceeding 100 people. The Norway location of its main office is based the history: it was in Norway that Nord Pool was established, and its main operations have always been based there. Nordic and Baltic NRAs decided early on that even though the market was regulated in all the participating countries, NVE (Norwegian Directorate for Energy and Water Resources) should be the operational regulatory body for Nord Pool Spot, but with the support of the other regulators. Nevertheless, all the NRAs have access to the same information and have equal rights; but to make the regulatory tasks more efficient, the day-to-day contact is with NVE. The organisation has a normal set-up, with a special unit responsible for market surveillance.

The Nordic market has had a marketplace licence from the start, but was only formally fully regulated in 2001. This experience shows that a regulated market is good for market development. To have a competent NRA that oversees the operation has also proven to be valuable for the market.

Nord Pool can be seen as a long success story, but of course it has had to overcome several challenges throughout its development. One of the first challenges arose when Finland and Denmark were to become co-owners of Nord Pool. The problem arose from the success of the market that boosted the price that these countries would have to pay to buy a share of the company. This was mainly because the financial derivatives market had become a success, which led to the high valuation of the company. This problem was solved by splitting Nord Pool into two main units: the physical markets that then was to be owned by all the TSOs; and the financial market was to be owned by the two initial owners (Statnett, the Norwegian TSO; and Svenska Kraftnät, the Swedish TSO). This split also created some challenges in the management of these two different entities as Nord Pool Spot was in this process created to manage the physical markets while Nord Pool ASA still operated the financial market. The conclusion to all this came in 2008 when the financial market was sold to NASDAQ, and was operated by them on commercial terms thereafter.

Integration with European markets has also been challenging as the process has been very resource-intensive and has required a lot of careful management. Therefore, for several years, the business development unit was renamed “European integration”. However, with the PCR (Price Coupling of the Regions) project going live, this situation has improved.

Another important factor behind the success of the market is that the regulation of the market is based on principles, not detailed rules. This gives the power exchange the possibility of developing its offerings within these principles. The Nord Pool Spot market licence is five pages long, and just lists a set of principal requirements:

- The licensee shall as far as possible contribute to efficient price formation and appropriate energy flows.
- The licensee shall act in a neutral and non-discriminatory manner, including ensuring impartiality of all parties and efficient access to information that is of importance to price formation.
- The licensee shall design a suitable infrastructure, regulations for trade, and contracts between parties, as well as systems for collateral and settlement that ensure confidence and predictability for the parties.
- The licensee's revenue from the organisation and operation of the marketplace shall cover its costs and provide a reasonable profit through efficient operations.
- The licensee shall have an advisory board with broad representation from the parties in the market.
- The licensee has a duty to disclose information to NRA.
- The licensee shall apply to NRA for approval of measures/changes well in advance of the time when the changes have or may have an influence on price formation. The licensee must carry out an impact study in relation to the changes being presented, and the views of affected parties via the advisory board and possible comments from other market participants shall be submitted to NRA.
- Primary capital requirements
- Market surveillance
- The licensee is obliged to handle confidentially information concerning market participants' business which it will be of competitive importance to keep secret.
- Changes to conditions: in special cases, the established conditions may be changed in order to take account of public interest.
- Withdrawal of concession: the licence can be withdrawn if it was issued on the basis of incorrect or incomplete information regarding conditions that are of material importance, or if the licensee contravenes the Energy Act or regulations and ordinances issued pursuant to this act.

The detailed rules for the market can therefore be defined (and maintained) in the market participant agreements that include much more information. This means, for example, that all the detailed bidding rules, order forms, settlement calculations, order types offered in the market, security requirements, and other operational requirements are defined in the participant agreements and can thus be adapted relatively easily as long as the main operation of the market is within the licence's requirements.

Southern African Power Pool: A Case Study

The development of the Nordic market model has throughout the years attracted many other regions that want to learn from the development of this power market. Southern

African Power Pool (SAPP) has been one of the long-term relationships established. SAPP was created on 28 August 1995, with the primary aim of providing reliable and economical electricity supply to consumers in each of the SAPP member countries, consistent with the rational utilisation of natural resources and minimised negative impact on the environment.[2]

Cooperation in the electricity sector is not a new phenomenon in the Southern African region; it has taken place at policy, planning and operational levels and has involved governments, power utilities and financial agencies over a period of several decades. To formalise this cooperation, several of the utilities in the region came together to create SAPP. The members of SAPP have undertaken to create a common market for electricity in the Southern African region—the Southern African Development Community (SADC)—and to let their customers benefit from the advantages associated with this market. All utilities participating in SAPP have equal rights and obligations, and have agreed to act in solidarity without taking advantage of one another. Members share information and knowledge, and strive to be politically neutral.

SAPP cooperation includes development, common planning, and system operation. The overarching cooperation is done through an agreement between the energy ministries in the region. There is also a committee structure that enables different topics of concern to be discussed. At the top of this structure is the Executive Committee, with its supporting committees, namely: the Management, Markets, Operations, Planning, Telecommunication and Environmental sub-committees. In addition, there is a Control Centre that acts as the operational body for the cooperation and as the market operator.

The Norwegian and Swedish organisations NORAD (The Norwegian Agency for Development Cooperation) and SIDA (Swedish International Development Cooperation Agency) have been two of the main contributors to the establishment and operations of SAPP. SAPP's first decade of operation where focused on regional planning and grid development. In early 2000, its focus slowly turned to regional market development. It was in this period that contact with Nord Pool was established, mainly through Nord Pool Consulting (NPC). After a visit to Norway, a consulting agreement on market development was signed in 2004 and NPC has been assisting them ever since.

The first task was to create a market design that was based on the Nordic experience, but adapted to local conditions in the region. In 2006, a contract for development of their day-ahead market was signed with Nord Pool and a local vendor in South Africa (Enerweb), marking the start of a long journey of market development for the region. The market went live in 2009 but had a very slow start due to the fact that most interconnection capacity was sold through long-term bilateral contracts. However, the market has slowly opened for more trading and today SAPP is operating a healthy market consisting of three different market segments: FPM (Forward Physical Market), allowing for monthly and weekly

[2] SAPP membership includes utilities from the following countries: Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

trading; DAM (Day-Ahead Market), trading the 24 hours for tomorrow; and the IDM (Intra-Day Market), allowing for hourly trading up to one hour ahead of the actual hour.

All of these markets have been developed in close cooperation with the original partners from Norway and South Africa to ensure that all relevant experience—both international and regional—are taken into account.

One important lesson drawn from this market is that the national markets have not been deregulated—there are still national incumbent power companies acting as single buyers (and sellers) of electricity. However, this is not hindering the development of using a market model to ensure the best utilisation of the power resources in the region. In some countries, IPPs (Independent Power Producers) have been allowed to participate directly in the market and the national markets are gradually opening to the competitive market.

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