

INTERFACES BETWEEN SYSTEM OPERATORS, MARKET OPERATORS AND OTHER MARKET ACTORS

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On behalf of JWG C2/C5-05: Development and Changes in the Business of System Operator

SUMMARY

The background for the paper is work done within the JWG C2/C5-05. Related work was published in 2002 based on the responses of a questionnaire circulated in 2001. This paper contains a review and an update of the conclusions made at that time, together with a description of market developments with increased focus on the interfaces between the market actors.

Some of the findings of the 2001 questionnaire responses seemed to be linked to how long the market had been in operation. During the liberalization, most countries appear to take several steps instead of going for an over complicated solution immediately.

A new questionnaire that focused on status of liberalization and the progress since 2001 has been circulated. Responses were received from 10 countries. The paper gives a brief description of the status for each country and discusses the driving forces. The findings are that for example both for USA and Europe external forces as political decisions are important. In USA the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Council (NERC) are important drivers for the liberalization process. In Europe similarly the EU and the EU-Directives and associated regulations and guidelines are important drivers. The EU internal market directive defines fundamental principles and milestones for the process. To which extent the member states implement the changes differ. Some are in front while others just follow the minimum requirements. In USA the states are also in very different stages of liberalization. Other countries as Brazil, Korea and Japan are working on liberalization issues but are not currently fully liberalized.

Another important observation is that market design is a continuous process where functions are introduced in steps. All the countries that early made steps in the direction of liberalization of electricity industry, have made reviews of their original schemes and are redesigning the markets. In Europe some changes have been made due to regulations imposed by the European Union, while other adaptations are made to enhance market functioning and to increase competition.

KEYWORDS

Market development – Liberalization – Interface – Competition – Efficiency

1.0 INTRODUCTION

The JWG C2/C5-05 has its main working area within the changes the system operators (SO) face in the changing liberalized market system. The terms of reference for the JWG states that it shall focus on the developments and future trends of the system operators in the competitive electricity market environment, monitor the evolution of the system operator activities and describe different development paths and compare actual solutions.

The working group has published several papers related to the changes and challenges in the new competitive environment [1, 2, 3, 4]. Paper [1] presented the results of a questionnaire survey and subsequent analysis and discussions within (at that time) the Cigre WG 39.05 of the development and changes in the business of system operators as a result of the liberalization and restructuring in the electricity industry. The analysis was concentrated on: Electricity market organisation, driving forces behind liberalization, changes in the SO function due to liberalization and its stages in different countries. Some key findings from those analyses were:

- There were different motives for liberalization as: Increased efficiency and competition, attraction of private investment as well as freeing up capital.
- Basic requirements for a well functioning market are: Enough actors in the market, well-defined framework and true separation of competitive and monopoly activities.
- Some functions appear only in more mature markets, and most countries appear to take several steps in the liberalization process by starting with the basic functions first.

Some of the findings of the 2001 questionnaire responses seemed to be linked to how long the market had been in operation. During the liberalization, most countries appear to take several steps instead of going for an over complicated solution immediately. Some basic activities are first established in the process of getting full competition. As an example, financial instruments such as derivatives and financial hedging did not exist in the list of planned activities for the systems that were planning liberalization.

The amount of experience among the respondents at that time was very different, and the responses were classified into:

- Liberalized for more than 3-5 years
- In the transition process and have started implementation
- Planning or not yet started

Many of the countries in the transition process have now gained significant experience and major changes are also made in some countries in the liberalized group. There is also a trend with steadily expanding markets with more cooperation and electricity trade over international connections.

This paper addresses the consequences of these changes, evaluates the trends and discusses the challenges in the coordination of the development process. There are different kinds of markets with different time horizons. In the development of the markets the following interfaces and relations are important to consider:

- Regulator, market operator and system operators responsibilities
- Market and operation players interests
- Market actors versus system operator perspectives
- The roles of governments and end consumers

The paper discusses what is technically feasible today related to information exchange and coordination principles, and includes some future aspects on system operation and coordination.

2.0 SURVEY UPDATE

A questionnaire has been circulated to all respondents of the first survey. Responses were received from 10 countries. For each response, a brief description is included about the different stages and the current focus and challenges. The questions addressed were:

- To which extent competition in the energy supply was a focused topic
- The chosen market solutions
- Approach and status of separation of monopolistic and competitive activities
- The trend of expanding markets to increase competition, the principles of congestion management to handle lack of transfer capacity as well as principles behind balance management of larger areas
- Transmission access and freedom to choose supplier for the costumers
- Challenges faced in the future liberalization process

2.1 USA

Competition was introduced in the USA on April 24, 1996, when the Federal Energy Regulatory Commission issued its Open Access Transmission Tariff Order 888. That rule requires that all public utilities that own, operate or control interstate transmission must have a tariff that offers others the same transmission services they provide for themselves, under comparable terms and conditions. Utilities must take transmission service for their own wholesale transactions under the same terms and conditions.

The individual states have controlled the pace of wholesale and retail competition. All fifty states and the District of Columbia are addressing Retail competition. The level of activity goes from ongoing review of pilot programs to full retail competition (in 24 states and the District of Columbia).

On January 6, 2000 FERC issued its Regional Transmission Organization Order 2000 that promotes the voluntary formation of regional transmission organizations (RTOs) to foster regional energy markets. There is no fixed schedule to implement that Order on all utilities.

Since May, 2004, PJM has integrated five new transmission systems. Prior to the integration the PJM peak usage was 63,779 MW. In June, 2005 the PJM peak usage was 135,002 MW.

The recently passed Energy Policy Act of 2005 (EPA) dismantled the 70 year old Public Utility Holding Company Act of 1935 which in part limited utilities under its jurisdiction to serving load in a single state, precluded combining gas and electric utilities, and effectively prohibited mergers. By limiting previous intrusion and oversight, the new Act is intended to foster increased competition.

In North America congestion management is designed around the North American Electric Reliability Council (NERC)'s Transmission Loading Relief standard. In the current practice of "contract path" scheduling, schedules identify a source point for generation of energy, a series of wheeling agreements being utilized to transport that energy, and a specific sink point where that energy is being consumed by a load.

The customers' freedom to choose supplier varies by states.

The major challenge in the USA concerns transmission asset obligation. Who is responsible for accessing, mandating, constructing and compensating for the construction of transmission assets?

2.2 Great Britain

The introduction of a fully competitive, free and liberalized energy market occurred in 2001 and is known as NETA (New Electricity Trading Arrangements). This environment is regulated by an independent body mandated to reducing cost to the customer. NETA evolved from a POOL system of centrally despatched generation following the privatisation of the UK electricity body CEGB in 1994.

Under the current market arrangements, the Great Britain electricity market is actualised via a power exchange up until one hour ahead of real time, known as Gate Closure. Up until this point any participant with sufficient credit rating is free to trade a position. Positions can be traded for any length of time ahead, from say year ahead through to intra-day trades. Generators self despatch to meet these contracts. Beyond Gate Closure the market is then centrally administered by the System Operator through despatched instructions to all participants based on live and dynamic price submission. This is known as the Balancing Mechanism.

Imbalances are regulated via representative buy and sell energy prices (System Buy and System Sell price). These prices are based on Volume Weighted averages of Power Exchange prices, and also on instructed despatched prices within the Balancing Mechanism.

Electricity transmission in the England and Wales is owned and operated by one single integrated organisation, National Grid. This activity is regulated by an independent regulator (OFGEM) mandated to achieve maximum value and reliability of the networks, and pass these benefits on to the consumer. Efficiency on the TO (Transmission owner) has so far been achieved via an RPI – X environment of revenue reduction to the TO.

All generation is privately owned and must compete within this environment. Supply to consumers is fully liberalized and competitive with consumers able to choose supplier with no regard to location.

Once granted, access to the Great Britain electricity transmission system is firm and is open to any market participant of the Great Britain transmission network. Rules for connection are provided by the CUSC (Connection and Use of System Code) and charges are made through “Use of System” charging frameworks that are laid down in this document.

Great Britain has a fully liberalized non-locational energy market. One of the key responsibilities of the Great Britain TSO is to manage congestion, and a variety of tools are employed in carrying this out. These include:

- Forward trades
- Balancing services contracts
- Re-despatch within gate (currently gate closure is one hour ahead of real time)
- Rescheduling of transmission system outages to relieve congestion
- Innovative TO and SO tools and techniques developed since NETA go-live in 2001

All electricity consumers within Great Britain are free to choose to any supplier. Supply of electricity is fully independent of location.

The difficulties associated with construction of new overhead lines continue to pose a challenge, due in the main to the difficulties associated with winning public support for such projects. Other challenges include the uncertainty of sufficient plant availability over particularly severe winters, combined with the growing reliance on gas for generation. The lack of direct accountability for any market shortfall in capacity in a fully liberalised and free market environment makes this problem particularly challenging to resolve.

2.3 Spain

The daily and the intraday markets were started in 1998. Increased competition is very important in Spain and after 7 years of liberalized market, the government has decided to review the model. An independent expert has been contracted in order to review the liberalized issues and all utilities and institutions involved have been asked by the expert to make a report. The report, named “White Book”, was published in June 2005. In the Spanish system the unbundling among distribution, transmission and generation was also done in 1998. The previous vertical companies have been split in different companies that operate independently. On the other hand, trade issues can be managed by generation companies. Some transmission assets remained in the hands of the distribution companies,

but in 2005 they sold them to the main transmission company that was also the system operator. Presently, the System Operator is the owner of 100% of the transmission network (TSO model). The development of the transmission system is proposed by the TSO and approved by the Government. Usually, there are many difficulties linked to environmental reasons to construct the new lines that could solve constraints (in the interconnections, for example). The TSO is remunerated for the new lines according to standard costs.

Open access to the transmission and distribution grid is also granted since 1998. The government decides the access tariff yearly (the tariff depends on voltage and time periods).

There are two different changes for expanding markets that are under discussion, one with Portugal and the other with France. On one hand the Iberian Market will be established between Spain and Portugal (it will be a common market). A Portuguese market operator has been created and probably it will be in charge of managing the forward Iberian market. The current Spanish Market Operator (OMEL) will be in charge of managing the day-ahead and intraday Iberian markets.

In the current method, the internal constraints resulting from the daily market are solved by re-dispatching and managed by the TSO. This is possible in the Spanish market because the energy re-dispatched due to internal constraints is below 3% of the total energy managed in the daily market. For intraday market those transactions that create a constraint are rejected.

Congestions in the interconnections are managed by implicit auctions and explicit auctions for bilateral contracts. In a first step, the Market operator runs the daily market without considering any limit in the international borders. International capacity is then split between bids below the marginal market price (of this matching process) and bilateral contracts. The exceeded bids are rejected by implicit auctions and exceeded bilateral contract are rejected by explicit auctions (using prices that must be sent before the daily market). This model is in the process of change at the writing of this paper: It has been proposed (by Market Operators and System Operators of Spain and France) to couple the markets (in the daily and intraday market). A decentralized market coupling model together with explicit auctions has been proposed for the congestion management of the Spain-France interconnection (this will be the third step in a step by step process). For the Spain-Portugal interconnection a market splitting mechanism is foreseen when the Iberian Market starts.

The system operator manages the imbalances using ancillary services. The cost of all ancillary services used plus the costs of the real time security re-dispatches (due to generator trips, for example) are paid by all the generators and consumers that incurred in deviations and their payments are proportionally to their deviation (independent of the sign of the imbalance)

All consumers are free to choose supplier since 1 January 2003. Currently 40% of the total energy has been contracted freely and there are many retailers competing in this market.

2.4 The Nordic Market, Finland and Norway

Finland and Norway are both part of the Nordic market. The market was opened in 1992 in Norway and in 1995 in Finland. An international power exchange was established between Norway and Sweden in 1996 and Finland joined in 1998. The market solution in the Nordic countries is based on a combination of bilateral trade and voluntary trade on the power exchange Nord Pool. Clearing principle is market cross. As an average the physical trade on the power exchange represents approximately 40 % of the traded volume in the area over the last years.

Financial trade going from 36 h to several years ahead of operation can be done in organised financial markets. Intra day trade can be done bilaterally or in the Elbas adjustment market. Clearing principle in Elbas is pay as bid, since the trade is based on matching single bids and offers from buyers and sellers.

Regulating power is the traded power in the balancing market that is called the regulating power market (RKM). The clearing principle here is marginal pricing, separate prices both for regulation up and regulation down. Balancing power is the power settled after the fact due to imbalances. Imbalances are settled according to different rules in the different Nordic countries. In Norway there is a 1 price balance settlement. In the other countries there are different forms of 2 price systems.

From day one, competition has been considered as important, and it was a requirement from the authorities to split the countries incumbent when the market was liberalized. European Union Directive implied changes to national legislation. The network activities has to be separated legally and functionally from the production and trading of energy. In both countries the rules are more strictly than the requirements in the Directive, that is smaller companies are demanded to separate these activities. There is open third party access on equal terms for all actors. The payment for use of the network is based on a regulated tariff.

The main method for congestion management is market splitting, used in the planning phase day ahead. In practice it is handled through the Elspot market. Real time congestion is solved by what in the Nordic countries is called counter trade. This is equal to what is called coordinated re-dispatch in continental Europe. In addition, moving of bottlenecks to the border of Elspot areas are to a certain extent being used as a mean of relieving congestion in the planning phase.

Since 2002 there is a common Nordic Balance Management system in operation. The main outcome of this is:

- An essential step on the road to harmonising the conditions for the players on the Nordic electricity market.
- Efficient balance control.
- Lower number of control actions in opposite direction in the different control areas.
- Lower total control cost for the TSOs.
- Improved operational reliability due to simplified routines and improved overview in the TSO control centres.
- Equalisation of the regulating power price in the Nordic countries.
- Increased interest in placing bids on the regulating power market.
- Harmonisation of balance settlement between the countries.
- In practice, the TSOs work as one company in this respect.

Everybody is eligible to choose supplier in Norway since 1992 and in Finland since 1997. Initially small consumers in Finland needed an hourly meter to be eligible, but since November 1998 the use of load profiling consumption curves have made it possible without an hourly metering. In Norway procedures have been considerably simplified since 1992. Now a consumer only needs to notify the new vendor and give present meter reading. The change of vendor will then be accomplished within two weeks.

The Nordic and European markets are being integrated. The Nordic market has a limited market coupling to the German market via the Kontek HVDC cable since 2005. There is a connection from Finland to Estonia planned for 2007. The Norwegian and the Dutch market will be linked via market coupling on the NorNed HVDC cable planned to be in place before 01.01.2008.

At present there is a focus on further harmonisation between the Nordic countries. This involves solving what in the broad liberalization picture could be listed as second and third order issues, but they become more important when the first order issues have already been solved. Issues are among others:

- System responsibility and role of TSOs
- Balance control and balance settlement
- Capacity allocation and congestion management
- Financing and organisation of Nordic grid investments

- Provision of ancillary services and technical functionality of the power system
- Information exchange and training
- Enhancement of demand response

2.5 Belgium and the Netherlands

Belgium and Netherlands have chosen different paths of liberalization. Netherlands started in 2001 by separation of the transmission system from the generating companies. Belgium is in the process now, and coupling of these market systems is an example of the development of the new de-centralized market coupling that will be a cornerstone in establishing regional markets in Europe.

Belgium

At this moment there is no electricity power exchange in Belgium. Only bilateral trade is possible. To increase liquidity inside the Belgium market, Elia (The system operator) proposed to establish a power exchange in Belgium and has introduced a demand for a licence to operate a power exchange. A company, the Belgium Power Exchange (Belpex) has already been created. To enhance the liquidity, Belpex is proposed to be coupled with the French and Dutch power exchanges. To increase competition in Belgium, Elia invests in additional transmission capacity with France. Thanks to the liberalization, there are a lot of new suppliers active in the Belgium market but most of them don't have generation facilities in Belgium. There are some new investment projects but most of them are in the field of green energy (because of the system of green certificates) and local production (to avoid grid charges and taxes).

The available daily transmission capacity between Belgium, France and the Netherlands is proposed to be allocated by the power exchanges (implicit auctioning). The Dutch and French TSO's and Power Exchanges have taken a participation in Belpex. Belpex will start as a day-ahead market with a marginal price as clearing mechanism.

In 2005 Belgium has a regulated balancing mechanism. Starting 2006 the balancing mechanism will be changed. The price paid for unbalance will be based in most of the cases on the average prices paid by the System Operator but can evolve to marginal prices in case the total unbalance in Belgium is very important. For the sourcing of energy the principle of pay as bid will be applied. Every Access Responsible Party can introduce bids. Elia has developed an intraday hub. This gives the Access Responsible Parties the possibility to conclude agreements after the closure of the day ahead market in order to avoid unbalances (for example in case of failure of a production plant);

Regulated third party access is one of the principles of the Belgium Electricity Law. The direct users connected with the Elia-grid, are all eligible. The regulator approves the tariffs. The regulator also approves the general conditions of the contracts.

The TSO's and power exchanges of Belgium, the Netherlands and France have agreed to introduce a market coupling system at the moment the Belgium Power Exchange will become active as a day-ahead market. This is expected to become operational in the second trimester of 2006, subject to the approval of the regulators of those three countries.

The Belgium system is operated as one price zone. Congestion inside the zone is rather exceptional. In case of congestion Elia changes the topology of the grid or applies incremental and decremental bids to change the generation. The interconnection capacities between Belgium and the Netherlands are allocated by an explicit auction. Until 2005 interconnection capacities between France and Belgium were allocated by a system based on "first come, first served" (although eased by a pro rata rationing). Starting 2006 Elia and RTE allocate capacity by an explicit auctioning. After the start of Belpex, and subject to the approval of the regulators in the three countries, the daily capacity on all borders of Belgium will be allocated by the power exchange.

Until 2005 Belgium had a regulated balancing mechanism that had been approved by the regulator. Prices for unbalance were determined by the direction of the unbalance (positive or negative), the size of the unbalance, the fact of the unbalance position of the ARP was helping the balance of the system and the time period (peak – off-peak and season). Starting 2006 the balancing mechanism has been changed. The price paid for unbalance is based on the cost of the sourcing of the energy.

Electricity is partly a competence of the federal government, partly of the regional governments. All non-residential users are free. In the Flemish region, the households can also choose freely their supplier. In the Brussels and Walloon region, the households have to wait until 2007.

The Netherlands

TenneT is the transmission system operator (TSO) in the Netherlands. The following market arrangements are in place in the Netherlands:

- Commodity Markets (TSO not involved)
- Crossborder capacity Market: There is a Joint Explicit Auction on behalf of Eon Netz, RWE TSO, ELIA and TenneT for the Dutch borders; yearly, monthly and daily cross-border transmission rights auctions. The applied principle is marginal pricing.
- Congestion management is done by the TSO: trade & countertrade. The applied compensation principle is marginal pricing.
- Regulating & Reserve Power market operated by the TSO. It is mandatory to participate for generating units larger than 60 MW, marginal pricing
- Metering Market opened up as of 2005, Metering companies certified by the TSO, Metering Responsible Parties acknowledged by the TSO.

Programme Responsibility is legally assigned to connected parties and these are responsible for sending balanced exchange programs and to act accordingly. The Imbalance Settlement done by the TSO is based on prices established on the Regulating & Reserve Power Market.

Grid operation and system operation are monopolistic activities. These activities are unbundled. However, there is an ongoing discussion focusing on separation of ownership as well.

For expanding the market there are two projects in progress (not operationally implemented yet): 1) an HVDC cable from the Netherlands to Norway with application of market coupling and 2) a market coupling project for the French – Belgium – Dutch borders.

Internal congestions are solved by changing network topology or by redispatch. Solving congestion to neighbouring systems is done by market coupling or by ex-ante reduction of cross-border capacity, changing network topology or cross-border redispatch. For the transmission access there is a difference between national and international practice. For the national case, connected parties have transmission rights up to the contractual value of the connection. For international connections, acknowledged Programme Responsible Parties have transmission rights up to in the Auction acquired cross-border capacity.

All customers are eligible to change supplier in the Netherlands.

The major challenges are currently the introduction of the market coupling in the European transmission network, the intra-day cross-border trade and the regional approach for n-1 security. Currently the French, Belgian and Dutch Regulators have published a roadmap on the "Regional market integration between the wholesale electricity markets of Belgium, France and the Netherlands" to elaborate their vision.

2.6 Brazil

In the Brazilian Power Exchange, Market Operator (MO) is responsible for managing and operating the purchase, sales, accounting and settlement transactions of electric energy. Nowadays, 100% of the

total demand of each retailer and free consumer must be supplied by long-term and medium-term bilateral contracts. All the generators receive the volumes and prices defined in bilateral contracts.

The spot market can be seen to be primarily managing a market of differences. It allows for bilateral contracts to be negotiated between generators, traders, retailers and free consumers. System Operator (SO) is responsible for definition of unit commitment and generation dispatching of each hydro and thermal power plants according to a tight schedule as well as the operation marginal cost that is adopted in the spot market.

Generation and trade (purchase and sale) of electricity are competitive activities. Transmission is a monopolistic activity. But there is a competition for the definition of the transmission charge to each transmission power plant (lines and substations). For that, there is an auction among interested agents and the winner is the agent that proposes to receive the minimum annual charges related to each installation for a defined time, for example, 20 years. Distribution is a monopolistic activity.

All players have free access to the basic transmission grid (230 kV and above). The definition of access conditions and transmission charges as well as the management of the settlement, accounting and billing of the transmission system use is managed by the System Operator.

When transmission congestions occur, thermal power plants are dispatched to eliminate them. These additional costs are paid for all affected consumers. In such cases there is a congestion fee that will be paid for all affected consumers and applied to eliminate transmission congestions and contribute to reduce the transmission charges with respect to new installations. Transmission companies are not responsible for transmission congestions.

If the thermal generation available is not enough to eliminate transmission congestion, then the following load-flows will be reduced proportionally in order of sequence, bearing in mind the current contracts: international (cross-border) flows, inter-regional (inter-area) flows and intra-regional (intra-area) flows.

These procedures are applied in the operation scheduling in three stages: one month, one week and one day ahead on a weekly, daily and hourly basis, respectively, according to a tight schedule.

Old customers (existing until 1995) are considered free since they have demand ≥ 3 MW and they are supplied in 69 kV and above. New customers (existing after 1995) are considered free since they have demand ≥ 3 MW regardless the voltage that they are supplied.

After the energy rationing that occurred in 2001, the current federal government changed the electricity law and stopped the liberalisation process, particularly the free trading between generators and retailers which are responsible for supplying captive consumers. The free trading continues between generators and free consumers.

2.7 Japan

Since April 2004 the following new steps have been taken for deregulation:

- Establishment of a neutral organization called “ESCJ (Electric Power System Council of Japan)” for making rules and monitoring fairness and transparencies of the practices.
- Establishment of power exchange market called “JEPX (Japan Electric Power Exchange)” for power exchange operations.
- Abolishment of transmission surcharges (Elimination of pancaking problems)

In Japan, there are “day ahead spot market”, “monthly-based forward market”, and “billboard market”

- For “day ahead spot market” 48 products are prepared (30 minutes interval of 24 hours). The so-called single price auction system is employed.

- For monthly based forward market, products for 24 hours (day and night time) and products for daytime are prepared. The trade is carried out by individual continuous auction system.
- For billboard market, people watch the board and contact directly among the interested parties.

In Japan the so-called “vertically integrated system” is retained in which utilities hold generations, transmissions and system operations. However, newcomers called PPS (Power Producers and Suppliers) can participate in the electric power business. In the deregulated environment, fairness and transparencies are guaranteed by law and monitored by the neutral organization ESCJ. Also regulators have controlling abilities.

Transmission systems are used indiscriminately by all the players. First come first served system is employed. Priorities are given for long term contract generations. There are certain rules for emergency cases. The so-called “use it or lose it” system is applied so that the tie-lines may be used efficiently. ESCJ has the following tasks: Rule making, Rule monitoring, OASIS information release, coordination with and among TSOs.

For customers of more than 50kW and 6kV, the PPS can sell electric power. The electric power can be produced by them selves or purchased from utilities.

Japan has a single market with no international tie-lines. Thus there will be no coupling with other markets in the near future.

Currently, customers who have contracts of more than 50kW and 6kV are eligible to change supplier. From April 2007 discussions will start for full-fledged deregulations.

2.8 Korea

Competition was introduced in 2001. A day-ahead CBP (Cost Based Pool) Market is operated. Generators participating in the market, are compensated by SMP (System Marginal Price) and CP (Capacity Payment). KPX, the system and market operator, forecasts the demand and makes the operation schedule hourly based on the cost of each generator.

The generation side is separated to 6 major companies from vertically integrated KEPCO (Korea Electric Power Corporation).

The transmission, distribution and sales part are bundled and a monopoly, because deregulation schedule is stopped by government due to political issues. Transmission will in the future be remained as monopoly (1 company) by the Code.

Re-dispatching is applied for congestion management. The principles applied are quite similar to that of the vertically integrated system cases, because of the CBP market.

Everybody can access freely to the transmission network, if it has paid for the connection cost. However, only customers larger than 50MW are eligible to choose supplier from the market or KEPCO.

Deregulation and liberalization schedules are stopped by the Korean Government. The former government started the deregulation project, but the present government postponed the processing because of worries about reliable supply of electricity. Most likely, the next step will be made in three years time under a new government.

3.0 DISCUSSION

Responses from ten countries were received and these responses showed a wide variety of implementation approaches, progress and future challenges. Some had suspended the liberalization

process due to political decisions and security of supply issues while other had gone quite far to obtain sufficient competition in the electricity industry. Political pressure appears to be an important driving force due to how fast the different levels of liberalization are reached. Voluntary guidelines differ quite a lot from directives giving certain milestones for when the stages have to be implemented.

In USA competition was introduced when the Federal Energy Regulatory Commission (FERC) issued its Open Access Transmission Tariff Order 888 in 1996. The individual states have had the possibility to control the level of wholesale and retail competition. This has caused the level of competition to be very different in the different states. When FERC in 2000 issued its Regional Transmission Organization Order 2000, that promotes for a voluntary formation of regional transmission organizations (RTOs) to foster regional energy markets. A proposal to create a Standard Market Design has been eliminated. Again freedom for the different states to choose approach and speed makes the liberalization process to be different in the different regions.

In Europe the directives 1996/92/EC and 2003/54/EC from the European Council and parliament of European Union have played an important role for the introduction of the competition in the energy sector. The directives have given guidelines for the progress and the valid approaches. When we compare the responses of this questionnaire, it is clear that the level of progress have been very different in distinct member states. Some countries are just following the minimum requirements while others have reached a significant level of competition where all costumers have freedom to choose supplier. There were not too many responses from European Union countries, but it is obvious that much of the attention now is focused on formation of regional energy markets by implementing market coupling principles either by decentralized market coupling or explicit auctions.

It is stated that political decisions and milestones are important for the progress, but another important driving force in the market design is the pressure of the different market actors. Especially when it comes to the continuous market redesign and development, the market actor organizations actively participate in the process and contribute with comments and separate proposals.

Another important observation is that market design is a continuous process where functions are introduced in steps. All the countries that early made steps in the direction of liberalization of the electricity industry, have made reviews of their original schemes and are redesigning the markets. In Europe some changes have been made due to regulations imposed by the European Union, but others are adaptations made to enhance market functioning and to increase competition. This is a highly focused task in the Nordic market.

The market integration process is a dynamic and complex process. Market integration offers benefits to national markets in terms of better functioning and more competitive markets. Current national or state markets are often too small or dominated by incumbents, which makes it difficult to establish a well functioning separate market.

Congestion management is also essential in all the responses received. Congestion management is definitely one of the most important items for enhancing competition. Lack of transmission capacity may effectively prevent competition if the market design does not sufficiently account for it. In the selection of congestion management schemes, the transmission system structure must be considered. In some systems a Locational Marginal Pricing (LMP) principle may be the most efficient while in other systems a more regional representation may be suitable. In Europe much effort has been spent in the design of regional system representation but with economic efficient utilization of the transmission network. The member states in the European Union have not a similar market structure and the congestion management scheme must account for differences. Flexible de-centralized market coupling and explicit auctions are the techniques used to expand market and increase competition. Within each node the congestion management was mainly based on counter trade and switching to alleviate congestions.

In three of the responses the systems could not be considered fully liberalized. Brazil and Korea had got the initial liberalization scheme suspended due to the security of supply issues. Japan continued the process but was evaluating the steps made.

The challenges in the different responses had many similarities but also differences. Principles for market coupling and harmonization of rules were important in Europe since different countries are involved. Mostly a TSO principle is used for transmission system organization. One of the big challenges in USA was tied to the transmission asset obligation. Who should be responsible for construction of new transmission assets and what should the compensation be.

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