Electricity Restructuring in France

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Abstract: **The trend shows that the electricity restructuring in France is leading the several aspects of this evolution in Europe. This paper presents an overview of the electrical market situation in France. Among the questions addressed by this paper are: What is the status of restructuring in France? Who are the real players in the French electricity market? What is actually the panel of electricity production plants inside the country? The paper will discuss some of the issues that are managed by the French market to fulfill the European mandatory requirements. At this time, there are some concerns about the French market. For instance, what has been accomplished by the French trading market Powernext? What are the roles of players in the market its future? Will the French market complete its role in becoming the major European trading place in near future? What will the market look like after the new European laws of last November are enforced? What will be the impact of restructuring on the entire country?**

*Keywords: **Electricity restructuring, restructuring models, France, power sector, open power market***

I. INTRODUCTION

RESTRUCTURING of utility markets is a new phenomenon in the Western Europe. The participating nations are debating the issue immensely and examining its viability as a new venture even though the prospective markets have the possibility of learning from the experience of United States, Great Britain, and Nord Pool markets [1]. The preliminary experience has shown that new markets are going to be different in specifics as legislations, traditions, and electricity operations are specific to each nation [2]. The European Union, under the pressure from its members with a fully restructured utility market, has decided to follow the restructuring trend. Consequently, it is obligatory for all participating nations to engage in the restructuring process for establishing electricity markets.

France, the second largest European electricity market, currently has the most centralized electricity market among European countries. At the end of World War II, France decided to enhance its public services with a large state ownership in aviation, telecommunications, and energy industries, to guaranty better services for all its citizens. Consequently, the issue of restructuring is being debated intensely in France which is one of the nations in Europe to open its energy market to competition.

This paper will address the condition of energy markets in France by offering a view of French and European laws, introducing the Powernext trading market, emission compliance in France, restructuring of EDF, concerns for restructuring, and discussing its DOM-TOM (offshore territories) power delivery and markets.

II. FRENCH ELECTRICITY RESOURCES

The French electricity market, one of the largest in Europe, has a total energy production of 500 TWh. The market is organized in a traditional way, with a state-owned vertically integrated company, Electricité de France (EDF) [6]. The company holds about 95% of the generating power and manages around 97% of the supply to consumers. The second largest company in France is Companie Nationale du Rhône [7], with 18 hydropower plants, producing about 3% of French electricity consumption. In November 2000, the company signed agreements with a Belgium company, Electrabel [8], to challenge EDF. The last major producer is Société Nationale d'Electricité et de Thermique (SNET) [9], founded in 1995. The company is 80% owned by the Charbonnages de France (CdF) company, and 20% by EDF [10]. SNET owns nine generating units ranging from 60 to 600 MW capacity.

Electricity generation in France is grouped into four different categories which are nuclear, hydro, thermal and renewable energies, representing 81, 13, 5 and 1% of the total generated electricity, respectively. Base load is represented by 57 nuclear generating plants (62,950 MW installed capacity). Hydro plants represent 20,380MW of installed capacity, and gas unit plants encompass 16,650 MW of various sizes corresponding to intermediate and peaking units.

Finally, despite a delay in establishing its electricity market, French co-generation capacity was up to 2,000 MW by the end of year 2000, and the installed wind capacity was about 500 MW. France is a net electricity exporter due to its ample nuclear and hydro generation. Figure 1 depicts the generation mix in France [25].

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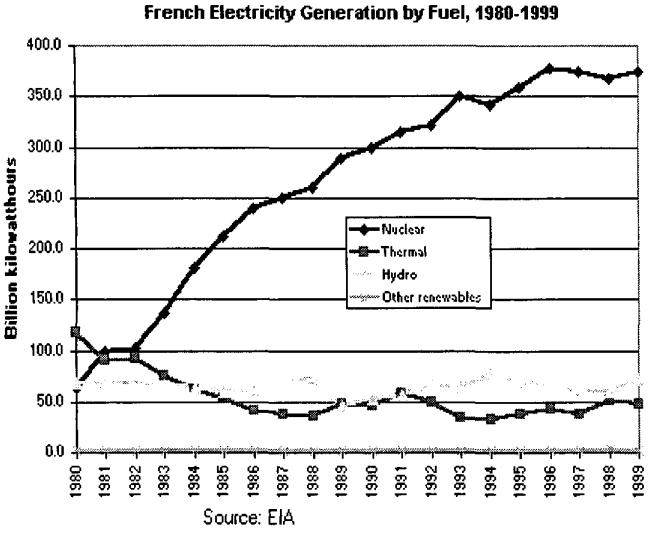

Fig.1: French Electricity Generation Mix

III. ENVIRONMENTAL COMPLIANCE

While France is being criticized for its high level of nuclear power generation, it remains to be one of European pioneers in terms of renewable and hydro generation. France is ranked first among European countries in terms of clean energy. This is because of its low NO2, CO2 and SO2 emissions [21]. Today, less than 5% of the electricity production by EDF is subject to carbon dioxide (CO2) and sulfur dioxide (SO2) emission. The carbon emission in France has recently been increased which is due to the growth in the transportation industry [22,23]. According to the Kyoto agreements, France is committed to stabilizing its greenhouse gas emissions at 1990 levels by 2008-2012. Compared to current growth trends, this means a 10% reduction by 2010. Nevertheless, the France's National Program to Combat Climate Change has set out a balanced strategy to limit emission. The strategy promises to introduce more consistency in French policies on renewable energies and energy efficiency.

A new concept arose in France in 1999 to exempt from tax the repair cost for facilities that were damaged by pollution. The TGAP (General tax for polluting activities) goal is to dissuade various sectors form environmental polluting practices. TGAP simplifies the previous ecological taxation system. It represents 5 different preexisting taxes including a tax on the treatment and the storage of the special industrial wastes, air pollution, water pollution, harmful noise pollution, and on the storage of domestic waste.

IV. NEW LAWS FOR A NEW MARKET

It is believed that the European electricity restructuring will allow other markets such as England, Whales and Nordic Power Exchange to penetrate the French electricity market. This issue has concerned various entities in the French electricity system. United Kingdom could not prevent EDF from infiltration in the British market and the repurchase of London electricity. Today, EDF provides about 10% of the England Electricity consumption, while Spain succeeded in preventing EDF from acquiring assets in its market.

In 1990, under the pressure from its members, and because there already were "free circulation goods" laws in existence across Europe, the European Union decided to restructure electricity markets. Requirements are settled in the Directive of the 19 December 1996: In order to ensure the security, reliability and efficiency of the system, in the interests of producers and their customers, a transmission system operator (TSO) should therefore be designated and entrusted with the management, maintenance [3] and, if necessary, development of the system within a given area, as well as its interconnections with other systems, to guarantee security of supply (Art.7.1). The Directive also outlines the duties of the TSO. Each TSO shall be independent, at least in management terms, from other activities not related to the transmission system (Art.7.6) and shall not discriminate, particularly in favor of its subsidiaries or shareholders (Art.7.5), but also as concerns the rules for the dispatch of generating installations (Art.8.2). Finally, the TSO must preserve the confidentiality of commercially sensitive information (Art.9).

The restructuring process should follow three steps: a minimum of 26% of electricity sales in member countries opened to competition by 1999, 28% by February 2000, and then up to 33% by the year 2003. One can notice that European institutions have decided to speed up the restructuring process through Europe and to complete the restructuring process by 2005, even though 2010 seems to be a more likely date at this time.

In order to reduce the barriers for international electricity trades, it was decided in July 1999 to regroup European transmission system operators' under the Association of European Transmission System Operators (ETSO) [11,12]. The association is separated into four different entities, UCTE [13] for metropolitan European countries, Nordel [14] for Northern Europe, Association of Transmission System Operators of Ireland (ATSOI) for the entire Ireland, and the United Kingdom TSO association UKTSOA for the United Kingdom. Figure 2 depicts the details of these arrangements [13].

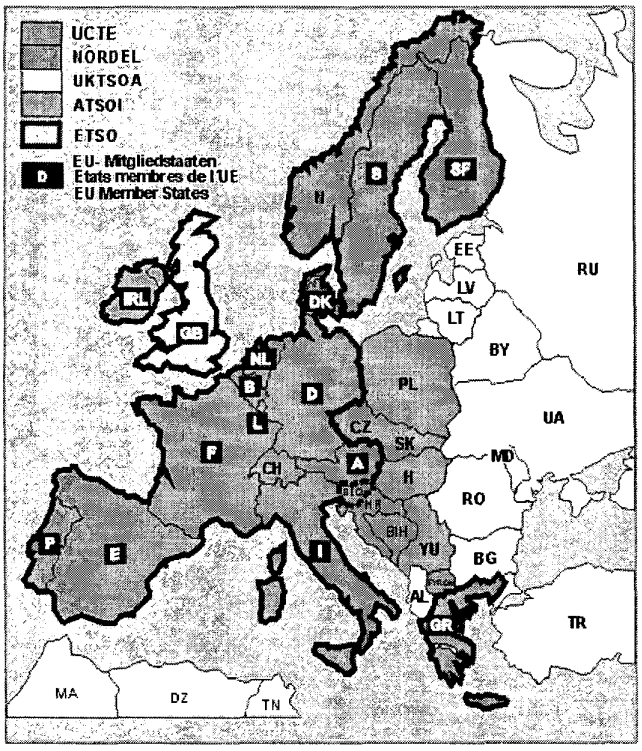

Fig. 2 : European TSOs united in ETSO

V. RESTRUCTURING OF FRENCH EDF

EDF owns all of the French transmission facilities and international ties. Exports represent 18% of the French electricity production. The transmission system is split into high and extra-high grid, with about 100,000 km of lines. High voltage is composed of three different voltage level, 225 kV, 90 kV, and 63 kV to direct electricity to transformers, switching electricity to 220 V consumption lines. The 400 kV extra-high represent inter-regional and inter-national transmission grid.

The unbundling of generation, transmission and distribution required a real evolution in the EDF structure. The goal of the French state was to figure out a new EDF structure while maintaining the company's leadership and satisfying the European union requirements. Therefore, it was decided that transmission lines would be owned by an independent entity, a subdivision of EDF, called Réseau de Transport de l'Electricité (RTE) [15]. RTE is responsible for the operation, maintenance and development of high voltage (90 kV and 63 kV) and extra high voltage (400 kV and 225 kV) power transmission system. It is also in charge of all international links existing in the nationwide network. RTE has to match generation and consumption, the power system reliability and security, and the maintenance and technical enhancement of the transmission system. It must comply with the open transmission access.

The integrity of the RTE management system is ensured by a state-owned organization, the Commission de Régulation de l'Electricité (CRE) [16]. CRE was created in May 2000, under the European Union February 10th, 2000 directive. CRE's principal mission is to manage the operation of gas and electricity markets. Current CRE duties cover the establishment of third party access tariffs for the use of EDF's transmission lines, ensuring an independent grid management, guaranteeing a third party access to transmission and distribution networks, and market monitoring to guaranty that there is no discrimination in favor of EDF (dominant supplier). All the tariffs proposed by CRE must be approved by the French Ministère de l' Energie [17].

In order to establish competition in the market, EDF was asked to sell part of its generating plants, totalizing 6,000 MW. The first phase of the operation started in September 2001, with the sale of 1,200 MW of generating facilities, 800 MW of base load power, 200 MW of peak load power, and 200 MW of co-generation facilities.

For the first time, French consumers with more than 16 GWh per year consumption have been authorized to purchase electricity from the producers of their choice. That decision concerned 1,200 large industrial and commercial consumers making up 30% of the market. In December 2002, capacity auctions consisted of call options for 656 MW of base load power and 395 MW peak load, allowing buyers the right to buy electricity at a fixed price for a premium. The starting date was January 1, 2003 for periods of 3, 6, 12, 24, and 36 months. The direct consequence of those sales is was that the 12% of the total French electricity production would be owned by EDF competitors. The consequence of the 2002 European decision on the French market is a reduction in electricity consumption from 16 GWh to 7 GWh in France for 2003. Once a consumer decides to move from EDF to another electricity supplier, it must sign a contract for a minimum of three years.

An interesting point about the French market is the diversity of prices that are offered by EDF to its clients, whether industrial or residential contracts. EDF clients are divided into three categories, residential customers, small commercials and industrial customers. Different prices are available for each category. Single-rate, two-rate (usually day and night) and seasonal rate (divided into 300 cheap "blue days", 43 average "white days" and 22 expensive "red days" randomly chosen, with a day and night period) are available for residential customers. 200,000 small commercial consumers, with contracts going between 36 and 250 kVA, are subject to the "yellow tariff". It consists of two seasons four tariffs periods with night and day shifts. Customers exceeding the contract size supply are penalized in proportion of the time they exceed the contract value. Finally, large consumers above 250 kVA demand are supplied through medium and high voltage networks.

VI. THE FRENCH MARKET

The new French electricity trading market was officially launched on November 26th, 2001. This market is the first web-based only market available in Europe. Powernext SA [18] shareholders are Euronext Paris with about of 34% of the shares, a holding of managers of grid systems (HGRT) with 17%, and the remaining 49% of the shares are divided between BNP Paribas, EDF, Electrabel, General Company and TotalFinaElf. Given the fact that liquidity is the first objective of the market, it has been decided to trade day-ahead hourly contracts during the first phase. The goal of the market is to establish a reference price for electricity in France. Principles of the market exchange are fairly similar to those used in other markets. Members of the market can propose price and quantity of electricity to trade hourly in the market.

The whole trading and delivery process occurs in a 9-day time frame. The bidding process starts 7 days before the delivery occurs and stops the day prior to delivery at 11:00 a.m. Any buyer or seller can pass up to 64 different hourly price-quantity offers. The current tick size is 1MWh and the minimum quotation tick is 0.01 per MWh. The fixing occurs every day at 11:00a.m. and there is a 15 min dispute resolution period. The market clearing price is fixed by matching offers and demands like in any other electricity market. On the afternoon of the day prior to delivery, Powernext would inform both RTE and members of the electricity amount they would have to dispatch in the grid. RTE calculates each member's power balance, and payments are made through Clearnet, which is a Euronext's clearing body.

During the first day of trading, the six current members which are Cargill, EDFTrading, Electrabel, Endesa, Iberdrola, TotalfinaElf, take part in bidding. One year after the opening of the new market, Powernext represents 32 members among which 25 are trading actively. Usual daily volumes traded on Powernext vary between 10,000 and 15,000 MWh.

The correlation between the French Powernext market and its neighbors are high. The German EEX is the mostly correlated entity, which is usually larger than the French one, but the lack of available transmission facilities between the two countries prevents traders from arbitrage possibilities. Within the last year, the average peak load price (between 08:00 and 20:00 hours) was 28.793 /MWh and for base load was 17.640 /MWh. On the contrary to the American markets, summer prices are lower than winter ones because of a far lower air conditioning capabilities in France.

In France, a regular load forecast day has a morning ramp starting at 6 a.m. and two characteristic spikes at 11 a.m. and 6 p.m. on weekdays. Saturdays and Sundays follow the same trend with much lower demands. In the summer time, starting at the end of March, the 6 p.m. peak is less pronounced than that in winter. We noticed that within this first year of service, Powernext maintained a 90% correlation between price and demand. On the other hand, power prices were negatively correlated with temperature.

Today, Powernext does not conceal its European ambitions. Its actual plan is to establish a price reference for the French electricity market. New contracts including contracts on energy derivatives will be created soon. The final goal is to make Powernext a European leader and possibly merge other markets with the Powernext entity.

VII. CONCERNS LINKED TO RESTRUCTURING

Large industrial consumers were originally concerned with the restructuring process. However, they are more inclined now to accept this evolution. After they first hesitated to change their electricity providers, despite a 5% bill reduction, they are now considering different providers, which could offer the same electricity price with a more superior quality of service. However, certain groups of customers have remained loyal to EDF because of its reliability record and the fact that those customers are more concerned with signing three-year contracts with new providers.

The possibility of keeping the same electricity provider for businesses across Europe has certainly become an important factor of choice for electricity customers. Correspondingly, electricity providers try to establish themselves by offering their services in various countries and making their clients feel more confident about using foreign providers, even if the providers do not break-even with their venture.

In certain market situations, EDF will still be able to retain its competitive edge against its opponents. For instance, most of the French electricity production is base nuclear power with small marginal costs. However, EDF is currently charging its customers higher prices for paying off its investment loan on nuclear plants. It is envisioned that the situation will change in favor of EDF by the year 2005, as 37 of the 57 French nuclear plants will be fully amortized.

Considering other markets during the winter months of 2001/2002, we notice that restructuring has a sensible impact on electricity prices in Europe. Sweden and United Kingdom, the most restructured countries have seen a drop in their prices up to 15%, whereas in Finland, Norway and Denmark, prices have risen up to 13%. In Germany, even though prices dropped by 25% during the last years, they remained among the highest in Europe. Ironically, the 10% price reduction offered by France since 1996 for small businesses signifies the French government's willingness to show its "pro-restructuring" neighbors that a monopolistic market can achieve the same results than a restructured market. Although many would argue that the French price reduction is the by-product of competition that stemmed out of restructuring.

The fact is that electricity, like water and telecommunications is still considered as a public service entity. The state engages French companies to offer residents the lowest possible fares, and is willing in some cases to

subsidize companies' deficits with French taxes. As a consequence, French community has benefited from the cheapest electricity across Europe. However, because of the EDF's obligation to buy small producers' electricity (under 12 MWh) at a fixed price, and to increase the amount of electricity produced by green energies, like solar, wind, co-generation, the French people have actually seen a further increase in their electricity bills.

Last major concern of the French government for restructuring is the DOM-TOM (off-shore territories) situation. The price of generating electricity is at least twice in DOM-TOM. However, DOM-TOM consumers usually pay the same price as those who live on-shore. There is very little chance for electricity competition in those remote and small locations, as it seems harder to establish an open and competitive market in DOM-TOM. The numerous strikes in those Islands prevent major businesses from establishing themselves in those areas. It seems quite obvious that as electricity can be transmitted and delivered at any place on the grid, EDF and other providers will have a mandate to supply electricity in those remote locations as well. It is also perceived that EDF and other participating companies could share the corresponding deficits according to their market shares for supplying electricity.

VIII. CONCLUSIONS

Electricity has become a product, which is mainly controlled by its price, and not by politicians. Quality and services will soon become dominant factors in a supplier choice [4].

Even if the French electricity market is far from being fully restructured, a number of steps have already been taken in fulfilling that goal. It is the intention of government organizations to make sure that loads are supplies efficiently with free access for all suppliers to French markets. Under penalty of seeing itself out of the race, EDF will have to make sure that it is available with competitive prices for its eligible customers.

Electricity markets will need to create synergies between different markets like electricity and gas in order to profit from the arbitrage of various commodities. The multi-commodity arbitrage in the energy market should also consider the perceived risk for both short-term and long-term trades in order to manage the effectiveness of the market.

For environmental compliance, France is in advance of other countries in terms of mitigating carbon and sulfur dioxide emissions. This is due to the large amounts of nuclear power that is available in France. Currently, nuclear power is a choice that has been really effective for France. However, the country may have to diversify its generation mix in order to be able to supply it customers in the years ahead. In essence, providers in various countries should be able to provide cheap and environmentally safe electricity in order to remain competitive. It is viewed, therefore, that fossil plants are not a solution for tomorrow as they can be very pollutant, nuclear plants generate a hazardous waste, and wind energy is still expensive and noisy. At that time, other types of power plants such as gas, combined cycle, and fuel cells remain to be viable alternatives.

The global economics and electricity restructuring alert governments to keep their eyes on their competitions in other countries and be prepared to deal with energy crises as new technologies are made available for providing cheaper and more reliable electricity to customers in Europe.

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X. BIOGRAPHIES

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