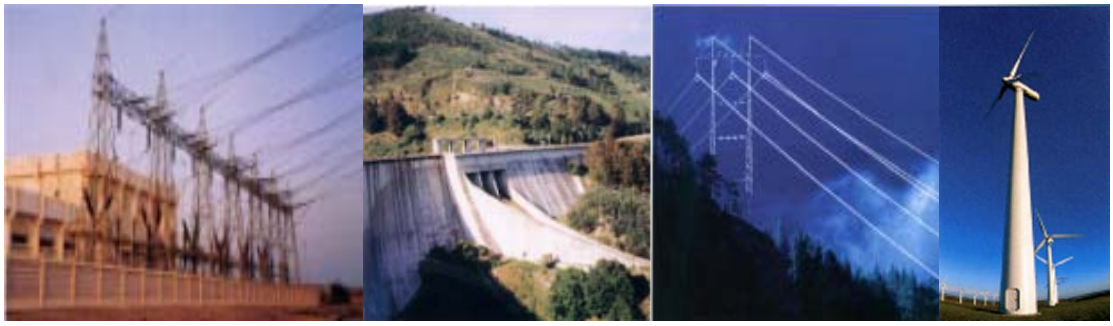
France Country Report



Innovative Electricity Markets to Incorporate Variable Production

to

IEA – Renewable Energy Technology Deployment

May 2008

IPA Energy + Water Consulting

COWI A/S

SGA Energy

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1 MARKET MECHANISMS

This section provides an overview of the operation of renewable generation within the French power markets.

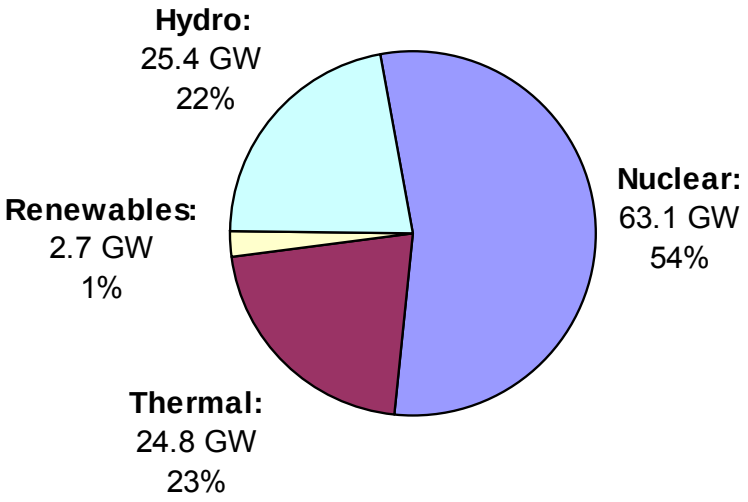
France is the second largest producer and consumer of electricity in Europe and has the largest generation capacity. At the end of 2006, the installed capacity of all electricity generation facilities in France was about 116.2GW as presented in Figure 1. Electricity generation for the same year was about 559.1TWh compared to 478.4TWh domestic electricity consumption (with peak demand around 85GW).

France has interconnections to all of its neighbouring electricity markets which makes its markets highly interconnected and excess generation above indigenous demand being exported. France has historically been a major power exporter, providing a market for the output of its considerable nuclear fleet.

Nuclear energy dominated the generation portfolio with a share of about 78 % of total electricity generation. France has also high hydro potential. In 2006, generation was 60.9 TWh or 11.1 % of total generation, which makes the country the second biggest hydro producer in Europe after Norway. However, other renewables only accounted for less than 3% of generation output.

The French market is dominated by EDF who own around 85% of the generation fleet. There is limited competition provided by companies such as Veolia, Electrabel-Suez, and Air Liquide, mainly in the area of gas fired generation and renewables. In addition, EDF allows companies access to 6GW of its generation capacity which is sold via periodic auctions. Nevertheless the French market remains highly concentrated which significantly reduces competition and market liquidity.

Figure 1: France – Installed electricity generation capacity 2006



1.1 Renewable Generation Capacity

According to the EU Directive 2001/77/EC, France aims to have 21% of its domestic electricity consumption from renewable energy sources by the year 2010. However, this target includes large hydro.

1.1.1 Hydro

At the end of 2006, the French electricity system had 25.5 GW of hydro generation capacity. 7.7 GW of this is purely run-of-river plants without hydro reservoirs and hence has very limited operational flexibility. 4.3 GW of the hydro generation capacity has some limited water storage capability and is operated on a short-term reservoir compensation basis. Pondage hydro plant can provide some short term flexibility and adjust their output to load curve requirements, particularly by storing water in off-peak and generating during peak hours of the day. 9.3 GW of capacity has significant reservoirs for seasonal water storage. These plants optimize their output on a seasonal basis. Pump storage plant amount for 4.2 GW installed capacity in France. Annual electricity generation from hydro installations was 60.9TWh in 2006 or 11.1% of total French production. More stringent French legislation regarding water and the aquatic environment is likely to have important consequences on hydro operation [1]:

- Increase of “reserved flows” to be maintained in the natural river bed from 1/40 of the average annual natural flow to 1/10 from 2013 on. This is expected to result in a loss of 3 TWh of annual generation.
- Limitation of flow variation for storage and pondage plants might have negative consequences on the availability of energy in peak load periods.
- Banning new constructions along rivers or parts of rivers which have not yet been equipped with hydro installations.

Currently, there are no plans for extensive increases to hydro capacity.

1.1.2 Wind

Wind energy installations are still relatively small compared to neighbouring countries like Germany or Spain. By the end of 2006, 1.6 GW wind capacity was installed in France with new installations of 810 MW during 2006. The significant growth of wind capacity is expected to increase over the next decades. France still has high potential of wind generation, particularly along the Mediterranean Coast and the Channel. Europrog 2006 estimates installed capacities of about 18,500 MW for 2030.

1.1.3 Others

Renewable energy sources used in thermal power generation include biomass (wood, etc.), bio-gas (landfill gas, methane from manure and sewage plants) and municipal waste. At the end of 2006 approximately 1.1 GW of thermal plant generated 3.3 TWh of electricity from renewable energy sources. Additionally, France has significant renewable resources from geothermal energy and biomass. The long term capability of thermal renewable energy sources has been explored in the Generation Adequacy Forecast 2005 with 8.2TWh of generation in 2010 and about 12 TWh of generation in 2016 appearing to be achievable aims [1].

1.2 Renewable Generation Size

Renewable generation below 12MW can be connected into the distribution network without the requirement for any transmission access agreement. However, projects above 12MW would need to apply to the transmission network for access.

1.3 Renewable Generation and Power Markets

Most renewable projects other than existing large hydro have been supported by either feed-in tariffs, or tender systems for large renewable projects. However the Government is now moving toward feed-in tariffs for all wind projects.

The French Transmission System Operator (TSO) buys all wind energy produced at fixed price. Wind projects are not subject to balancing obligations, with the TSO purchasing all generated output. Effectively this completely isolates most renewable generation projects from having any interactions with the competitive power market, with the TSO being a central purchasing organisation. The French TSO is currently RTE.

A high level overview of the key principles governing the French market is provided below.

- **Traded Market**

  Counterparties can trade power either bilaterally, through brokers or through exchanges. Non-physical players may also be involved in the traded market. Renewables that are eligible for feed-in tariffs are not part of this traded market.

- **Self despatch**

  Counterparties (generators and suppliers) decide individually how much power they physically plan to inject and withdraw from the system.

- **Notification**

Counterparties have to notify their traded position and planned physical position to the market and system operator respectively at a specified point in time.

- **Balancing**

  Counterparties are incentivised to balance their physical and contractual positions. There is a dual imbalance price depending on whether the counterparty is long or short (in relation to their physical and contractual position). Renewables are insulated from this market by fixed feed-in tariffs.

- **Transmission Access & Charging**

  Transmission Access is firm. Transmission charges are primarily levied against demand users.

1.4 Degree of Centralisation

Most renewable projects other than existing large hydro have been supported by either feed-in tariffs, or tender systems for large renewable projects. The French TSO buys all eligible renewable energy produced at fixed price.

These plants are therefore not subject to balancing obligations, with the TSO purchasing all generated output. Effectively this completely isolates most renewable generation projects from having any interactions with the competitive power market, with the TSO being a central purchasing organisation.

1.5 Support Mechanisms

Most renewable projects other than existing large hydro have been supported by either feed-in tariffs, or tender systems for large renewable projects.

Feed-in tariffs (introduced in 2001 and 2002, and modified in 2005) for PV, hydro, biomass, sewage and landfill gas, municipal solid waste, geothermal, offshore wind,onshore wind, and CHP. The tariffs cover power plants <12MW and provide a 15 year contract (20 years for PV/Hydro). Current feed in tariffs for wind are:

- €82/MWh for on-shore; and
- €130/MWh for off-shore

A tender system exists for large renewable projects (those greater in size than 12MW). This effectively means that the support provided is related to the economics of the projects, and so will reflect issues such as the quality of the wind resource that is being exploited.

Tax reductions and capital grants are in place in order to promote biofuels.

Stimulating the uptake of renewable heat energy is done in three ways. Tax credits of 50% are available, a 5.5% reduction in VAT has been introduced for residential energy equipment using renewable energy, and subsidies up to 40% are granted for biomass heating plants.

ZDE (Zone de développement éolien/wind development zone): The 19 June 2006 circular on wind development zones, which stated that the ZDE came into force in July 2007, specified the three requirements to be fulfilled before approving building permit requests: "having a sufficient wind potential, the possibility to be connected to the grid and respecting the landscape, historic monuments and protected areas all around." The feed-in purchase tariffs are applicable in ZDE only.

This allows wind turbines which are larger than 12MW to benefit from feed-in tariffs, but only if they are in the wind development zones.

1.6 Trading

The structure of the power markets in France is similar to that in much of continental Europe. There is bi-lateral and exchange based trading allowing counterparties to trade power around 3 years into the future.

In addition there is a voluntary power exchange run by PowerNext, that provides a day ahead power auction with hourly prices based upon marginal pricing. There is also the ability to trade outside the auction day-ahead and intra-day.

Liquidity in the French power markets is relatively limited, volumes on PowerNext in 2006 equated to around 6% of demand.

There is a trilateral market coupling of the day ahead auctions with France, Belgium and Netherlands, which facilitates optimal economic utilization of available interconnection capacities between the markets. This may help to increase liquidity in the day-ahead markets in all of the countries.

1.7 Despatch

Counterparties (generators and suppliers) decide individually how much power they physically plan to inject and withdraw from the system.

The TSO purchases all renewable generation, so renewable generators will typically plan to inject all available generation on to the system.

1.8 Notification

There is a day ahead notification of generation when all Program Responsible Parties (PRP) have to submit notifications of a half hourly programme of

generation and primary /secondary reserves to the system operator (RTE). There is an initial notification at 12.30 D-1, with the final notification at 16.00 D-1.

After the day ahead notification any change to scheduling can only take place during the intra-day gate trade windows. There are now 24 gate closures for the intra-day market (which has been recently increased from 12). PRP can modify their programme (output, technical constraints), but must be able to justify technical constraints causing redeclaration at RTE request. A redeclaration:

- Requires two hours notification;
- Must be consistent with plant technical characteristics at gate closure;
- Cannot counter balance orders made by RTE; and
- Must be compatible with commitments made by PRP under contracts.

1.9 Imbalance Settlement

Counterparties are incentivised to balance their physical and contractual positions. Imbalances between these positions are subject to cash-out prices. There is a dual cash-out price depending on whether the counterparty is long or short (in relation to their physical and contractual position) and whether the system is long or short, with a market based charge for imbalances that *reduce* the system imbalance, and a premium charge for counterparties that *contribute* to the system imbalance.

The market balancing charge is based on PowerNext spot prices, with the premium imbalance price calculated based upon the costs of balancing/regulation within the period. The premium imbalance price moves to a multiple (currently 1.15 times) of the weighted average price of balancing (capped by the PowerNext price for positive imbalances). The balancing charges are designed to be reflective of the costs incurred by the TSO in resolving system imbalances. As such, participants tend to be long to avoid high (and volatile) buy prices.

1.10 System Balancing

The responsibility for system balancing is split between the TSO and market participants – with the TSO responsible for short term system balancing of the system as a whole, and Balance Responsible Entities (BRE) responsible for balancing within *notional* balancing perimeters.

1.10.1 TSO

The TSO (RTE) is responsible for and grid planning, ensuring the operation of the system as a whole by accepting bids and offers from the Balancing Mechanism (BM). The Balancing Mechanism was set up in April 2003 after its approval by the Energy Regulation Commission (CRE). The objectives of the BM are:

- To mobilise reserves to ensure the generation-consumption balance in real time;
- To contribute to solving network congestion; and
- To produce a legitimate reference price that can be used for the settlement of imbalances of BRE.

BRE that can participate in the balancing mechanism are injection sites (production), extraction sites (consumption) and exchange points (interconnection). Each BRE may be made up of several entities connected to the network (though in general generating stations must participate as single units unless they are physically linked, such as hydro units that form part of a cascade system). It can also cover generators outside France (e.g. Switzerland, Spain and the UK).

Balancing offers are pay as bid, and can be submitted up to 2 hours ahead of each balancing period although they may still be modified or withdrawn. The balancing offer may simply be an energy price, but may also include costs for start-up. The TSO accepts in offers/bids in economic order RTE (according to their price and the technical restrictions indicated by the players concerned) subject to meeting the dynamic and energy requirements of the system. There are penalties for non-delivery of balancing bids and offers.

In 2004 there were 18 balancing players and the volume called by RTE in the BM reached 12TWh (7.8 TWh downward and 4.2TWh upward) which equated to around 2.5% of demand.

1.10.2 Balancing Responsible Entities

Counterparties in the French market are responsible for balancing supply and demand within their portfolios. The French market uses the principle of Balancing Responsible Entities (BRE).

The BRE system provides market parties with the opportunity to carry out all types of commercial transactions within the electricity sector. Any player who becomes a BRE can create his own activity portfolio, also known as their balance perimeter.

This system allows a player to reduce their financial risk by diversifying their sales and purchases: accumulating physical and/or declared extractions for their clients, physical injections of their production units, declared injections for their counterparts and sales and purchases on electricity exchanges that are active in France.

Each BRE must declare to RTE, and eventually to Distribution System Operators (DSO) the injection resources and extraction elements that make up its balance perimeter.

BREs undertake to pay financial compensation to RTE for negative imbalances (injection-extraction) subsequently reported within his balance perimeter. The balance Responsible Entity is financially compensated for positive imbalances by RTE.

Imbalances are calculated using a process for reconstituting injection and extraction flows on the public transmission system and the public distribution system. This process is carried out by RTE and the DSO.

As at the middle of 2007, RTE had over a hundred BREs, with around 1,500 notifications of bloc exchanges per day. In 2006, nearly 280TWh were exchanged, i.e. an equivalent of half of the volume of France's electricity consumption in one year.

2 CROSS BORDER TRADING

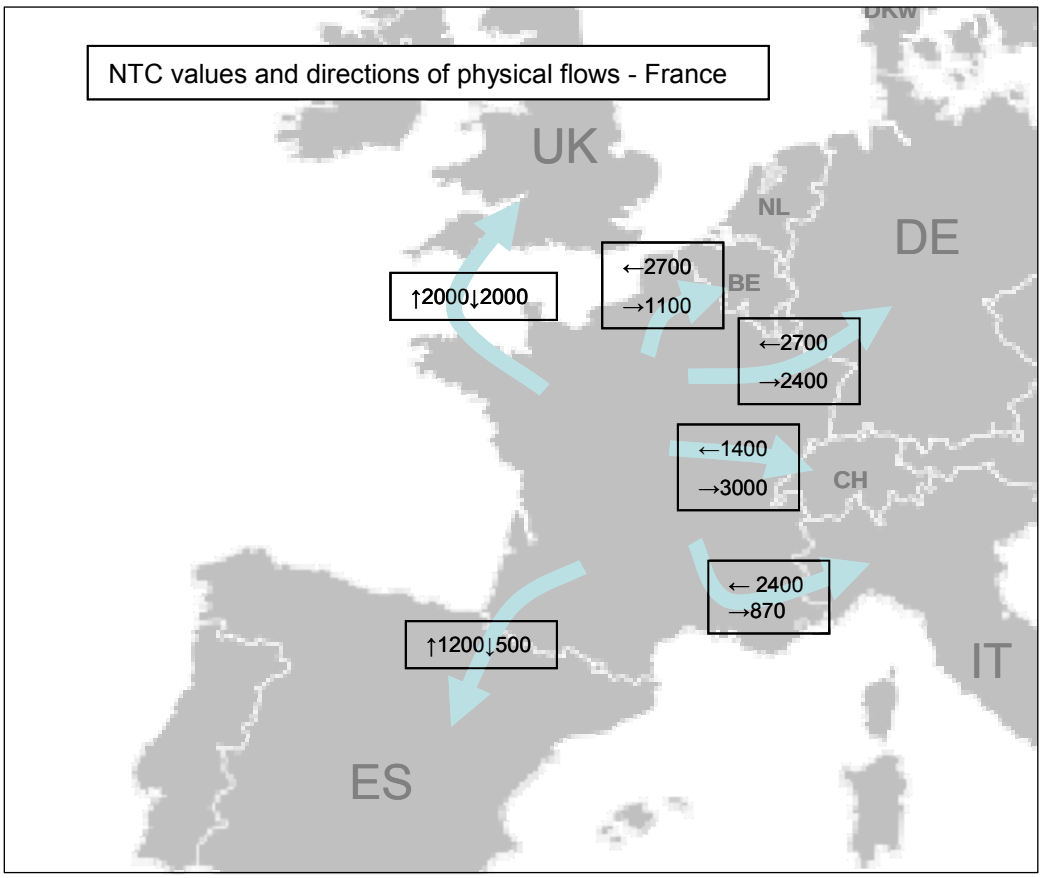
France currently has the ability to trade with six different electricity markets – GB, Spain, Belgium, Germany, Switzerland and Italy. The British-French interconnector is covered in the chapter on Great Britain.

2.1 Current Cross Border Flows

Physical Flows and Interconnector Capacity

Interconnection capacities with neighbouring countries remain insufficient in France which prevents the development of cross border competition. The map below (Figure 2) describes the net transfer capacity (NTC) and the direction of physical flows in 2007.

Figure 2: NTC Values and Physical Flow Directions



Detail of each of the interconnections is provided in Annex D.

Interconnections are often congested and, since December 2005, priority access based on historical contracts on interconnectors to Belgium, Germany, Italy and Spain have been banned. Contract-based allocation of transmission capacities

remains, however, on the French-Swiss border. Since January 2006, capacity is allocated to the other countries through explicit auctions.

France is a net exporter of electricity. The export via various routes is outlined in Table 1 below.

Table 1: Share of cross border flows on various interconnectors in 2006 [2]

	Contractual exchange [TWh]		Share of the total		Physical exchange [TWh]	
	Import	Export	Import	Export	Import	Export
Spain	2.3	6.6	8.19%	7.34%	1.479	5.91
United Kingdom	1.6	11.4	5.69%	12.68%	0.899	10.929
Belgium	1.7	17.2	6.05%	19.13%	1.981	10.644
Germany	15.1	9.5	53.74%	10.57%	0.838	16.172
Switzerland	6	26.5	21.35%	29.48%	2.156	11.322
Italy	1.4	18.7	4.98%	20.80%	0.726	14.891
Total	28.1	89.9			8.079	69.868

French power exports are considerable with 91TWh in 2005 of which 50% was destined to Switzerland and Italy. Imports from Germany are also significant at 32 TWh and trade takes place in both directions. In addition, electricity trade with Belgium and the UK are significant.

However, interconnection flows with the Iberian Peninsula are one of the lowest in Europe and even though interconnection with Belgium and Germany is relatively high, they do not permit the development of a competitive regional market.

The French wholesale market can be considered a market with a national dimension only. The wholesale prices in France have nevertheless a strong correlation with the German and British wholesale prices on the EEX. The spot market prices in the second trimester of 2006 were on average 37.15€/MWh, 9% lower than in the second trimester of 2005.

The French power exchange Powernext concluded 20TWh in day-ahead auctions in 2005, 39% more than in 2004. Since 2004, a futures market exists which traded 62TWh in 2005.

The German power exchange offered “French” physical capacity representing 1.6TWh in the last four months of 2005.

Calculation of Crossborder Capacity

In order to make sure that an incident will have no effect on the users of the interconnections, RTE calculates the commercial capacities on the basis of the physical margins by using factors called influencing factors.[1]

[1] The **influencing factor** of an exchange, in a given direction, on facility 1 after the outage of facility 2, is the impact of a volume of additional exchanges on facility 1 after the outage of facility 2. This factor is expressed in % and in relative value. For example, saying that an exchange from France to Belgium has an influence of 10% on facility 1 after the outage of facility 2 means that 100 MW of exchanges from France to Belgium increase the physical flow by 10 MW on facility 1 after the outage of facility 2.

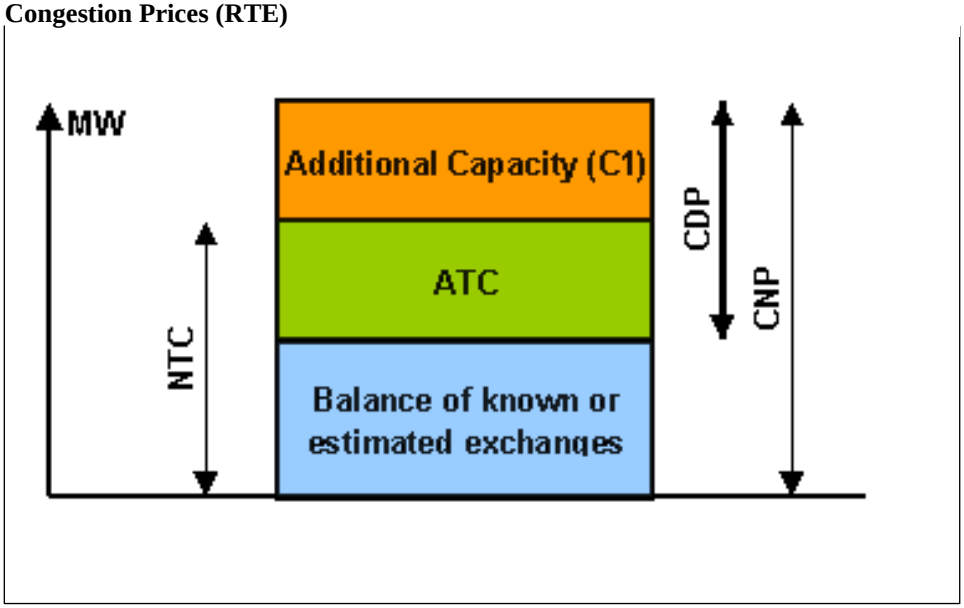
The physical margin on a given facility is transformed into commercial capacity available on each of the interconnections: this margin is divided up equally on each interconnection and one takes into account the influencing factors of an additional exchange on the interconnection, on the physical flow of the facility for the incident considered.[2]

When this available commercial capacity is calculated without providing for any generation plan adjustment, it is the ATC (Available Transfer Capacity) as defined by the European Transmission Systems Operators association (ETSO).[3]

When the adjustments and the network constraints allow it, RTE can increase the commercial capacity proposed to the users by adding capacity which leads to an additional cost which is paid by RTE. The total commercial capacity is then called CDP (Capacité Disponible Proposée, i.e. Proposed Available Capacity).

Figure 3 graphically shows the process outlined above with the calculations outlined below.

Figure 3: Determination of Commercial Exchange Capacities and Related Congestion Prices (RTE)



RTE summarises calculation of the capacity values as follows (note: NTC & ATC are Net Transfer Capacity and Available Transfer Capacity):

- ***CNP = Capacite Nette Propose (Net Proposed Capacity)***

[2] This transformation of physical margin into commercial capacity is carried out for all the facilities of the French 400 kV grid. The commercial capacity available on each interconnection is finally defined as being the minimum value of the calculated commercial capacities. This available commercial capacity therefore meets all of the constraints studied.

[3] http://www.rte-france.com/htm/an/offre/offre_inter_capa.jsp

concerns the total volume of commercial capacity proposed by RTE for the exchanges, including an additional capacity block C1 resulting from programme adjustments and therefore with a congestion price

CNP = NCT + C1

- ***CDP = Capacite Disponible Proposee (Available Proposed Capacity)***

  concerns the volume of commercial capacity still available for the next allocation period proposed by RTE for the exchanges, including an additional capacity block C1 resulting from programme adjustments and therefore with a congestion price

  CDP = ACT + C1

2.1.1 Potential Future Interconnector Capacity

Since France is geographically separated from the Iberian Peninsula by the Pyrenees, additional interconnector capacity is necessary to enable increased trade in wind power between Spain and France. Development plans envisage the construction of a new interconnector line between Sentmenat (Spain), Bescano (Spain) and Baixas (France), scheduled for 2010.

The French-Belgian interconnection is frequently congested. With planned extension of the current trilateral market coupling between Belgium, the Netherlands and France to Germany and Luxembourg, this line may become a limiting factor for the trade of wind energy on the spot market. To relieve congestion, a new line is planned between Moulaine (France) and Aubange (Belgium), with completion expected between 2010 and 2015.

France is connected well to Great Britain and no priority development plans exist at present. No priority development plans are currently in place for the border to Italy.

2.2 Cross Border Capacity Mechanisms

The former priority given to long term contracts was abolished on January 1, 2006 on all cross-border lines connecting France to the other EU countries (Switzerland excluded). Since that date, the whole capacity allocation has been based on market mechanisms [3]. The general framework can be outlined as follows, with border specific deviations of the general guidelines:

- Some form of capacity auctioning is used on all French borders and since January 2006, interconnection capacity is officially allocated through explicit auctions following EU legislation;
- As for the standard explicit auction under RTE guidance, available interconnection capacity is offered by the auction operator in form of

physical transmission rights (PTRs). Volume constraint is 1MW over one hour and bid files may not contain more than 10 bids;

- In general, capacity can be re-sold. This must be notified to RTE by 12.00 two days prior to delivery. It can also be sold back through the auctions; and
- The participant loses annual, monthly, daily or intra-day PTRs that have not been nominated with no financial compensation according to the use-it-or-loose-it principle. Capacities allocated at annual and monthly auctions and which are unused by the participants are re-allocated at daily auctions. Unused capacities that have been allocated at daily auctions are re-allocated at intra-day auctions where this mechanism is available.

2.2.1 France- Spain Interconnector

The explicit auctions are organised jointly by the auction administrator in both directions on the France-Spain interconnection, but separate auctions are implemented in the direction France-Spain and the direction Spain-France.

Annual and monthly capacity is allocated for the entire year and month respectively while daily auctions allocate hourly capacity.

Netting of the firm nominations resulting from every matching process performed by the TSOs will also be applied and considered in the calculation of the available capacities for the subsequent explicit auctions.

2.2.2 France-Italy Interconnector

RTE is the auction operator for the direction France - Italy and TERNA is the auction operator for the direction Italy – France. Explicit auctions are held separately per directions:

TERNA, as auction operator for the daily auction from Italy to France, performs the joint allocation on 100% of available interconnection capacity from Italy to France, 5 days a week; French RTE will conduct annual, monthly, and daily auctions 7 days a week.

For PTRs in export direction France – Italy, a capacity usage authorisation will be calculated by RTE according to French Import/Export Rules.

PTRs may be transferred and resold, provided prior notification is given, but a transfer notification from France to Italy must only be notified to RTE.

2.2.3 France-Switzerland Interconnector

Currently, the capacity allocation in the direction France - Switzerland takes place under the standard explicit auction procedure as defined under French regulation.

For the opposite direction there is no predefined allocation mechanism. If any congestion occurs, the capacity nominations are curtailed on a pro-rata basis.

However, RTE and the Swiss TSO are working on a new common capacity allocation procedure.

2.2.4 France-Belgium Interconnector

Auctions, intra-day allocations and the secondary capacity market are organised jointly by the two TSOs in both directions of the France-Belgium interconnection. RTE and the Belgian TSO ELIA appoint a joint auction operator who is in charge of allocating available capacity. Separate auctions are implemented in each direction.

Annual and monthly auctions are carried out as explicit closed auctions, comprising a single round. Day-ahead capacity is allocated using an implicit auction, meaning that the allocation of this daily transfer capacity is coupled to a price settlement on PowerNext and the Belgian power Exchange BelPEX.

Where market coupling is unavailable, daily auctions ensure the allocation of available capacity over each hourly period of a day. Intra-day allocations are implemented in both directions of the France-Belgium interconnection

2.2.5 France-Germany Interconnector

The interconnections capacity available for the yearly, monthly and daily auctions is auctioned in each direction jointly by TSOs under uniform terms and conditions (one clearing price for each transfer direction).

Auction coordinator is RWE for the German TSOs and RTE on the French side; the interconnection capacity available for auctioning in form of PTRs relates to export and imports between Germany and France without any distinction being made between the German control areas of EnBW and of RWE.

The mechanism on both directions is a sealed-bid, single round auction that is held in three different time horizons: annual, monthly and daily. Annual and monthly cross-border capacities are sold offered for every hour of the entire year and the entire month. Daily capacity is offered on an hour-by-hour basis.

Solely for French exports, the user may assign his transfer notifications and/or resale notifications to another user who will act on his behalf by notifying the PTR transfer and the PTR resale of capacities acquired by the initial user. Ordinary transfer and resale are possible on both markets.
Intra-day available capacity is allocated by RWE according to the first come – first served principle. The overall intraday PTR volume indicates the netted value of the schedules between Germany (EnBW and RWE control areas) and France submitted by the intraday PTR holder. The capacity allocation is coordinated between EnBW and RWE only. That is, the allocation solely concerns intraday PTRs from and to the German control areas notwithstanding any intraday capacity constraints that might be imposed by RTE.

In 2006, the interconnection was almost fully used (i.e. the net flow exceeded 90% of the net transfer capacity in one of the two directions) for 26% of the time, whereas in 2005 it was almost fully used for only 13% of the time.

2.3 Cross Border Trading

Except for the border to Switzerland, all electricity trade across French borders has been harmonized with EU legislation on cross border electricity trading. This concerns the management of the interconnections F/ES, F/I, F/BE, F/UK and F/DE.

For the monthly and annual allocations, the capacities are awarded when the bids are stable (no additional upward bid). Participants are then paying what they have been bidding for. The other auctions are closed and always based on the marginal bidding price and not on a “pay as bid” system.

“Market coupling” between F/B/NL (thus between Powernext, Belpex and APX) has been implemented, which has moved auctions from explicit to implicit.

D-2 and D-1 Auctioning Processes

The D-2 and D-1 process takes place with slight differences for each interconnection. These are described per interconnector below. However, common features to the trading schedule exist:

- ***D-2 calculations***

  For each interconnection, the CNP (Capacité Nette Proposée) seen from D-2 is calculated on D-2. The CNP is equal to the total capacity admissible on the network.

- ***D-1 process and calculations***

  - At 14:00 (14:30 for Spain), RTE has the total of the exchange programmes nominated by the users;

- At about 15:00, RTE has settled the consumption forecast for the day after;
- At 16:00, RTE has the producers programmes;
- From 16:00, RTE places all of these data (which may differ from the hypotheses selected on D-2) on a network state and performs the network calculations. In the case of congestion occurrences, RTE endeavors to solve them first by adjusting the network topology (therefore at no cost), then by adjusting the generation plan by seeking the least expensive and most efficient adjustment.

At the end of day D-1, RTE determines the commercial capacities available for an intraday utilisation. For a given interconnection, the available intraday capacity is defined as:

Intraday Capacity = D-1 commercial capacity - balanced sum of the nominations.
This intraday capacity is recalculated between two intra day gate closures.

Ancillary Services

To be an actor of the balancing market, the user has to be a Balancing Responsible entity (BRE) for the programming entities which form the balancing entities on its balancing perimeter. They must also provide RTE the notification of a balancing perimeter and sign a participation agreement. A balancing entity is defined has an entity who is in position to modify the balance between generation and consumption of the French control zone either directly or via installations connected to the transmission system (interconnections or distribution system).

There are three types of balancing entities:

- Injection point type balancing entity (power plants);
- Exchange point type balancing entity (import and export); and
- Offtake point type balancing entity (industrial customer)

RTE defines the number of exchange point type balancing entities for each border. A list of BREs is published online by RTE[4].

Any balancing orders executed incorrectly may lead to:

- Correction balancing order (no payment);

[4] http://www.rte-france.com/htm/an/offre/offre_resp_liste.jsp

- Penalty Charges. Over each half-hourly period showing incorrect implementation, the balancing actor is charged a penalty equal to 35% times the incorrect energy volume times the maximum offer price or Powernext spot price. The penalties are due to RTE solely if information was not brought to RTE before the activation time.

2.3.1 France – Spain

The following times apply to the D-1 auction process between France and Spain:

- Before 07:45, the users send to RTE their periodic export and import exchange programmes,
- Before 08:30, RTE calculates and publishes the available commercial capacities which will be sold at the daily auctions. These capacities are linked to the results of studies carried out on D-2, any contingencies occurring during the night, and the periodic exchange programmes nominated before 07:45;
- From 08:45 to 09:15: daily auctions;
- Before 09:30 the users receive the auctions results;
- Before 14:30, the users send to RTE their daily export and import exchange programmes.

In case the auction mechanism is unavailable, an alternative bidding process ("downgraded mode") can be employed which entails the bidding process to be conducted via fax. Intra-day auctions would, however, be cancelled.

The link from France to Spain is very often saturated, although congestion is also not uncommon in the opposite direction. Capacity on the France-Spain interconnector is allocated non-firm a priori but firmness is guaranteed by RTE after the auction:

- In the Spanish system, the TSO (REE) will check at the time of program nomination deadlines, if the participant also has the associated energy.
- In the French system, after the matching of the nominations received, the nominations will become firm exchange programs and, after each of the nomination deadlines, they will be accordingly included in the settlement of imbalances of RTE's balance responsible mechanism.

Concerning future developments, several of the provisions contained in the present interconnector rules France - Spain are interim in nature. The provisions will be improved or replaced by definitive provisions according to the roadmap set up in January 2005. Provisions particularly concern:

- the introduction of a "market coupling" mechanism and the subsequent replacement of the explicit daily auctions by implicit daily auctions;
- the introduction of a "use-it-or-get-paid" exercise potentiality for non nominated PTR;
- the evolution towards a continuous platform for the PTRs transfer.

2.3.2 France – Italy

Separate auctions are held for PTRs for each direction from France to Italy and from Italy to France.

As mentioned in Chapter 2.2.2, RTE holds annual, monthly and daily auctions for capacity allocation from France to Italy; daily auctions are held seven days a week. TERNA only holds daily auctions in the opposite direction, five days a week.

The interconnection capacity allocated by TERNA during the daily auction is firm and will be construed as automatically nominated (obligatory use of the capacity allocated).

The following times apply to the D-1 auction process between France and Italy:

- Before 07:00, the users send to RTE their periodic export exchange programmes;
- Before 07:30, RTE calculates and publishes the available export commercial capacity which will be sold at the daily auction, this capacity is linked to the results of studies carried out on D-2, any contingencies occurring during the night, and the exchange programmes nominated before 07:00;
- From 07:45 to 08:15: export daily auction;
- Before 08:30, the users receive the auction results; and
- Before 14:00, the users send to RTE their daily export and import exchange programmes.

PTR curtailment is allowed up to 45 days. PTRs acquired through yearly and monthly auctions are curtailed on a 'pro rata' basis.

2.3.3 France – Switzerland/Germany/Belgium

The following times apply to the D-1 auction process from France to Switzerland/Germany/Belgium:

- Before 08:15, the users send to RTE their periodic export and import exchange programmes;
- Before 09:00, RTE calculates and publishes the available commercial capacities which will be sold at the daily auctions, these capacities are linked to the results of studies carried out on D-2, any contingencies occurring during the night, and the periodic exchange programmes nominated before 08:15;
- From 09:15 to 09:45: daily auctions;
- Before 10:00, the users receive the auction results; and
- Before 14:00, the users send to RTE their daily export and import exchange programmes.

Different times and rules can apply to imports from these countries to France and are outlined in the following sections.

- ***France - Switzerland***

  A joint auction system will be introduced in conjunction with the Swiss system operator in the future.

  In the meantime, capacity is auctioned as non-firm and import capacity requests take place at the same time as nomination: A daily import capacity request for a transaction is accepted subject to the safety of the power system and up to the limit of available capacity. If the sum of daily import capacity requests is higher than available capacity, access authorisations are granted in proportion to the daily import capacity requests, according to an iterative algorithm giving preference to smaller capacity requests.

- ***France - Germany***

  Capacity on the German-French border is allocated firm and no capacity curtailments occurred on the French-German border in 2006, in contrast with other French interconnections. Furthermore, only three daily auctions were cancelled from France to Germany and no auction cancellations occurred in the opposite direction.

  France and Germany apply different intraday process rules. Since RTE, EnBW, and RWE limit only their respective export interconnection capacity, users must comply with differing processes as regards intraday allocation of capacities, following differing time tables.

  On the French side, RTE allocates options to nominate intraday capacity, for import and export to France, through an improved pro-rata procedure:

  Requests for intraday PTRs are notified to RTE:

- from 14:00 on D-1 for the first gate and,
- for the other gates, after the gate preceding the gate concerned; and before the concerned gate.

The twelve gates are shown in Table 2.

Table 2: The twelve daily gates (Germany-France)

Gate (G)	Time limit for the sending of answer by RTE (G + 30 min.)	For information: Time limit for the receiving of Nominations by RTE (G + 1Hr)	For information: Time limit for the sending of Nominations confirmations by RTE (G + 1Hr 45)	Delivery Period
D-1 21:00	D-1 21:30	D-1 22:00	D-1 22:45	00:00 – 24:00
D-1 23:00	D-1 23:30	00:00	00:45	01:00 – 24:00
01:00	01:30	02:00	02:45	03:00 – 24:00
03:00	03:30	04:00	04:45	05:00 – 24:00
05:00	05:30	06:00	06:45	07:00 – 24:00
07:00	07:30	08:00	08:45	09:00 – 24:00
09:00	09:30	10:00	10:45	11:00 – 24:00
11:00	11:30	12:00	12:45	13:00 – 24:00
13:00	13:30	14:00	14:45	15:00 – 24:00
15:00	15:30	16:00	16:45	17:00 – 24:00
17:00	17:30	18:00	18:45	19:00 – 24:00
19:00	19:30	20:00	20:45	21:00 – 24:00

A user may have a maximum of one active request for intraday PTR per gate and per direction on the interconnection.

On the German side, EnBW and RWE allocate obligations to nominate intraday capacity for import from and export to their control areas, with a “first come first serve” procedure:

Interconnection capacity is allocated to users according to the chronological order of receiving their usage requests. The inquiry about and reservation of available transport capacity within the scope of the intraday allocation procedure shall occur up to 60 minutes before the start of the intraday usage, in order to ensure that the required procedure for drawing up and coordinating the schedule and informing all affected TSOs can be carried out in time.

In the event of inconsistency between the intraday nominations on either side of the border, the TSOs reserve the right to revise and /or to set to zero the intraday nominations. In any such event, the user has no right to claim compensation of any kind.

Despite differing auction schedules, however, German market players currently participate in the French balancing market. As shown in the table below (Table 3), their activity represents 2.7% of the accepted offers and 3.8% of the accepted bids.

Table 3: Activity of German operators in the French balancing mechanism[5]

	Accepted offers	Accepted bids
Average total activated capacity	450 MW	450 MW
Average activity of all foreign operators [2]	98 MW *(21.7%)*	40 MW *(8.9%)*
Average activity of German operators	12 MW *(2.7%)*	17 MW *(3.8%)*

For the time being, French market players cannot participate in the German balancing market.[6]

- ***France – Belgium***

  Closed explicit auctions are held for annual and monthly capacity while implicit auctions in the form of market coupling is applied to day-ahead capacity, as outlined in Chapter 2.2.4.

  Bids are submitted on local power exchanges (French parties on PowerNext, Belgian ones on BelPEX) and are energy sale or purchase bids. The central auction office gathers all bid information and determines the optimal set of bids and offers which maximize the market value potential of all possible energy transactions. The inter-zonal energy exchanges are limited by ATC (maximum of day-ahead transfer capacity allowed). As a result, the transfer capacity is allocated in function of energy prices.

2.4 Renewable Support Mechanisms

2.4.1 France– Feed in Tariff

To qualify for the feed in tariff, a renewable generator must be in France and must sell to the French TSO. Therefore the electricity must be both generated and consumed in France.

2.4.2 France – Guarantees of Origin

Conform to EU Directive 2001/77/EC and 2004/8/EC, France has established a system to issue guarantees of origin in order to promote

[5] An accepted offer on the French balancing mechanism corresponds, for foreign operators, to a flow from their country to France, while an accepted bid corresponds to a flow from France to their country.
[6] German TSOs balance their control areas using only reserves that they have previously contracted: under these contracts cross border balancing interconnection capacity would have to be reserved either by TSOs or market participants.

renewables and cogeneration. Producers are eligible to purchase guarantees of origin if they possess a contract for transmission access with RTE and if they do not profit from the feed-in tariff.

2.4.3 Spain

Spain supports renewable energy with guaranteed grid-access and a feed-in tariff, with generators who sell their production to a distributor receiving a fixed tariff that is defined as a percentage of a regulated tariff. The percentage is established on a technology by technology basis. Generators who sell their electricity on the free market receive the negotiated market price of electricity as well as an incentive for participating and if eligible, a premium. While the feed-in tariff is part of national legislation, further legislative authority belongs to the autonomous communities.

2.4.4 Italy

Italian TSO TERNA manages the renewable energy promotional system based on tradable green certificates, the price of which in 2005 was 108.92 €/MWh. In order to obtain green certificates, the sources have to be qualified with the IAFR label (Renewable Source Powered Plants).

2.4.5 Switzerland

Switzerland supports renewable energy development by a feed-in tariff and prioritisation of renewables in grid connection and construction of facilities[7].

Renewable development in Switzerland is constrained by budgetary limits. By 2010, it plans to generate an additional 3% of heat (equalling 3,000GWth) and 1% electricity from RE installations over the baseline year 2000.

2.4.6 Germany – Feed In Tariff

The German Renewable Energy Sources Act (EEG) is valid within the German economic zone. As the main support mechanisms within this law, the feed-in tariff, priority grid access and purchase obligation are applicable to generators and TSOs within the German network only. Therefore, cross-border trading of electricity is not affected by this law.

[7] The Swiss Power Supply Act (“Stromversorgungsgesetz”) applies to networks of 50Hz and application can be extended to other networks if this is deemed necessary to achieve the goals of this Act (security of supply and maintaining the international competitiveness of the Swiss economy)

2.4.7 Belgium

The Royal Decree on the promotion of electricity produced from renewable energy sources addresses two fundamental issues: first, it sets the conditions for issuing green certificates by the federal regulator (CREG) for offshore wind energy production, and second, it states that the grid operator is obliged to buy green certificates issued anywhere in Belgium at minimum prices. The monitored green certificates are valid for five years and are not associated to fixed quotas. Two regional schemes exist for Vlanders and Wallonie.

2.5 Utilisation for Variable Generation

Interconnection capacities from France to neighbouring countries are large. For example, in 2003 gross exports of electricity (in TWh/year) were 5.3 to UK, 9.4 to Belgium, 20.2 to Germany, 11.7 to Switzerland, 18 to Italy and 6.4 to Spain.

France has many very good wind energy sites and its potential for electricity from wind is among the best in Europe. Three big areas with good conditions for the use of wind energy exist: North-west (1,740 km of coastlines from the North to the Charente Maritime), South (departments with coastlines, 42,650 km²; departments of Centre/southwest without coastline, 30,000 km²) and very specific areas (Alpes, Central Pyrenees).

The production potential for France is estimated to be 66TWh/year for onshore based facilities and 97TWh/year for offshore facilities.

However, due to the limited wind energy production (0.6 TWh in 2004) and due to the power purchase agreements with EDF, there are almost no exports of wind power from France.

3 GRID PLANNING

This section investigates some of the issues associated with integrating renewables within the transmission and distribution grid.

3.1 Grid Investment

3.1.1 Mechanism for determining grid investment

The transmission system operator, RTE, maintains the electricity transmission grid. It is responsible for grid development to allow the connection of producers, public distribution grids and consumers, as well as interconnection with other countries' grids.

RTE is required to draw up a development plan for the transmission system which is then submitted for the appraisal of the CRE and subsequently for approval by the Minister for Energy.

CRE ensures the provision of the necessary investments for the proper development of the grids and that access to them is transparent and nondiscriminatory. They evaluate the annual investment programme on grounds assigned to it by law, the commitments of RTE to maintain or improve the technical and economic performance of the public electricity transmission grid and the main criteria which are:

- the development of the cross-border infrastructure contributing to the development of the electricity market at national and European level; and
- the transparent and non-discriminatory treatment of market players by RTE, for example as regards the connection of new electricity generating units.

RTE's investment decisions are taken in response to the projects initiated by local political and financial organizations and other bodies (including economic development, local production facilities, and demand side management policy). The service life of network infrastructures is long (around fifty years), while the associated investment costs and works completion times are substantial (around 6 to 7 years for overhead lines, and even around 10 years in some cases).

The development plan provides an overview of the present state of affairs, and forecasts the constraints which are likely to affect the transmission system in the next ten to fifteen years. It is based on studies of the network, along with forecasts and analyses of future trends in electricity supply and demand carried out by RTE (generation adequacy report) or by regions (collective energy services plan). The development plan also contains

details of the multiannual production investment programme, which is drawn up by the Minister for Energy.

The studies are conducted in each region by specialist organisations, working under the guidance of the regional Prefect and in conjunction with the Regional Commission for Territorial Planning and Development (CRADT). The organisations generally consist of representatives from elected bodies, the government, network users, associations and RTE. Their work has resulted in a set of hypotheses, setting out a shared view of how the economic, industrial and energy situation is expected to evolve in each region.

This regional dialogue helps guarantee that any network constraints identified, along with the development projects subsequently drawn up to deal with them, meet the region's development needs.

3.1.2 Offshore

France does not yet have specific rules for leasing and permitting of offshore generation.

21 wind turbines, with a capacity of 105 MW situated some 7 km off the coast of Veulette-sur-Mer, in Seine-Maritime, France's Alabaster Coast, are set to be operational in 2008.

3.1.3 Interconnectors

Interconnection capacities with neighbouring countries remain insufficient in France which prevents the development of cross border competition.

France is geographically separated from the Iberian Peninsula by the Pyrenees and additional interconnector capacity is planned between Sentmenat (Spain), Bescano (Spain) and Baixas (France), scheduled for 2010.

A new line is planned between Moulaine (France) and Aubange (Belgium), with completion expected between 2010 and 2015. This is intended to relieve congestion on the French-Belgian border

France is connected well to Great Britain and no priority development plans exist at present. No priority development plans are currently in place for the border to Italy.

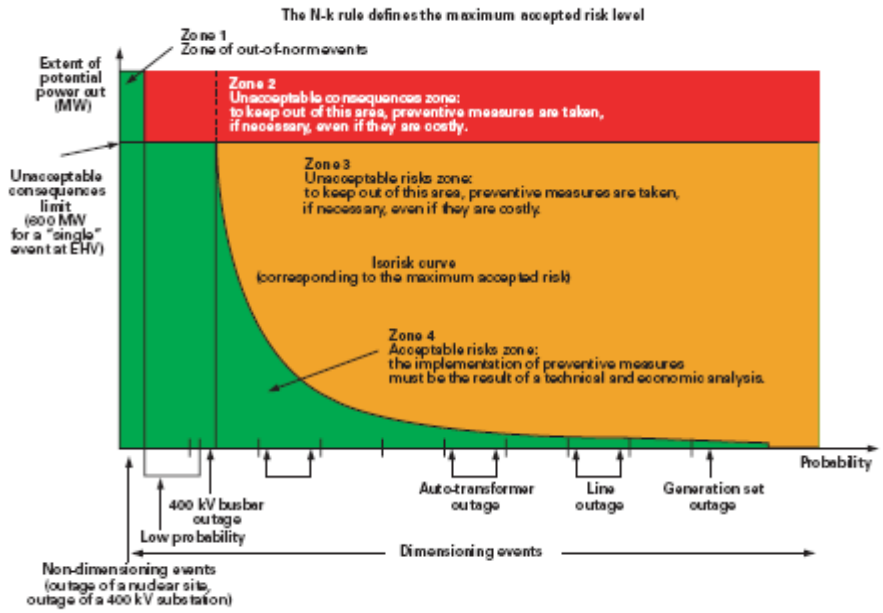
3.2 Planning & Security Standards

RTE, as transmission system operator, is responsible for ensuring the quality, reliability, security and efficiency of the transmission network. They are required

to do this economically – and the capital expenditure must be consistent with the cost, frequency and seriousness of the incidents that it hopes to avoid.

To maintain satisfactory system operation, the system is planned such that it can withstand a number of events set out in the planning and operating rules.

Figure 4: Setting acceptable risk levels (RTE, Memento of Power System Reliability)



RTE applies the N-k rule to various stages of preparing system operation and control. This involves considering system security with respect to “reference likely incidents”, which include outage of a single line, outage of a double line, outage of one or two 1300MW units and outage of a busbar section.

3.2.1 Grid Code Requirements

Generators are obliged by the law in France to provide primary/secondary reserve (the quantity provided depending on the technology employed) but there is no provision for payment for this service. Generators therefore enter into bilateral contracts with RTE to ensure payment for the provision of primary and secondary reserve. These contracts are cost-based and subject to regulatory oversight by the CRE (note that these contracts are not formally approved by the CRE but to date we understand that there have been no interventions regarding them).

The behaviour of the French power system during the the system disturbance on 4 November 2006 revealed that RTE needed increased performance by "embedded" power generation and the need to know in real time the generation capacity connected to the distribution networks. The

mass tripping of "embedded" power generation connected to the public distribution networks (CHP, wind farms) is a major area for concern. Some 75% of this "embedded" power generation in France tripped (i.e. 2000 MW).

RTE's inability to obtain clear information of the power generation injected into the public distribution networks prevented it from properly assessing the status of the generation - demand balance. With the fast development in view of this type of power plants, efforts have begun with the authorities to ensure that regulatory texts stipulate that embedded power generation (especially wind farms) are operated according to more robust standards, more in line with those of other types of power generation, when network disturbances occur.

RTE is also working with the public distribution system operators to introduce facilities enabling RTE to measure this generation and forecast changes based on weather forecasts. Measures have also been defined that will enable RTE to control the generation in the case of an incident requiring rapid generation reductions.

3.3 Transmission Access & Charging

This section details some of the details governing transmission system access and charging on the French system. In order to gain transmission access a counterparty needs to be a Programming Responsible Party (PRP). There are a number of other requirements on PRP's, including a requirement to submit indicative schedules of planned output to the TSO.

3.3.1 Transmission Connection

Users are connected to the electricity transmission network according to a specific process. After studying the technical and economic constraints involved, RTE sends the customer a quotation. After the acceptance of offer, contracts are signed covering the connection and the way the installation will work.

In the case of electricity generators, RTE handles connection applications for installations with a capacity of over 12 MW. Requests concerning smaller installations are dealt with by a different company, called EDF Réseau de Distribution. RTE provides customers with information on the power capacities that its installations are able to handle, and any requests currently in the queuing system. The "available network capacity" for new generation of an electric substation is defined as the extra power it can accept without endangering the network. The available capacity of each substation is limited, and since the substations interact with one another, the capacities in any given zone of the country cannot be added together. Connection requests are placed in a queue as soon as they are received, to ensure they are dealt with fairly and impartially.

3.3.2 Connection Charging

Connection charging is based upon the costs of connection to the nearest substation where the adapted voltage level is available and where the connection is technically possible. This could be described as a shallow connection regime, with the deeper costs of transmission reinforcement socialised through transmission charges.

3.3.3 Transmission Access

Transmission access is usually set for a period of twelve months, and provides firm access rights, with any curtailing undertaken and compensated by RTE through Balancing Mechanism actions.

RTE does allow program spot overshoots between 1 July and 15 September, according to the conditions and lead times stipulated in the contract. These appear to be on a non-firm basis (when the load capacity of the grid permits it), and charged at a specified contract rate.

3.3.4 Transmission Charging

The price charged for using the public power transmission system operated by RTE is set by the Government, following proposals by the French energy regulator (CRE). The price is a "postage stamp" rate, meaning it is the same right across the country, only varying depending on the voltage level involved. It is mainly applied to offtakes or withdrawals of electricity from the network (98% of the charge is targeted at consumption), although Generators also pay an "injection fee".

RTE revised the price on 1st January 2006, and this price was expected to remain in place for two years. The price was designed to enable RTE to achieve a 7.25% rate of return on capital employed (ROCE), taking into account the company's other predicted revenues and costs for 2006 and 2007. Due to the growth in withdrawals by consumers from the network, it is 1.3% lower on average than the previous price.

The charge covers the capital and operational costs of the transmission network as well as costs for losses and system services. The charges are targeted approximately at 63% power: 37% energy and so charges will be dependent upon load factor. Typical tariffs are in the region €5-6/MWh, with the bulk of the charge relating to infrastructure costs.

3.3.5 Transmission Losses

In France losses are compensated for by the transmission provider (RTE) and bundled in overall grid charges.

The operator of the Electricity Transmission System, RTE is required to ensure that compensation is provided for power losses in the high and extra high voltage network. Actual losses are calculated as the difference between injections (generation injected + physical imports) and extractions (consumption extracted + physical exports) at the terminals of the public transmission system. These losses are approximately 12 TWh (Terawatt-hours) per year.

ANNEX A – ABBREVIATIONS

Acronym	Definition
ATC	Available Transfer Capacity
BE	Belgium
BM	Balancing Mechanism
BRE	Balance Responsible Entities
CEE	Central Eastern Europe
CDP	Capacite Disponible Proposee (Available Proposed Capacity)
CNP	Capacite Nette Proposee (Net Proposed Capacity)
CRADT	Regional Commission for Territorial Planning and Development
CRE	Energy Regulatory Commission
CWE	Central Western Europe
DE	Germany
DSO	Distribution System Operator
EC	European Commission
EDF	Électricité de France (electricity distribution and production)
ELIA	Belgian TSO
EnBW	German TSO
ERGEG	European Regulators' Group for Electricity and Gas
ES	Spain
ETSO	European Transmission System Operators: ETSO is an International Association of TSOs.
EU	European Union
EWIS	European Wind Integration Study, initiated by the European Transmission System Operators
F	France
GB	Great Britain: includes England, Scotland and Wales
GW	Gigawatt = 1,000,000 kW (unit of power/ capacity)
GWh	Gigawatt hour = 1,000,000 kWh (unit of energy)
I	Italy
IEA	International Energy Agency
kW	Kilowatt = 1,000 Watts (unit of power/ capacity)
kWh	Kilowatt hour = 1,000 Watt hours (unit of energy)
MW	Megawatt = 1,000 kW (unit of power/ capacity)

Acronym	Definition
MWh	Megawatt hour = 1,000 kWh (unit of energy)
NL	Netherlands
NTC	Net Transfer Capacity
PRP	Program Responsible Party
PTR	Physical Transmission Rights
REE	Spanish TSO
RETD	Renewable Energy Technology Deployment
RTE	French TSO
RWE	German TSO
SO	System Operator
TERNA	Italian TSO
TSO	Transmission System Operator
TWh	Terrawatt Hour = 1,000 MWh (unit of energy)
UCTE	Union for the Co-ordination of Transmission of Electricity. The association of transmission system operators in continental Europe.
UK	United Kingdom: Includes England, Scotland, Wales and Northern Ireland
ZDE	Zone de développement éolien (wind development zone)

ANNEX B – GLOSSARY

Term	Definition
Bilateral	Trades or other contracts between two participants, for example a generator and supplier.
Capacity	Cf. Energy, Power. The maximum ability of a generating station to generate an amount of electricity in a given time. Measured in units of power (kW). The actual energy generated is dependant on the load factor.
Clip Size	The minimum size of interconnection capacity contracts.
Credit Cover	The cash or other financial security that must be provided.
Day Ahead	The day prior to the day that is being traded for or balanced.
Deep Connection Costs	Cf. Shallow Connection Costs. The costs of reinforcing and upgrading the wider network to enable additional generation or demand to be connected.
Energy	Cf. Power, Capacity. Formally defined as the ability for a system to do work. In the case of an electrical energy this is measured in kWh. Energy cannot be stored in the transmission network, so at any given time the total energy generated must equal the total energy demand and total losses (due to heating of wires etc.) This is known as balancing the system.
Gate Closure	The last time at which energy can be traded before the markets are closed. Balancing trades may take place closer to real time on a separate balancing market.
Great Britain	England, Scotland and Wales (excludes Northern Ireland)
Intraday	Within the day that is being traded for or balanced.
Ireland	The term Ireland refers to the state of Ireland (Eire), which excludes Northern Ireland. Within this document we have usually referred to “the island of Ireland” or “all-island” to include both Eire and Northern Ireland. For clarity, the state of Ireland is referred to as Eire throughout.
Load Factor	Also may be known as a capacity factor. The ratio of the actual energy output of a power plant over a period of time and its energy output if it had operated a full capacity of that time period. For example, an onshore wind farm might have a load factor of 30-40%. This means that on average it generates at 35% of its capacity, although at any given time it may be generating anywhere between 0% and 100% of its total capacity.
Locational	Cf. Postage Stamp. Differentiated by geographical location. For example, in the case of transmission charging, this typically will mean higher charges further from demand centres.
Long	Cf. Short. Where a participant has more generation than is required to balance their demand (including losses where applicable)
Main Price	Cf. Reverse Price. The balancing price where a participant is out of balance in the same direction as the market, for example a participant that is “short” when the market is “short”.

Term	Definition
Postage Stamp	Cf. Locational. Uniform, equal throughout the network.
Power	Cf. Energy, Capacity. Power is the ability to create energy in a given time, and can be expressed in the following equation: $Power(kW) = \frac{Energy(kWh)}{Time(h)}$
Price Maker	Cf. Price Taker. In the context of an electricity pool, a price making generator will submit a number of bids/offers indicating how much electricity they would be prepared to despatch at a given price. The system operator will place the generators in order of cost to determine which plants will be despatched.
Price Taker	Cf. Price Maker. In the context of an electricity pool, a price taking generator will not submit a bid or will submit a bid at zero. This means it will always be despatched (subject to system constraints) and will receive the pool price. Price taking generators include variable generators with low marginal costs, such as wind.
Real Time	The actual time period that energy is being traded for or balanced.
Reverse Price	Cf. Main Price. The balancing price where a participant is out of balance in the opposite direction to the market, for example a participant that is "short" when the market is "long".
Shallow Connection Costs	Cf. Deep Connection Costs. The costs of physically connecting a generator to the nearest appropriate point in the transmission network, this may typically be the closest substation. This does not include costs associated with any required reinforcements to the wider transmission network.
Short	Cf. Long. Where a participant has less generation than is required to balance their demand (including losses where applicable)
Supplier	Normally used to describe a retail electricity supplier that sells electricity to final consumers, this can include domestic, commercial and industrial consumers
United Kingdom	Includes England, Scotland, Wales and Northern Ireland
Vertical Integration	Vertical integration is the degree to which a firm owns its upstream suppliers and its downstream buyers. For example, within the electricity industry this can be used to describe the situation where a parent company owns both an electricity retail supplier and generator.

ANNEX C – REFERENCES

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26	RTE - French Power System Reliability Report 2006 (21 June 2007)
27	LPSC - Espace Eolien

ANNEX D – INTERCONNECTION TABLE

Countries / Stations	Unavailability (min/year)	Operator		Transmission Capacity	
		Substation in France	Substation Neighbouring Country	Present (thermal) Transmission Capacity (MVA)	Limitations by transformer or substation
France – England					
Mandarins – Sellingde	6544/4011	RTE	National Grid	2 x 1000(in MW)	-
France - Spain					
Argia - Hernani	847	RTE	REE	1136	-
Errondenia - Irun	26379	RTE	REE	56	-
Argia - Arkale	2017	RTE	REE	340	-
Pragneres - Biescas	4911	RTE	REE	237	-
Lac d'Oo - Benos	870	RTE	REE	63	-
Baixas - Vic	514	RTE	REE	1105	-
France - Italy					
Albertville – Rondissone	18869/18869	RTE	Terna	2 x 1244	-
Trinite Victor – Camporosso	25328	RTE	Terna	320	-
Villarodin – Venaus	8415	RTE	Terna	956	-
Luciana – Suvereto	18240	EDF	Terna	2 x 300	-
Bonifacio – Santa Teresa	n.a.	EDF	Terna	53	
France - Switzerland					
Sierentz – Bassecourt	31863	RTE	BKW	1186	-
Sierentz – Laufenburg	45494	RTE	EGL Grid	1167	-
Mambelin – Bassecourt	9045	RTE	BKW	1046	
Bois-Tollot – Verbois	9963	RTE	EOS	1211	800
Bosi-Tollot – Chamoson	31962	RTE	EOS	1409	600
Genessiat – Verbois	3204/3258	RTE	EOS	2 x 315	-
Chancy-Pougny – Verbois	n.a.	RTE	EOS	52	42
Vallorcine - La Batiaz	695	RTE	Atel	266	-
Cornier – Riddes	14987	RTE	EGL Grid	275	
Cornier – St. Triphon	16072	RTE	EOS	275	-
Sierentz – Asphard	14157	RTE	Atel/NOK/EnBW	1167	-
France - Germany					-

Countries / Stations	Unavailability (min/year)	Operator		Transmission Capacity	
		Substation in France	Substation Neighbouring Country	Present (thermal) Transmission Capacity (MVA)	Limitations by transformer or substation
Vigy – Uchtelfangen	666/46170	RTE	RWE	2 x 1790	-
St Avoid – Ensdorf	16739	RTE	RWE	261	-
Vogelgruen – Eichstetten	8195	RTE	EnBW	338	-
Muhlbach – Eichstetten	500	RTE	EnBW	1751	-
France - Belgium					
Chooz – Jamiolle	6407	RTE	Elia	362	
Mastaing – Avelgem	3412	RTE	Elia	1207	-
Avelin – Avelgem	3392	RTE	Elia	1367	-
Lonny – Achene	3466	RTE	Elia	1207	-
Moulaine – Aunange	16478	RTE	Elia	286	-