COMMISSION
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Grids

Cross-border electricity exchanges Use and management of interconnections in 2012

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Summary

Interconnections: essential infrastructures

There is no longer any doubt concerning the vital role undertaken by interconnections within French and European power systems. In 2012, **the net exchange balance on French borders was positive, with exports of some 44 TWh,** making France the leading net exporter of electricity in Western Europe. The exported volumes represent 15% of national consumption.

Although France is predominantly an exporter of electricity, imports also have a decisive role in the French power system. Electricity consumption in France is especially sensitive to temperature and experiences highly pronounced peaks, with a record of 102 GW in February 2012. **Import capacities, representing between 8% and 10% of maximum consumption, facilitate management of these consumption peaks,** by relying on electricity surpluses in border countries, where consumption is less "temperature sensitive". **Electricity imports proved essential to guarantee a secured supply to French consumers and prevent unvoluntary load-shedding and blackouts during the cold spell in February 2012.**

In addition to their contribution in terms of security of supply, interconnections also make it possible to benefit from the complementarity of power generation fleets in Europe and of the 'pooling effect' of consumption peaks. **The end-consumer ultimately benefits from cross-border electricity exchanges since they enable electricity suppliers to procure power at lower costs by using the cheapest production sources.** For an example, look no further than the market coupling between France, Benelux and Germany, set up in November 2010, which has led to savings of approximately €50 million in terms of supply costs.

These exchanges facilitate the integration of renewable energies, particularly wind and solar power, which is possible at a lower cost than for non-interconnected systems. Interconnections make it possible to benefit from the pooling effect of variable production and to share flexibility sources available in Europe: balancing reserves, flexible production sources or storage systems. The 50% rise in intraday exchanges on all French borders between 2011 and 2012 is the result of an increasing interest in this timeframe, particularly because this tool is well-suited to countering the fluctuation of variable energy production compared to the forecasts.

As such, appropriate allocation mechanisms are crucial. CRE is part of the drive to construct a single European electricity market and fully participates in interconnection-related issues since it is responsible for approving their rules and methods for use. **Pursuant to article 1.10 of the Appendix to Regulation 714/2009, CRE is also responsible for assessing the effectiveness of interconnection use and management: the CRE report on the management and use of interconnections falls within the scope of this mission.**

In 2012, the use of interconnections generated a revenue of €300 million for the French Transmission System Operator (RTE), **an increase of 50% compared with 2011**. Market players will to obtain increased exchange capacities results, through the auctionning process, in an increased congestion income.
Congestion is a result of insufficient interconnection capacities to meet the requirements of market players or to make effective use of the less costly power plants on a European scale. To address this issue, two complementary solutions are implemented by RTE, having first been approved by CRE:

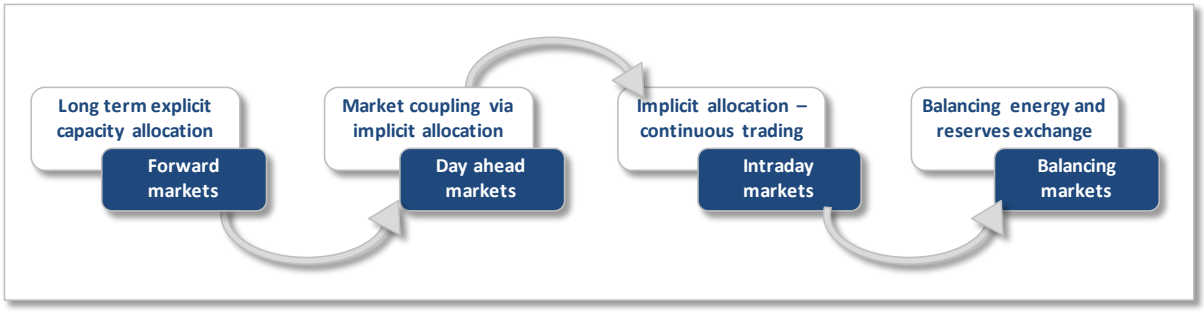
- **Improvement of interconnection management mechanisms:** increases cross-border electricity exchanges and the effective use of existing system infrastructures;
- **Investment in the transmission system, particularly interconnections:** in December 2012, CRE approved an RTE investment programme of €1439.9 million for 2013, €404.7 million of which was for major transmission systems and interconnections.

Visible progress made in implementing target-models

On 4 February 2011, the European Council set an objective to complete the internal energy market before the end of 2014. Achieving this objective entails implementing effective management mechanisms for optimized use of existing interconnections. Through application of the "Third Energy Package", the ACER framework guidelines, followed by Network Codes (currently being created), define for each timeframe the mechanism considered as the most effective: the "target-model". These target-models must be implemented on all borders in the European Union by the end of 2014.

Figure 1 provides an overview of the target-models for each timeframe, this represents all methods that are best suited to electricity exchanges at a given timeframe.

Figure 1: Target-models per timeframe

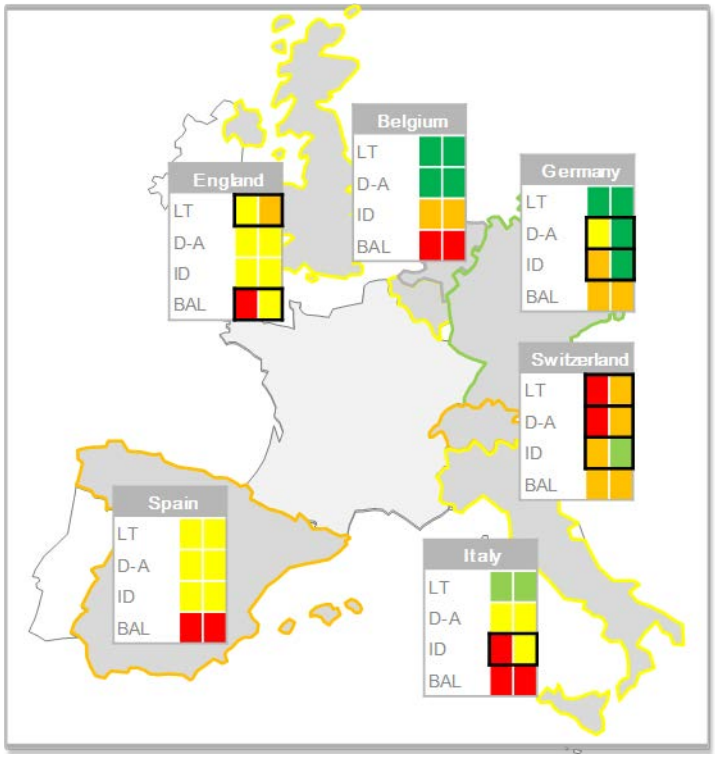


Source: CRE

Much progress has already been made for all French interconnections and has been made easier since some target-models were defined using feedback from pilot projects in which France was involved. To this end, steps have been taken over the last four years to bring the situation of French interconnections into line with European objectives.

As such, improvements to the capacity calculation and allocation rules, encouraged and approved by CRE, have already ensured that the maximum exchange capacity is largely available on the market at each allocation timeframe. However, to a large extent, the capacity between France and Switzerland remains an exception, since the procedures in place only guarantee this maximization for the intraday timeframe: this means this interconnection is used significantly less effectively than the others.

Figure 2: Proximity of mechanisms in place in relation to target-models, per border and per timeframe, changes between 2009 (left-hand column) and 2012 (right-hand column)



Source: CRE

For each border and for each timeframe (long-term, day-ahead, intraday and balancing), the map overleaf (Figure 2) shows to what extent the situation is nearing (green) or far off (red) from the target-model. The first column qualifies the situation in 2009 and the second at the end of 2012. This is only a qualitative[1] indicator, since Part II of the report describes the situation on each border for each timeframe in detail.

Over the last four years, several projects have been completed and have led to significant improvements, including market coupling with Germany, changes or developments of the intraday exchange mechanisms with Germany, Switzerland and Italy and the implementation of balancing exchanges with the UK through the BALIT project.

As an example, the following mechanisms have led to significant progress and benefits:

- Market coupling between France, Belgium, the Netherlands and Germany guarantees optimal use of interconnection capacities between these countries, and has therefore reduced congestion levels on these borders: the prices between these four countries were the same 50% of the time in 2012 (compared to 1% before the trilateral coupling was extended to Germany);
- The implementation of a more efficient intraday exchange mechanism (with Germany in December 2010 and with Switzerland in January 2012), made it possible to increase exchanges with Germany by 50% for this timeframe between 2010 and 2011, and, for Switzerland, they were multiplied five-fold between 2011 and 2012.

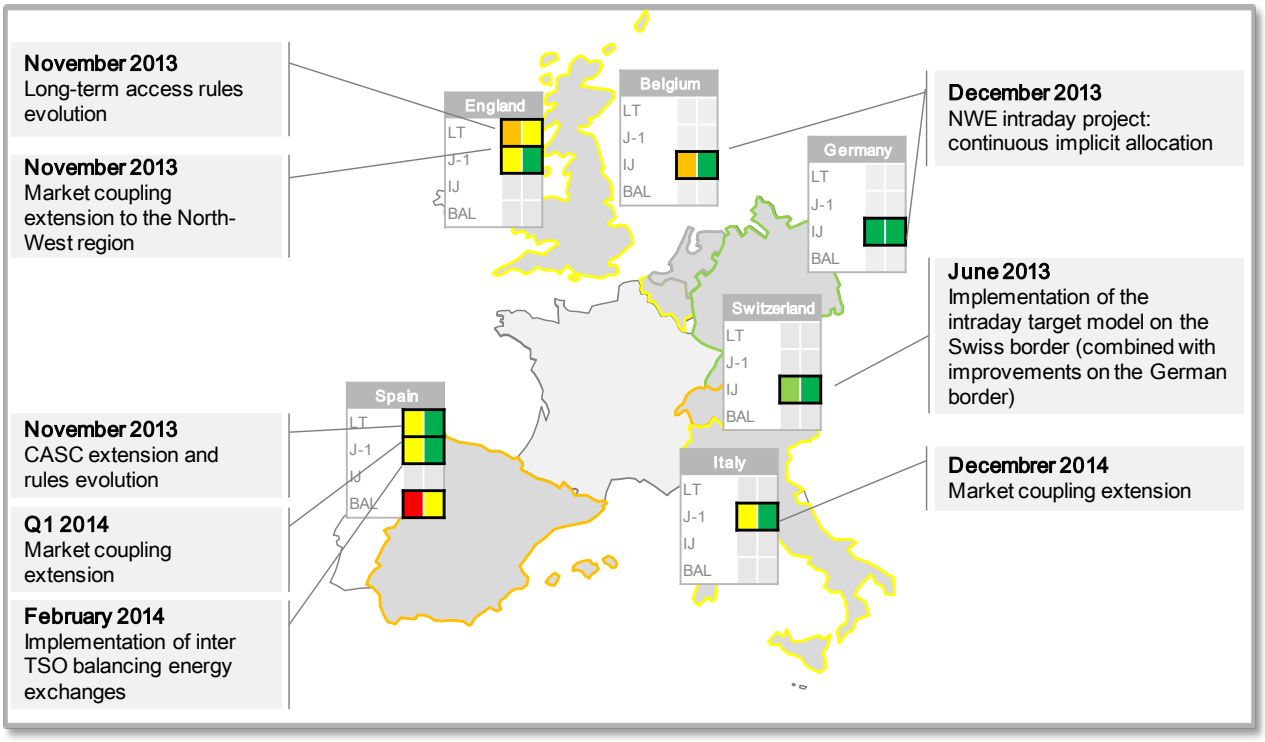
[1] Appendix 1 describes in detail the construction method of this indicator. This indicator intends to differentiate between mechanisms that are close to the target-model or on track to reach it and inefficient mechanisms that are far removed and very far removed from the target-model.

Explication of abbreviations in Figure 2: LT: long-term; J-1: daily; IJ: intraday; BAL: balancing.

Several projects on track to achieve the integration of electricity markets in 2014

However, reaching the 2014 objective remains a challenge: the deadline is close to have the target-models implemented on all borders. However, several projects, in which CRE is actively involved, are on track for completion over the coming months. They should considerably improve the efficiency of cross-border exchanges and have a significant impact in terms of power supply costs, of creating reserves or facilitating the integration of renewable energies. The map below (Figure 3) lists the main projects in progress and assesses their impact in terms of convergence towards the target-model. From among these projects, it is worth noting the improvement of long-term allocation rules, coupling with England, Spain and Italy, and the implementation of the intraday allocation platform, not forgetting the flow-based coupling project that will optimize capacities available on the market. Considerable benefits can be expected from the implementation of these projects: for example, analysis of the use of interconnection capacities in 2012 indicates that supply costs could have been reduced by €110 million by extending market coupling to all French borders. This gives us an idea of **the importance of projects initiated or supported by CRE.**

Figure 3: Schedule of upcoming changes, per border and per timeframe, changes between 2012 (left-hand column) and upcoming years (right-hand column)



Source: CRE

Moreover, other projects to obtain improvements at later timeframes are currently in their design phase. **The year 2013 is therefore crucial** in terms of improving the way interconnections are used and managed and each border will be involved in at least one of the projects.

Introduction

Interconnections: a crucial element of the European Energy Policy

The seeds for the European Energy Policy were sown in 1951 with a treaty that created the European Coal and Steel Community (ECSC), and its development continues today. The founding principles of solidarity and competiveness continue to guide this development, with treaties and texts from the Third Energy Package adopted in 2009 providing its framework. An environmental dimension has been added alongside the two founding pillars, resulting in the energy-climate package and the "3 times 20" objective: 20% reduction in greenhouse gases, 20% reduction in energy consumption and 20% of energy mix to be provided by renewable energy by the year 2020.

At the very heart of the single market construction process, interconnections are used for electricity exchanges between the different national systems, and, as such, they are a crucial part of each of the three pillars of the European Energy Policy. These exchanges meet three objectives:

- Interconnections enable market players to complete commercial exchanges to reduce their supply costs and, ultimately, end customers' energy bills. In particular, European countries have different energy production mixes and different consumption profiles. By reducing electricity supply costs and avoiding some investment cost, interconnections can be used to reap the benefits from production fleet complementarity and the pooling effect of consumption peaks;
- These benefits are strengthened by the large-scale development of renewable energies. Interconnections extend the pooling effect of variable generation and optimize the management of flexibility resources on a European scale. As a result, they facilitate the integration of new production sources and limit the investments required to compensate their production variability;
- Interconnections also play an essential role in terms of security of supply. Historically, interconnections were used to develop mutual support mechanisms between national power systems and pooled frequency control resources. Recent events illustrate their essential role for security of supply: interconnections have ensured continued supply to French consumers during the cold spells in recent winters[2].

Improved power exchanges between European countries is therefore a major challenge. This is particularly the case in France, where existing interconnections are not sufficient to meet all market players' requirements: interconnections act as "bottlenecks" and limit the possible exchanges. To rise to this major challenge for France and Europe, two complementary vectors must be used:

- To reduce "bottlenecks", huge investments must be made, both in cross-border and domestic systems;
- The use of existing infrastructures must be improved by developing, for example, methods for capacity acquisition and use of the capacities by market players, or methods applied by system operators to calculate the capacity provided to market players.

[2] During the cold spell of February 2012, the margins available in France (unused production or balancing capacities) to overcome consumption peaks were sometimes at lower levels than power imports at a given moment. Without relying on imports, France would not have had enough available capacities to cope with the demand.

Making better use of existing infrastructures

This report focuses on this second vector, in application of paragraph 1.10 of the guidelines attached to Regulation 714/2009, which specifies that "national regulatory authorities regularly assess the congestion management methods".

Choosing the right mechanisms to manage and use the interconnections installed on each border is crucial if their utilization is to be optimized. CRE is involved in the construction of the single European electricity market and is tasked with approving rules and methods used to implement the different interconnection management target-models. Many of these target-models have been introduced at the initiative of CRE. CRE is also responsible for assessing the effectiveness of these methods and interconnection management.

In the past, cross-border power exchanges were based on bilateral exchanges between integrated national players. The progressive transition to a competitive and open pan-European market necessitated a change of paradigm, and with that, the need to conceive, develop and implement new cross-border power exchange methods. Through consultation with market players, the regulators and power system operators worked together to define the target-models. CRE has been able to capitalize on its experience and successful projects conducted on French borders (for example, the trilateral coupling with Belgium and the Netherlands in place since 2006) and actively contributes to these issues, whilst taking account of the specific features of the French power system.

In February 2011, the European Council set an objective of completing the internal energy market between now and 2014. This entails implementing target-models on all European borders. Furthermore, their implementation will be made compulsory by the Network Codes, which are expected to come into force between 2014 and 2015.

CRE, having fully participated in the work to develop cross-border exchange target-models, is now dedicated to overcoming the difficulties specific to each of its interconnections with neighbouring countries to ensure their successful implementation.

This report provides an overview of the use and management of interconnections between the French power transmission system and those in its border countries. This report measures the effectiveness of existing mechanisms and intends to provide an overview of the role of interconnections in the European Electricity Market and the manner in which they are actually used. Furthermore, this document provides an opportunity to reiterate recent and upcoming progress towards the implementation of target-models.

Part 1 presents a set of indicators used to provide a general overview of capacities available on the market, the manner in which they are acquired and used by market players and the consequences of this use in terms of congestion income.

Part 2 sets out a more detailed approach for each capacity acquisition timeframe. It highlights the differences between mechanisms at each of the French interconnections and, more importantly, confirms the relevance of the target-models.

Part 1: Review of interconnections use and management on French borders in 2012

Interconnections that connect national transmission systems and transmit electricity from one country to another have a finite capacity. This limited physical capacity constantly varies depending on a wide range of factors, such as operating conditions of the local network or even temperature. Transmission system operators operate these capacities and assess on a daily basis the commercial capacity level on each border. This commercial capacity will then be available to market players through different allocation mechanisms, in accordance with a methodology approved by the regulators.

This means the capacities are allocated to market players who then perform commercial cross-border power exchanges. It also reveals the economic value of interconnection capacities.

It is clear that exchanges through French interconnections have a high value and the existing interconnections are not sufficient to meet all market player's demand for cross-border exchanges. Investments are therefore required to increase physical interconnection capacities ; implementing more efficient mechanisms tailored to generators and consumers' requirements is also needed to improve capacities use.

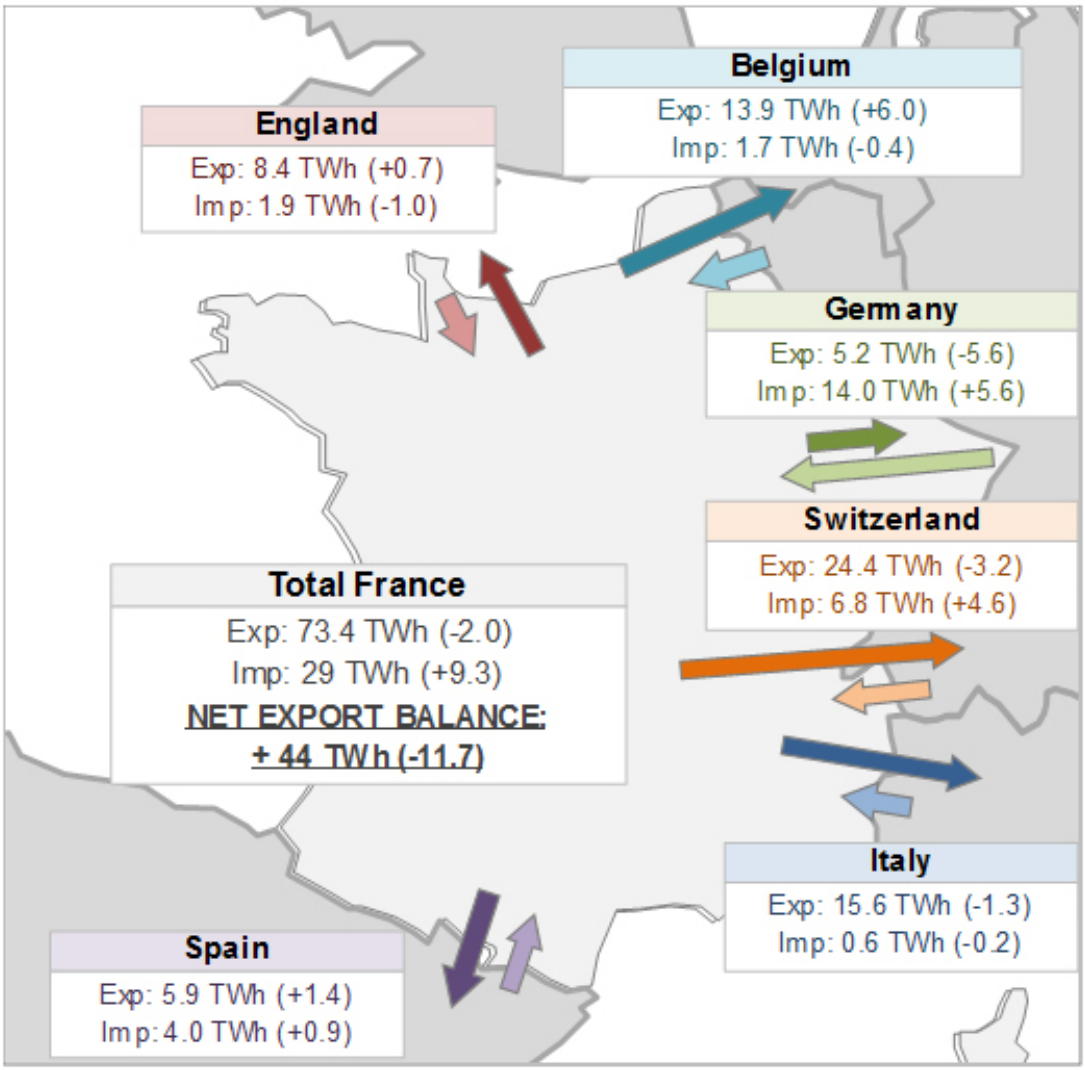
Part 1 of this report presents a summary of commercial exchanges on French borders in 2012: firstly focusing on capacities allocation by system operators and secondly focusing on the economic value of these capacities, i.e. the price that market players are willing to pay for these capacities, as well as the price to buy / sell electricity abroad.

1. Review of import-export and cross-border exchanges

As illustrated by Figures 4 and 5, in 2012 France was a net exporter across all its borders, except on the German border. France has a net export electricity balance of 44.4 TWh, showing a downward trend compared to 55.7 TWh in 2011.

- Decrease in the net export balance can be explained in part by the reversal of exchanges on the German border, with a balance that swung back to net importer (8.8 TWh), having been a net exporter (2.2 TWh) in 2011. In March 2011, Germany issued a moratorium that led to eight nuclear reactors being shutdown and an increase in electricity imports, particularly from France. The trend reversal in 2012 is related to the development of renewable energies, which contributed to pushing wholesale electricity prices on German markets down;
- Exports towards Switzerland have also dropped, whereas imports from this country have increased: net export balance is 17.6 TWh in 2012, compared with 25.2 TWh in 2011;
- The net increase in exports to Belgium (net balance higher than 12 TWh, compared with less than 6 TWh in 2011), caused in particular by the temporary shutdown of two nuclear reactors, was not enough to compensate the overall reduction of the export balance of France.

Figure 4: Flows at French interconnections in 2012

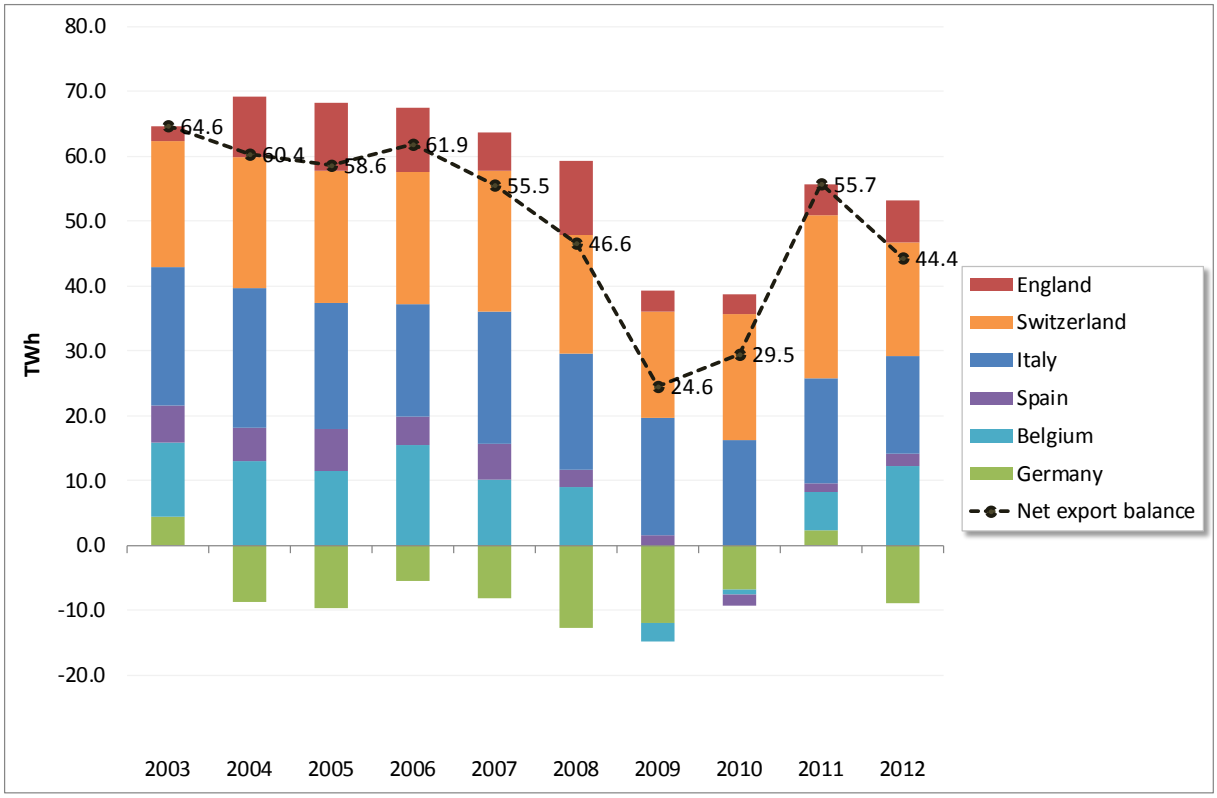


Note: Values in brackets represent changes (in TWh) compared with flows in 2011

Source: RTE – Analysis: CRE

Although this balance has decreased by 20% between 2011 and 2012, it remains much higher than the exchange balances observed in 2009 and 2010, as shown on Figure 5 below.

Figure 5: Changes in French net electricity balance since 2003

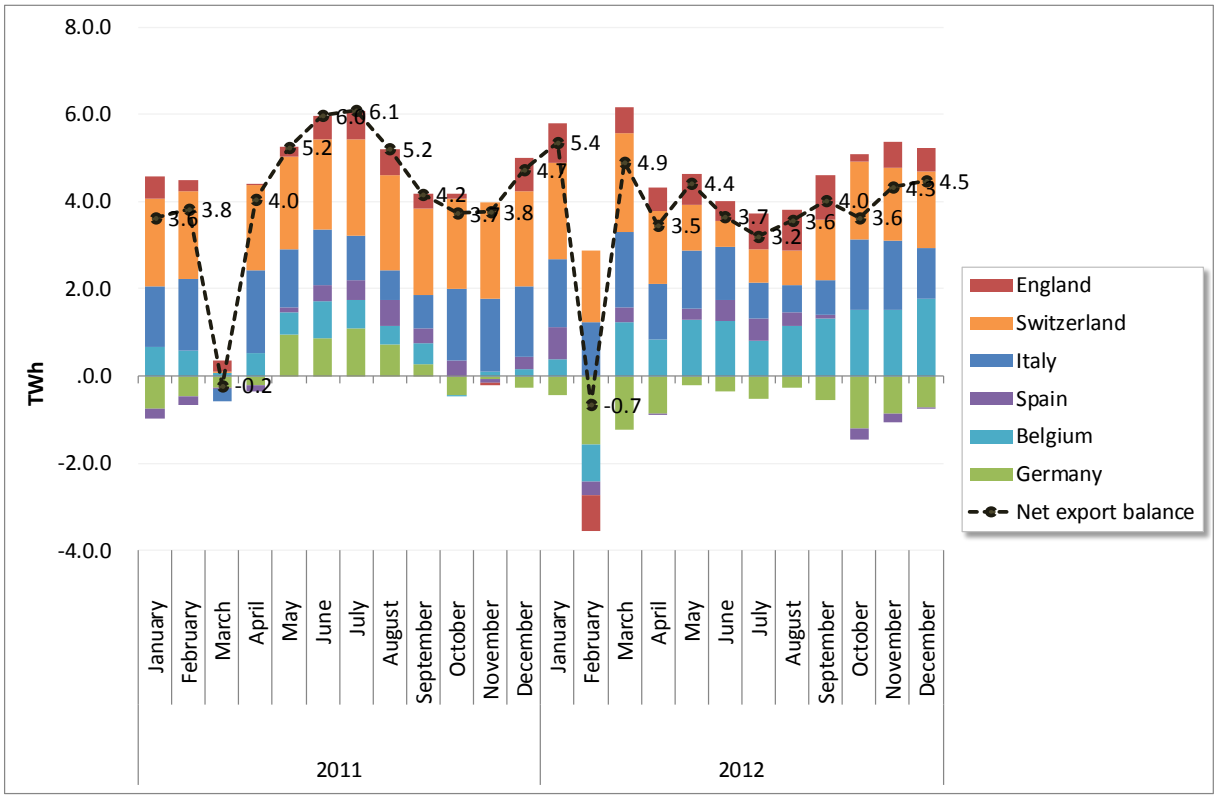


Source: RTE – Analysis: CRE

A month-per-month analysis of the exchange balance (Figure 6) highlights the specific case of February 2012, the only month when France had a net import balance.

- During the first ten days of February, France experienced a cold spell, with temperatures fallling 10°C below seasonal norms. In this context, with particularly high temperature sensitivity (for each degree lost in winter, 2,300 MW of additional electric power is required during the peak), record levels of electricity and gas consumption were recorded (for electricity: 102.1 GW on 8 February 2012 at 7pm) and resulted in reversal of electricity exchanges direction with England, Belgium and Germany. Although France's neighbours did not escape this cold spell, their electricity consumption is less sensitive to temperature variations and did not lead to such high consumption peaks;
- Compared to 2011, the increase in exports to Belgium is clearly visible, particularly during the last three months of the year, during which the capacity was often congested, thus causing a lower convergence rate between Belgian and French spot prices (see Part 2.2 "Review of use and management of interconnections on French borders for day-ahead timeframe").

Figure 6: Monthly exchange balance in 2011 and 2012



Source: RTE – Analysis: CRE

Exchanges between France and Germany

Market coupling introduced in November 2010 ensures an optimal use of interconnection capacities between France and Germany: indeed French and German prices converged 65% of the time in 2012, whereas before market coupling introduction convergence rate had never exceeded 10%.

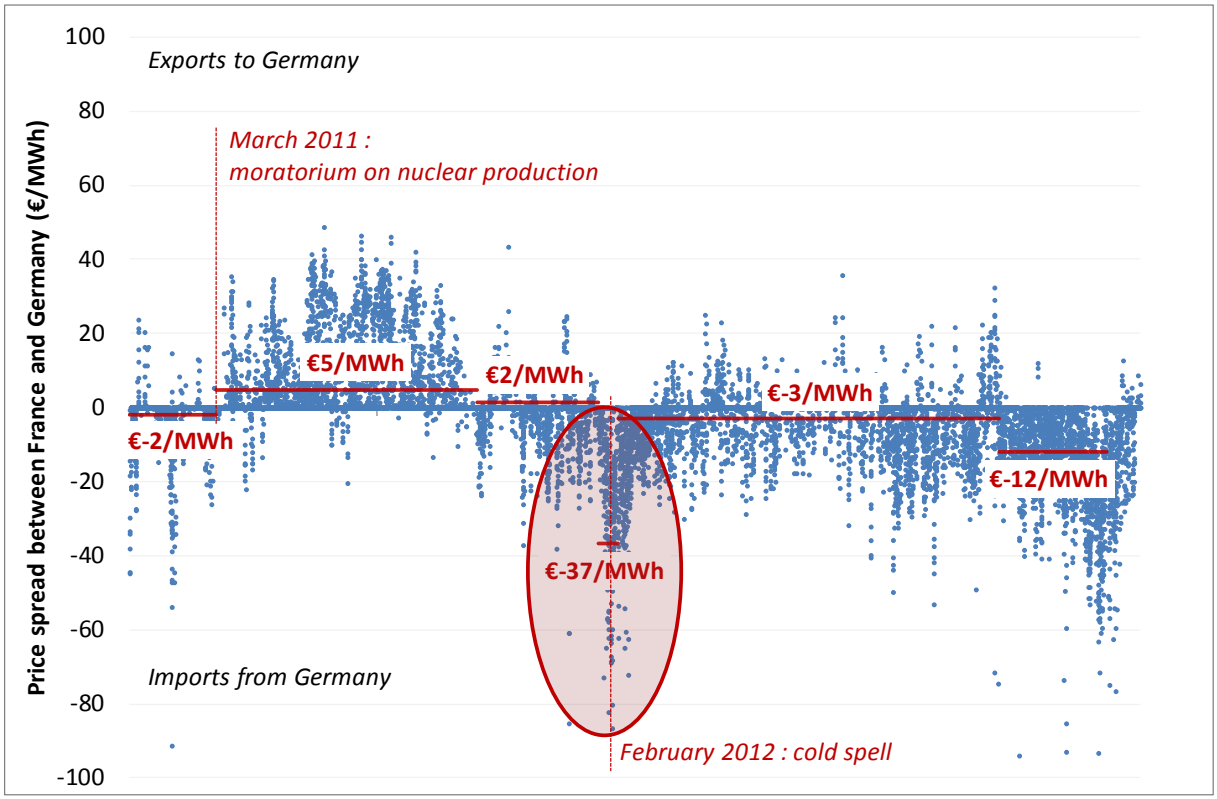
In March 2011, a moratorium on the nuclear industry was decided in Germany, firstly on a temporary basis, then permanently. It led to the rapid shutdown of 8 nuclear reactors. Combined with the drop in French prices at the end of the winter, the moratorium contributed to reversing the price differential between France and Germany, and France was again massively exporting to Germany. During the winter 2011-2012, the strong seasonality of French consumption (and thus prices) compared with Germany pushed French market prices above German ones, with import-oriented exchanges.

From the summer 2012 onwards, there has been an increasing divergence between the prices in both countries, marked by increasing imports from Germany to France, even outside the winter period (Figure 7). This trend led to increasing congestion of the interconnection capacity between the two countries, which, despite coupling, was no longer sufficient to enable convergence of the two markets: 44% and 35% of the time on average in 2011 and 2012. During the first quarter in 2013, capacity congestion will occur more than 70% of the time.

Another indicator that points to this trend: the gross income from import auctions from Germany amounted to €35 million in 2012, i.e. €20 million more than in 2011. This change is even more striking when the theoretical congestion rent from German import capacity is taken into account: from €7.9 million to €45.3 million, i.e. multiplied by almost six.

With regard to exports, the gross income from auctions (€12 million) represented four times the theoretical congestion rent (see Part 1.3 “Capacity value and scarcity”). This indicates that market players anticipated a much higher price differential on average for the export capacity to Germany than the price differential actually observed (probably due to the nuclear moratorium and the flow inversion in 2011).

Figure 7: Changes in price differential with Germany (01/2011 – 03/2013)



NB: to facilitate reading, this Figure does not illustrate extreme price differentials (>€100/MWh) observed during the cold spell of February 2012 (occurrences over period January 2011 - March 2013: less than 0.2% of the time).

Source: EPEX Spot – Analysis: CRE

Market participants were thus willing to purchase the import capacity from Germany at €4.23/MWh, compared with just €1.21/MWh for the same product in 2012. The price attributed by players to the German import capacity at the yearly auctions (and forward prices) indicate that this trend should continue throughout 2013.

This underlying trend can be in part explained by the sustained development of renewable energy generation capacities in Germany, as well as the decrease in coal and CO_2 prices, which underpin the electricity price fundamentals in Germany and contribute to pushing prices down on the German market.

Although market coupling performs its intended role, and, in its absence, the contrast between France and Germany would have been even more striking, observations confirmed that it was no longer sufficient to ensure strong convergence of French and German prices, with a convergence of only 15% in March 2013, and price differentials that reached €19/MWh on average in March.

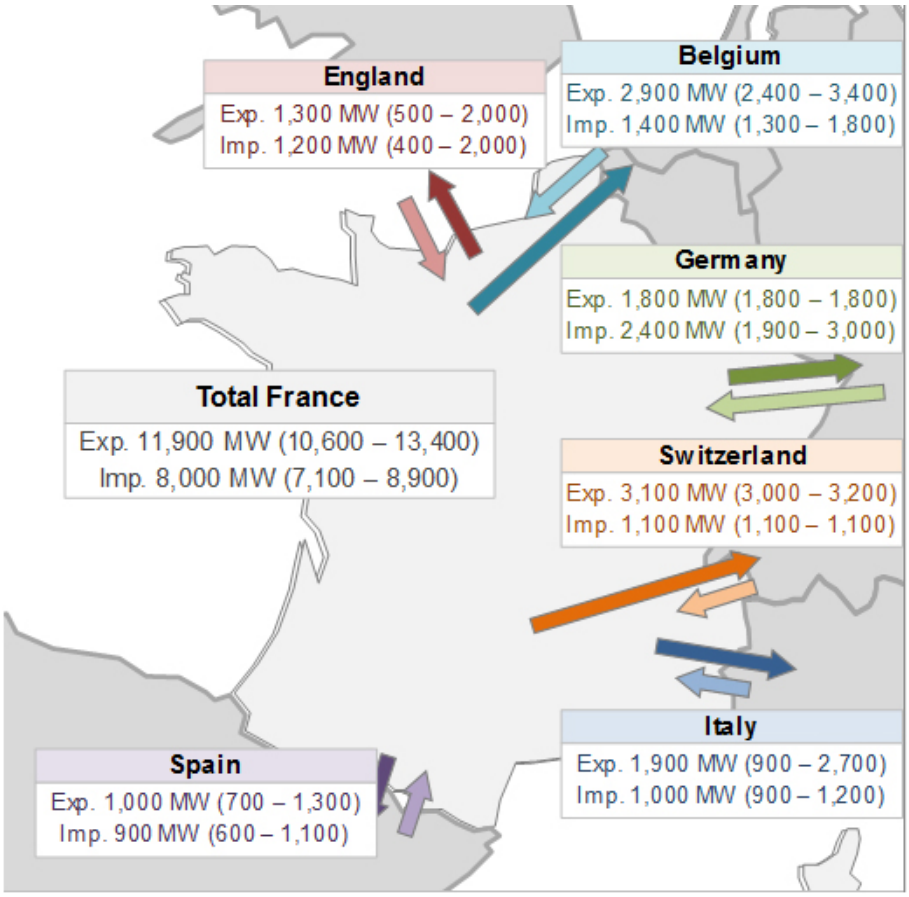
However, the flow-based market coupling project conducted by the regulators, TSOs and power exchanges in the Central-West region, which should be implemented early 2014, should increase the interconnection capacities available for market players to perform commercial exchanges, by improving forecasting and taking account the physical flows in the network caused by these cross-border transactions. As an example, according to TSO simulations focusing on the first quarter 2013, French imports from Germany and Belgium would have been increased from 2000 to 3000 MW (+50%) when prices were high in France, thus contributing to reducing French prices and aligning them with German prices. These forecasts also indicate that France, Germany, Belgium and the Netherlands would have had an identical price 47% of the time in the "flow-based" configuration, compared with 23% of the time observed with the current capacity calculation method.

2. Cross-border electricity exchange capacities

In 2012, the average capacity available for market players at French interconnections was 12 GW (export) and 8 GW (import) (see Figure 8).

- This "commercial" capacity differs from the "physical" interconnection capacity: it is obtained through coordinated calculations between system operators, and distribution to each border, based on the physical capacities available and the network conditions[3]
- The importance of Swiss and Belgian borders, for French exports, and the German border for imports, is very clear.

Figure 8: Interconnection capacity in 2012, average NTC* calculated in D-2



Note: The values in brackets represent the 1st and 9th deciles respectively.

** NTC ("Net Transmission Capacity") represents the total capacity that can be used (commercial capacity).*

Source: RTE – Analysis: CRE

[3] 'Physical capacity' means the maximum transmission capacity that can be physically accepted by each line in the system (including the interconnection lines) independently from the other lines. The commercial capacity of an interconnection means the capacity that remains available for cross-border exchanges once the internal flows have been integrated on the relevant lines in the network (a safety margin is included to manage hazards). The commercial capacity of an interconnection is therefore lower than its physical capacity. An internal line may be limiting in the import or export direction. This explains the overall difference observed between the average NTC in 2012 in both directions.

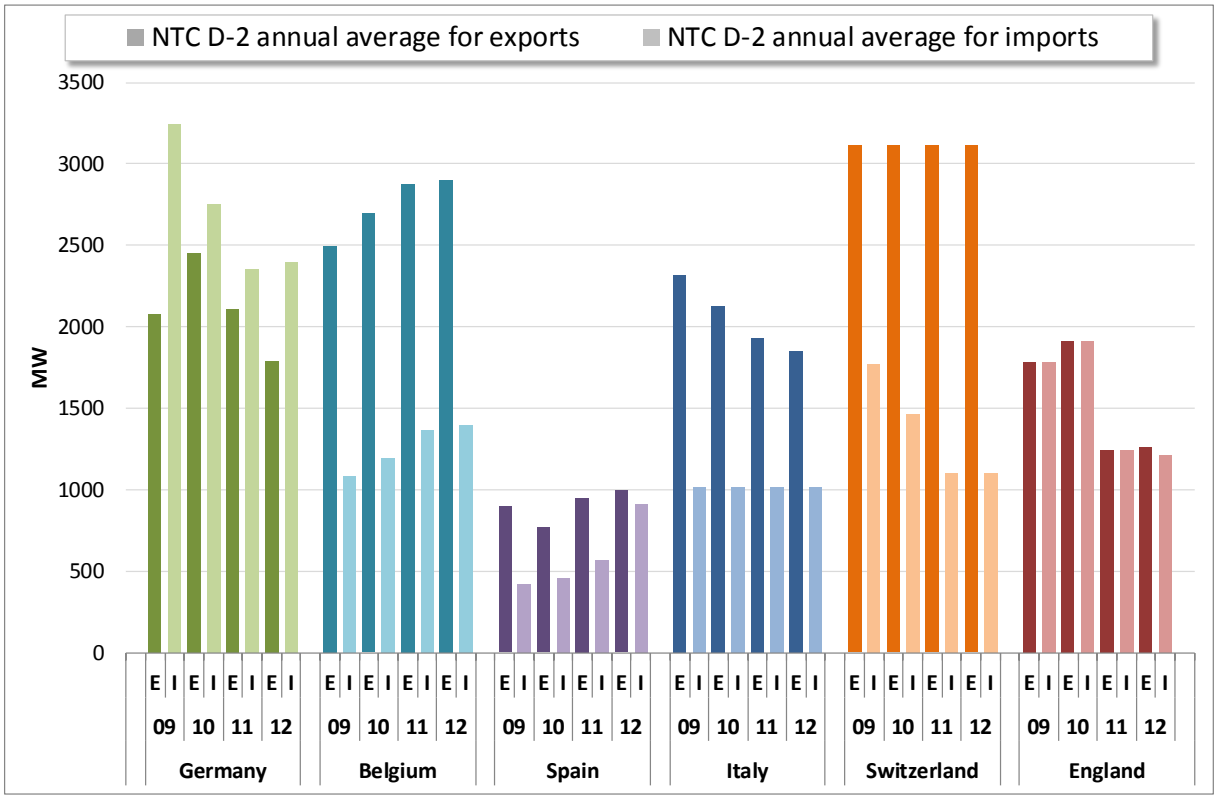
2.1. Changes in interconnection capacities

An overall reduction in the average available commercial capacity for exports is observed compared to 2011 (12.2 GW) and 2010 (13.1 GW), but this level remains in line with average values observed over the last few years. Import capacities remain stable.

Figure 9 reveals several trends:

Belgium	The increase in import and export capacities in 2010 and 2011 can be explained in part by reinforcing the interconnection that links Moulaine, in Meurthe et Moselle, to Aubange, in the Belgium Ardennes (15 km). From mid-2010, this reinforcement has made it possible to increase the available exchange capacity between the two countries by 10% - 15 %.
Germany and Italy	On the borders with Germany and Italy, the decrease in available capacity shall be compared with the constant export capacity towards Switzerland, which stems from guaranteeing exports within the framework of long-term contracts. The interdependence of capacities, particularly for borders that are geographically close, could have resulted in a more consistent decrease in capacity over the three German, Swiss and Italian borders.
Spain	Reinforcements to the internal network between Vic and Sentmenas, in preparation for the arrival of the new direct current line currently built between France and Spain (+2,000 MW), has made it possible to increase the export interconnection capacity.
Italy	The interconnection capacity with Italy contributes to around 50% of the total congestion income (€149 million for RTE in 2012, €105 million in 2011). The allocation of long-term capacities accounts for a large share of this figure (€124 million), since market players attempt to hedge themselves against the price differential. Exports represent 99% of income, also a result of high-price forecasts in Italy.
England	The significant reduction in the NTC can be explained by the large-scale works on the network connecting the two countries, firstly between March and October 2011, and then between March to July 2012, aiming to modernize the AC-DC conversion facilities.

Figure 9: Interconnection capacity, NTC calculated on D-2: changes from 2009 to 2012



Note: "E" and "I" indicate "Export" and "Import" respectively.

Source: RTE – Analysis: CRE

2.2 Capacity curtailment

Transmission system operators may have to cope with situations where allocated capacities cannot be physically used, since this would jeopardize the security of the system. Curtailing the allocated capacities is one of the tools available to system operators to ensure system security. Capacity holders receive compensation if their transmission rights are reduced.

Curtailment comes at a cost for TSOs, which depends on the firmness regime. In the meantime, a higher level of firmness provides a higher value for the capacity to be purchased by market participants. Three firmness regimes coexist on French borders: physical firmness, financial firmness and auction reimbursement:

- Physical firmness means that system operators cannot curtail capacity after nomination deadline ;
- Financial firmness consists of implementing a compensation scheme in the event of curtailment, meaning actors are financially indifferent to whether they use their transmission rights or have them reduced; the right holder is compensated at the price differential between the markets;
- Auction reimbursement entails compensating the holder of a curtailed capacity right at 100% or 110% of the auction price.

Provisions for firmness regime in the Framework-Guidelines

The Framework-Guidelines on Capacity Allocation and Congestion Management (CACM), adopted in July 2011, recommend financial firmness prior to the nomination deadline and subsequent physical firmness.

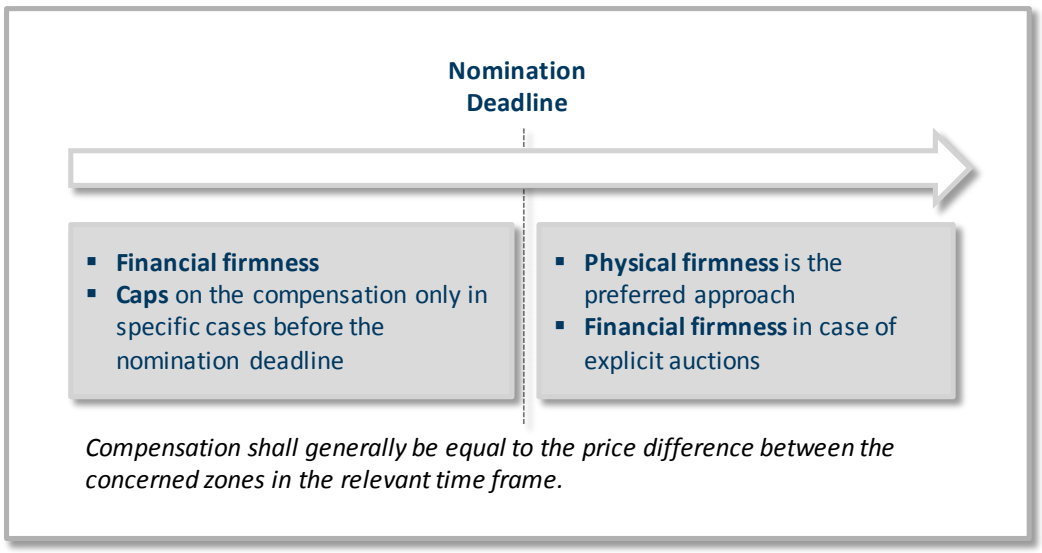


Table 1 provides a review of curtailment consequences per border. Following trends can be observed:

England	A strong increase in capacity curtailment is observed on the interconnection between France and England. Two major incidents occurred in 2012: - An incident on 30 September, which resulted in long-term unavailability of a *pôle*, and thus an impact of 500 MW on commercial capacity since the date of the incident; - Recurrent problems (oil leaks) requiring further lockouts to complete the works, with a 500 MW impact on the commercial capacity. Therefore, capacities already allocated to long-term auctions were reduced to the level of the new available commercial capacity, and compensation at the auction price was provided to holders of curtailed capacity rights. Monthly auctions in November and December were cancelled. As a consequence, the level of commercial capacity was low between October and December. During this period, capacity was curtailed 90% of the time, with an average depth of 730 MW, and the interconnections were not able to operate at full power (2,000 MW).
Italy	A strong reduction in capacity curtailment is noted on the French-Italian border in 2012, in the export direction. During the year 2011, curtailment was rife, owing to high-voltage phenomena in Italy, mainly linked to the development of renewable energy (increase of 18.4% of renewable energy production in Italy between 2010 and 2011). These frequent reductions also led to a reduction in the firm capacity offered at the yearly auction in the export direction (330 MW in 2012; 1,000 MW in 2011). In 2012, forecasts improved and consequently curtailment was more limited.

Spain	The cost for curtailment incurred by the French and Spanish system operators in the export direction (-90%) cannot simply be explained by the lower depth of reductions, since it decreased by -30%. Since the compensation is dependent on the price differential between the two countries, this decrease in the compensation costs is also explained by a lower price differential during the reduction time period.

Table 1: Review of 2012 curtailment and changes compared with 2011

2012 Figures (% of difference compared with 2011)		Average depth of curtailment (MW)	Number of hours concerned	Compensation costs incurred by TSOs
Germany	**Export**	0	0	- €
	Import	0	0	- €
Belgium	**Export**	0	0	- €
	Import	0	0	- €
Spain	**Export**	291 (-31%)	120 (-2%)	€26.7 k (-90%)
	Import	623 (-1%)	85 (0%)	€393.2 k (-5%)
Italy	**Export**	44 (-92%)	20 (-92%)	€20.7 k (-99%)
	Import	0	0	- €
Switzerland	**Export**	317 (∞)	68(∞)	€149.5 k (∞)
	Import	0	0	- €
England	**Export**	654 (41%)	2636 (41%)	€7 575.7 k (184%)
	Import	684 (43%)	3041 (71%)	€3 070.2 k (64%)

Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

3. Capacity value and scarcity

The analysis of the prices paid by by market players for interconnection capacity during auctions organized by system operators reveals the value of interconnection capacity between two countries. When there is insufficient capacity to meet demand, congestion occurs, a capacity price emerges to reflect scarcity. When comparing with the development cost of a new interconnection, one could justify new investments. Furthermore, pursuant to European regulation 714/2009[4] of 13 Jul 2009, the congestion income revealed during auctions must be used uppermost to fund investments aiming to reinforce cross-board exchange capacities.

[4] Regulation (EC) No. 714/2009 from European Parliament and Council dated 13 July 2009 related to conditions for access to the network of cross-border exchanges in electricity, Article 16.6 :

" Any revenues resulting from the allocation of interconnection shall be used for the following purposes:
(a) guaranteeing the actual availability of the allocated capacity; and/or
(b) maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors.
And point 6.6 in Appendix 1 of the Regulations':
"The use of congestion income for investment to maintain or increase interconnection capacity shall preferably be assigned to specific predefined projects which contribute to relieving the existing associated congestion and which may also be implemented within a reasonable time, particularly as regards the authorisation process."

3.1. Comparing values of interconnection capacity

The average hourly price for each megawatt of interconnexion, irrespective of timeframes (Table 2), allows to compare the different interconnections at French borders. This can be used when considering new investments in interconnection lines. On an indicative basis, the cost of building an AC interconnector stands at approx. k€300-500/MW, and approx. k€600-800/MW for a DC interconnector[5].

Table 2: Prices attributed to interconnection capacities in 2011 and 2012

		2012				2011			
		Average spot price differential	Average prices attributed to interconnection capacities		Total	Average spot price differential	Average prices attributed to interconnection capacities		Total
		€/MWh	€/MWh	€/MW	€/MW	€/MWh	€/MWh	€/MW	€/MW
Germany	Export	0.4	1.4	12,691	39,948	3.1	1.5	13,050	24,277
	Import	4.7	3.1	27,257		0.9	1.3	11,227	
Belgium	Export	1.4	0.5	4,484	10,811	0.5	0.0	435	2,358
	Import	1.4	0.7	6,327		0.0	0.2	1,923	
Spain	Export	5.9	2.6	22,580	34,174	6.1	1.8	16,131	31,516
	Import	5.6	1.3	11,594		5.1	1.8	15,385	
Italy	Export	29.5	17.4	152,526	153,128	23.4	12.2	106,769	108,908
	Import	1.0	0.1	602		0.1	0.2	2,139	
Switzerland	Export	4.9	4.0	35,412	39,222	7.9			
	Import	2.3	0.4	3,810		0.7			
England*	Export	11.1	3.7	32,597	37,084		2.2	19,107	26,555
	Import	2.3	0.5	4,488			0.9	7,447	

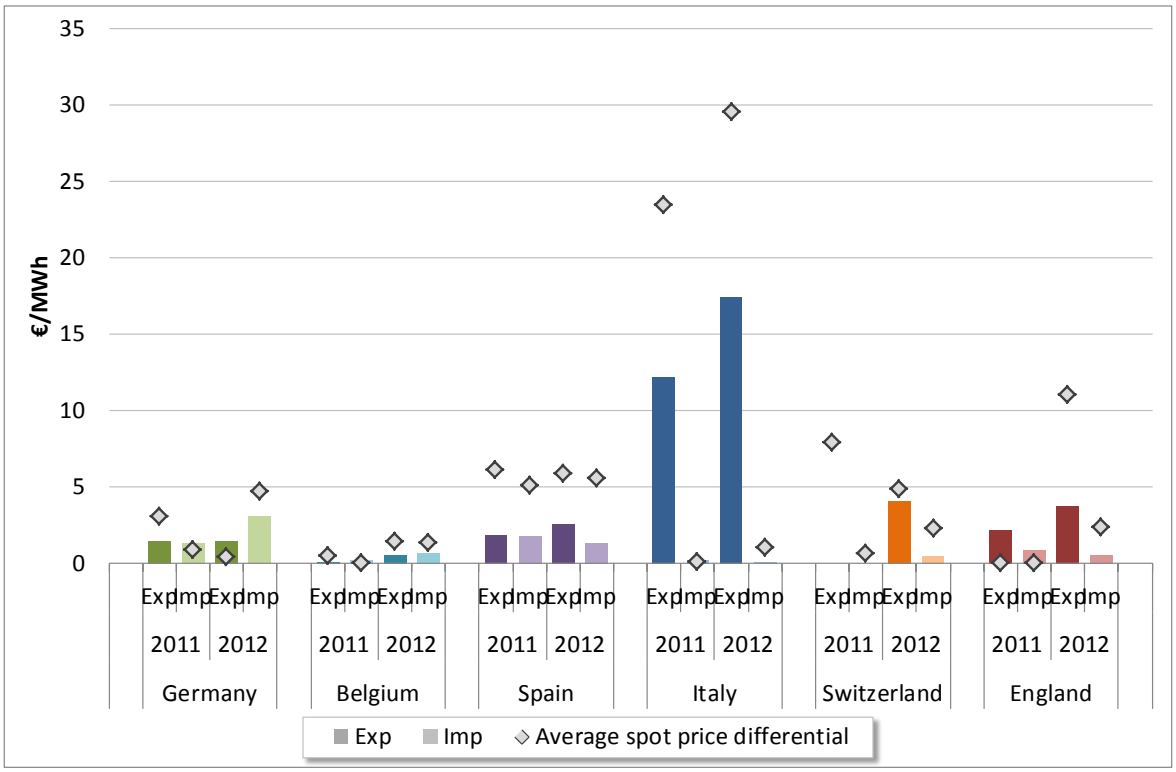
*For the average spread, spot prices in England will not be available until 7 February 2012

Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

[5] CRE estimates, based on the latest projects. The total cost of an interconnection facility is likely to vary greatly depending on the length of the connection, the auxiliary developments (unit works, reinforcement of national liaisons, dismounting of existing connections, etc.), the type of environment (plane, mountain, etc.), and suitability with society-based constraints (architecture pylons, underground burial, modification of route, etc.). Furthermore, the available commercial capacity may be lower than the technical power of the connection and fluctuates depending on flows in the network.

As illustrated by Figure 10, the interconnection with Italy is the most highly valued by market players in 2011 and 2012. The value of a MW on this interconnection (k€153.1/MW in 2012) could justify capacity developments from the system operators. It should be noted that, apart from the interconnections with Germany and Belgium, export capacities have a higher value than import capacities.

Figure 10: Prices attributed to interconnection capacities in 2011 and 2012



Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

3.2. Congestion income

The "gross" congestion income corresponds with the revenue from the allocation of interconnection capacities (irrespective of whether this is done through explicit or implicit auctions) at different timeframes (annual, monthly, other timeframes known as long-term[6], day ahead and intraday), from which the resales are deduced. "Resales" mean that TSOs allocate at a subsequent auction rights which were already allocated. The revenue from resales is then transferred to the former capacity holders.

~ €307 M

(+50% compared to 2011)

Gross congestion income received by RTE at the six borders for 2012

Table 3 provides elements of comparison on the willingness from market players to pay for cross-border capacity between different French interconnections. The actual "gross" congestion income, which reflects this propension to pay, is compared with the theoretical congestion income, which

[6] On the France-England interconnector, seasonal, quarterly and annual products are also proposed over the financial year (April to March).

calculation is based on ex-post hourly price differentials between national markets[7].
The actual congestion income differs from the theoretical one according to several factors:

- Inclusion, by traders, of the intrinsic value of interconnection capacity – equal to the price differential – as well as its time value, which reflects the fact that capacity is optional and depends on the volatility of the underlying and the remaining time before delivery);
- Difficulties for market players to forecast the price differentials in day-ahead and earlier;
- Taking account of the risks for market players linked to the forecast of price differentials between markets;
- Flaws in the interconnected markets (small number of players, information asymmetry, size differences).

Table 3: Actual and theoretical congestion income in 2011-2012

		2012			2011		
		Total gross income from auctions	Theoretical congestion income	Ratio	Total gross income from auctions	Theoretical congestion income	Ratio
		M€	M€	%	M€	M€	%
Germany	Export	11.8	3.1	379%	14.6	27.0	54%
	Import	35.5	45.3	78%	15.5	7.9	198%
Belgium	Export	6.58	15.5	42%	0.65	5.9	11%
	Import	6.24	8.3	75%	1.62	0.1	3092%
Spain	Export	23.7	27.1	88%	16.7	27.1	62%
	Import	15.5	22.7	68%	13.7	11.3	121%
Italy	Export	147.9	213.3	69%	102.9	181.3	57%
	Import	1.0	4.5	23%	2.8	0.8	338%
Switzerland	Export	14.1	67.7	21%			
	Import	1.2	11.0	11%			
England*	Export	33.9	43.3	78%	21.0		
	Import	9.2	18.3	50%	14.1		
Total		306.7	480.1	64%	203.5	261.3	78%

* With regard to the theoretical congestion income, spot prices in England will only be available from 7 February 2012

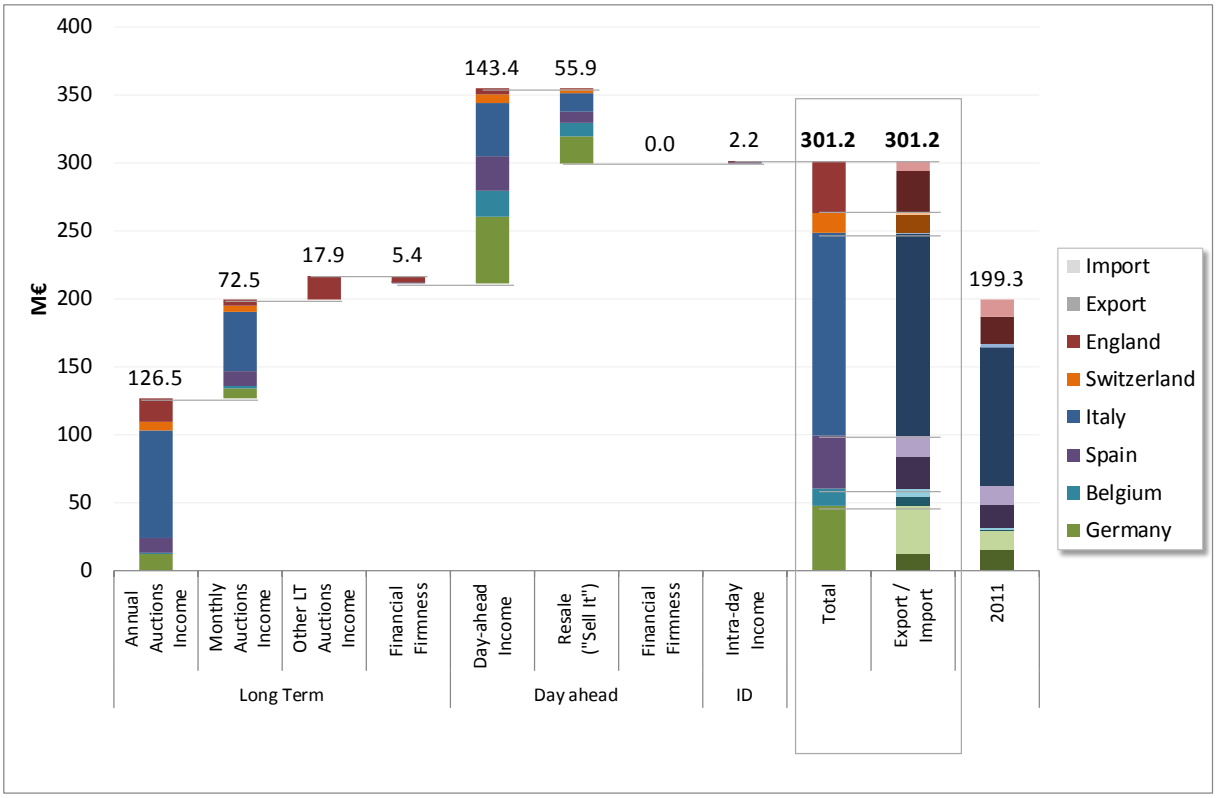
Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

[7] The theoretical congestion income for exports from market A to market B is the sum, for all hours in the year during which the price of market B is higher than market A, of the net transfer capacity(NTC) multiplied by the price differential between the two markets.

The “net” congestion income (Figure 11) is equal to the “gross” income minus the financial firmness costs. These costs correspond with the financial compensation paid by the TSOs to capacity holders when they have to curtail capacity, since the firmness conditions guarantee the capacity value. Pursuant to European regulation 714/2009[8], the system operators can use the income from auctions to guarantee that interconnectors are available for market players or to compensate them for any capacity curtailment they may experience. Figure ZZ shows that the costs related to financial firmness are very low today compared with the total income of the auction, since they stand for less than 2% of this income.

On each interconnection, the share received by RTE represents half of the congestion income, except for the France-UK interconnection where the share is subject to a slightly different rule. In 2012, it represents €605 M, i.e. €301 M received by RTE, an increase of 50% compared to 2011. This change is mainly due to the increase of the average price differential with Italy (+€6 /MWh in 2012, compared to 2011). To a lesser extent (€15 M), opening the auctions to Switzerland also contributed to this increase (see also box “The France-Switzerland interconnection”).

Figure 11: Congestion income – RTE share – in 2012 and 2011



Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

[8] See note on article 16.6 of (EC) regulation No. 714/2009 of the European Parliament and Council, dated 13 July 2009, regarding the access conditions to the network for cross-border electricity exchanges and point 6.6 of Appendix 1 of this regulation.

The "long-term" congestion income (capacities allocated during annual and monthly auctions), net from financial firmness costs, represents 70% of the total income (i.e. €211 M). However, this trend varies from border to border. The second part of this report will analyse the mechanisms implemented at different timeframes.

The following elements can be noted:

Germany	In 2012, income reached €47M, 60% of which is composed of net revenue from daily timeframes, reflecting a positive price differential[9] with France (coupled markets) 32% of the time in 2012. In this way, the daily congestion income generated an additional €16 M in 2012 (€28 M in total), compared to 2011 (€12M) and represents the main factor behind increases in the total congestion income in 2012 (+60% compared to 2011). The import direction standed for 75% of the income (see the "France-Germany" box).
Belgium	In 2012, income was multiplied by 6 (€13 M, shared almost equally between import and export). This increase is mainly caused by the daily timeframe: in 2012, prices "only" converged 87% of the time compared with 100% in 2011, particularly because of the extended decommissioning, from the summer onwards, of several nuclear power plants in Belgium.
Spain	Income increased by 30% in 2012 (€39M), shared equally between long-term and short-term timeframes. The import direction represents 60% of the income, i.e. €24 M.
Italy	The interconnection capacity with Italy contributes to approximately 50% of the total income (€149M for RTE in 2012, 105 in 2011). The allocation of long-term capacities represents a significant part of this figure (€124M), since the players strive to hedge against the price differential. The export direction represents 99% of the income, also resulting from expectations of high prices in Italy.
Switzerland	The interconnection capacity is used for long-standing long-term contracts, for which the accumulated power sum exceeds the NTC, meaning that market-based capacity allocation is not possible, as set out in the objectives of the European Union. In 2012, the end of a long-standing contract released 610 MW of capacity for export. Thanks to a joint decision from CRE and the Swiss regulator Elcom, this capacity was released to the market and was thus allocated at different timeframes (200 MW annually, 200 MW monthly and 210 MW daily to which resales are added), thus generating €15M income for RTE.
UK	The interconnection with England led to an approximately €38M income for RTE in 2012. A significant share (80%) from exports. This interconnection suffers" the most from firmness costs (€5 M), due to a significant number of curtailments.

[9] Indicator: price differential greater than €1/MWh

The interconnection between France and Switzerland

This interconnection differs from the others, particularly with regard to the congestion income indicator. This interconnection has the lowest ratio between actual and theoretical income, at 21% and 11% in the export and import directions respectively.

These observations can be explained by the priority (and free) access to this border for several long-term contracts, and, by the fact that Switzerland is not an EU member. Furthermore, this priority access is combined with special access conditions (for instance the ability for holders to nominate the capacity closer to real time (in the afternoon of D-1).

Until early 2012, these contracts have saturated the capacity in the export direction. Today, the aggregated volumes still largely exceed the NTC. However in 2011, based on a CRE decision ensuring that a capacity equivalent to this contract was now available for the market, allows for the implementation of long-term and daily auctions in the export direction. This justifies RTE's current income on this border.

The rest of this capacity, between 2390 and 2590 MW, is reserved for holders of historical long-term contracts and is not allocated on the basis of long-term or daily market mechanisms, which explains the very low ratio betweenthe actual and theoretical incomes.

Furthermore, the guarantee applied to this volume of exchanges requires thata fixed capacity at this border is available, which hinders capacity optimisation at adjacent borders. As such, a stable capacity is available on this border, whereas capacities on neighbouring borders are decreasing.

These contracts also have special terms of use and flexibility clauses that are reflected in the capacity access conditions. The holders thus have the option of not firmly nominating their use of the interconnection before D-1 afternoon. These conditions do not allow to maximise the capacity made available for D-1 auctions by both TSOs, since "netting" is not applied. The low level of available capacity in the day ahead market prevents the fundamental change in the balance between the two countries and thus contributes to poor use of the capacity: ***the highest additional costs are identified on this border (€68 M in 2012, see Section 2.2 "Review of the use and management of interconnections on French borders within day-ahead timeframe")***

The netting process is, however, allowed before the intraday auction, meaning massive exchange capacities are available for this timeframe. However, this timeframe is not adapted to allocating such capacities without a previous optimisation process (through the daily timeframe). ***Promoted by CRE, the transition towards a continuous allocation in January 2012 did however improve the situation and facilitated exchanges in intraday, which were subsequently multiplied by five. Implementing an organized intraday market in Switzerland, coupled with the French and German markets (thanks to the changes in the access rules, as requested by CRE in July 2012 and approved by CRE on 30 May 2013) will also help to improve the use of this interconnection.***

Additional changes are still required, in terms of access conditions to the interconnection for market players with long-term contracts, so that the France-Switzerland interconnection can be used more effectively. To do so, CRE is working with its Swiss counterpart, the European Commission and all the stakeholders.

4. Effectiveness of interconnection use by market players

The analysis of price differentials and of how exchange capacity is used by market players reveals the effectiveness of interconnection use. The net commercial flow of electricity will be considered as economically effective if it is performed from the market with the lowest price towards the one with a higher price, at the moment the transaction is made.

The share of time when the price differential is lower than €1/MWh may be considered as the percentage of hours in the year during which the price between the French market and neighbouring markets have converged. When there is a price differential greater than €1/MWh, it is worth examining whether the interconnection is congestioned (by

determining the percentage of hours in the year when the capacities that were available have been used to their maximum in day-ahead), in terms of the price differential between the French market and neighbouring markets. The use of the interconnection will not be fully efficient if the exchange capacity is not used to its maximum when there is a price differential.

The following elements can be observed on Table 4:

- France-Germany and France-Belgium interconnections are efficiently used, with a high price convergence rate (67% of the time for Germany and 87% for Belgium), as well as maximum use

  of capacities when there is a price differential. This specific feature is explained by market coupling, for which the main characteristic is allowing an optimal use of existing interconnection capacities and encouraging, at the same time, price convergence. An exchange entails a reduction in price of the importing market and an increase in price of the exporting market and therefore a lower price differential between the two markets. If the interconnection capacity is sufficient, the prices on both markets can converge.
- On other borders, a low price convergence is observed, between 1% of the time with Italy and 16% of the time with Switzerland. This low price convergence is due not only to a lack of interconnection capacity, but also inefficient allocation mechanisms in force on these borders. We can also observe that French interconnections are rarely used to their maximum, despite the existence of arbitrator opportunities (i.e. price differentials) with neighbouring markets.

x 10

French prices converge 10 times more frequently with coupled countries than with other countries

Table 4: Level of use of French interconnections in 2012

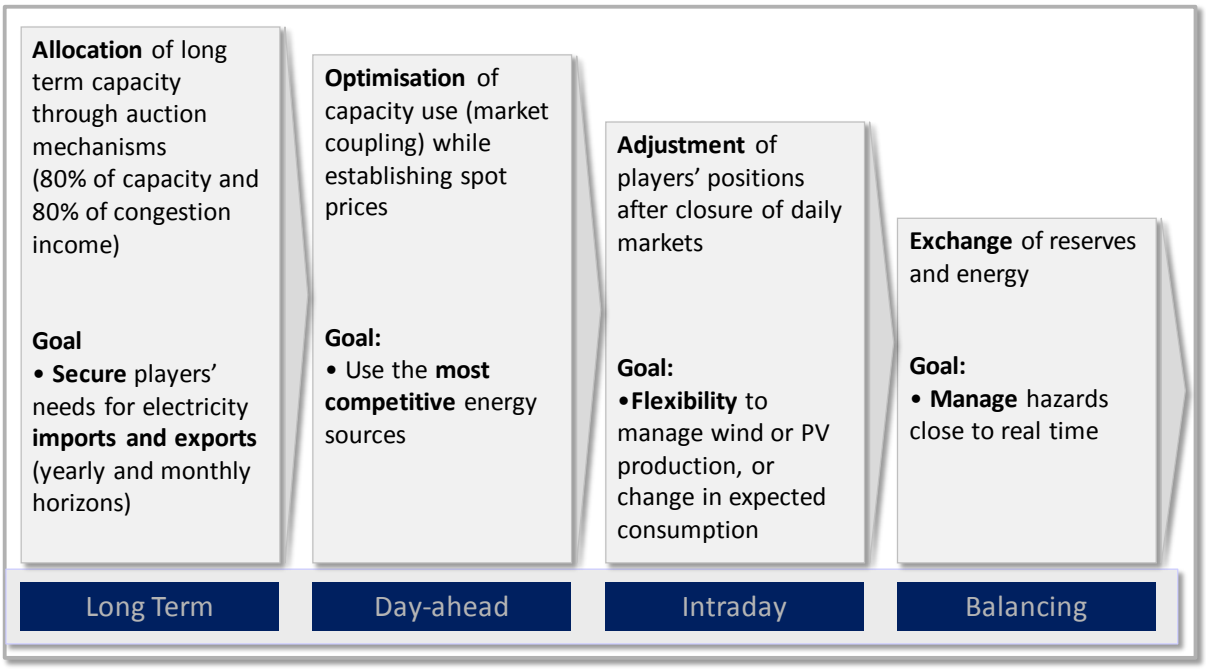
Figures in 2012 (reminder of 2011)	Percentage of time the price differential is lower than €1/MWh	Percentage of time where the price differential is greater than €1/MWh, and where the interconnection	
		is not used at its maximum	is used at its maximum
Germany	67 % (70%)	0 % (0%)	33 % (30%)
Belgium	87 % (100%)	0 % (0%)	13 % (0%)
Spain	9 % (9%)	36 % (33%)	54 % (58%)
Italy	1 % (1%)	26 % (27%)	73 % (72%)
Switzerland	16 % (12%)	58 % (70%)	27 % (18%)
England	4% (non defined)	56 % (82%)	40 % (18%)

Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

Part 2: Review of use and management of interconnections on French borders according to timeframe

Part 2 of this document aims to analyse in detail the French interconnection operations and present work currently being conducted by CRE, its counterparts, transmission system operators and any power exchanges involved in improving the management of French interconnections and implementing target-models at a European level for each of the four timeframes: long-term, daily, intraday and balancing.

Figure 12: Different timeframes to acquire capacity



Source: CRE

These four timeframes respond to different objectives and requirements. The system operators ensure that a minimum capacity is available for specific timeframes by splitting the annually-calculated capacity between the different timeframes ("*split rules*"). For instance, the daily capacity available on the market will be assessed by adding resales and netting [10] to the capacity provisioned for this timeframe.

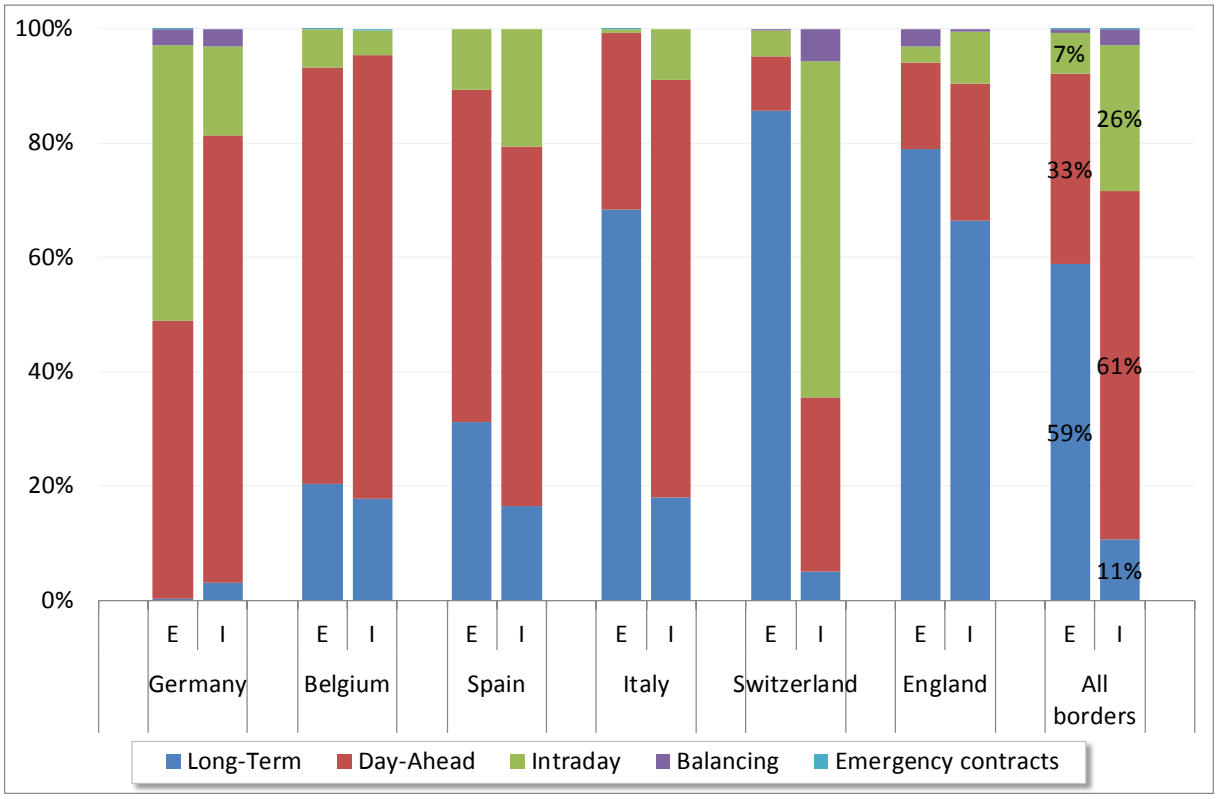
Figure 13 shows the source of the capacity that actually flows on an interconnection, i.e. the timeframe at which it was bought by market players. At the German border (and to a lesser extent at the Belgium border), whereas the splitting rule provision 70% of the capacity calculated annually to the long-term timeframe, the capacity acquired at this timeframe is then

[10] Taking account of the nominations for an interconnection, in both directions, to propose market players the full capacity that is actually available and to optimize the use of the interconnection considered.

physically hardly used. It only represents a few percent of the capacity used, since market coupling allows for an optimal use of the daily capacity. The long-term products are thus used as hedging products. On some borders where the coupling mechanism is not implemented the physical use of the capacity acquired at the long-term timeframe remains predominant, meaning that the capacity used was mainly acquired at this timeframe (this is to be observed for England in both directions, or Italy and Switzerland in the export direction).

The different timeframes do not carry the same weight at each interconnection and this distribution can chiefly be explained by the mechanisms in place at each one and by the market fundamentals. In this way the steady price differential between France and Italy leads market players to massively use long-term auctions and to nominate the associated capacity very frequently. For Switzerland, the long-term contracts explain the importance of this timeframe in the export direction, and, as a consequence, the importance of the intraday timeframe in the import direction.

Figure 13: Distribution according to purchasing timeframe of the capacity used in the export and import directions



Source: RTE – Analysis: CRE

A systematic approach has been adopted for each timeframe and goes through:

- The overview of mechanisms currently in place;
- The analysis of existing mechanisms and assessment of divergences between the different market designs on our borders;
- The description of the European target-model and the next steps for its implementation.

1. Long-term capacities

Holding long-term capacities is one of the main methods for market players to gain a lasting position on a foreign market. They allow market participants to import/export electricity, as well as to hedge themselves against the risks from any price differentials that may exist between markets.
The “long-term” timeframe (mainly annual and monthly horizons) thus represents an essential market for actors wishing to hold positions on both sides of a border. This timeframe may concern up to 80% of capacities and represent up to 80% of congestion income.

1.1. Overview of current mechanisms

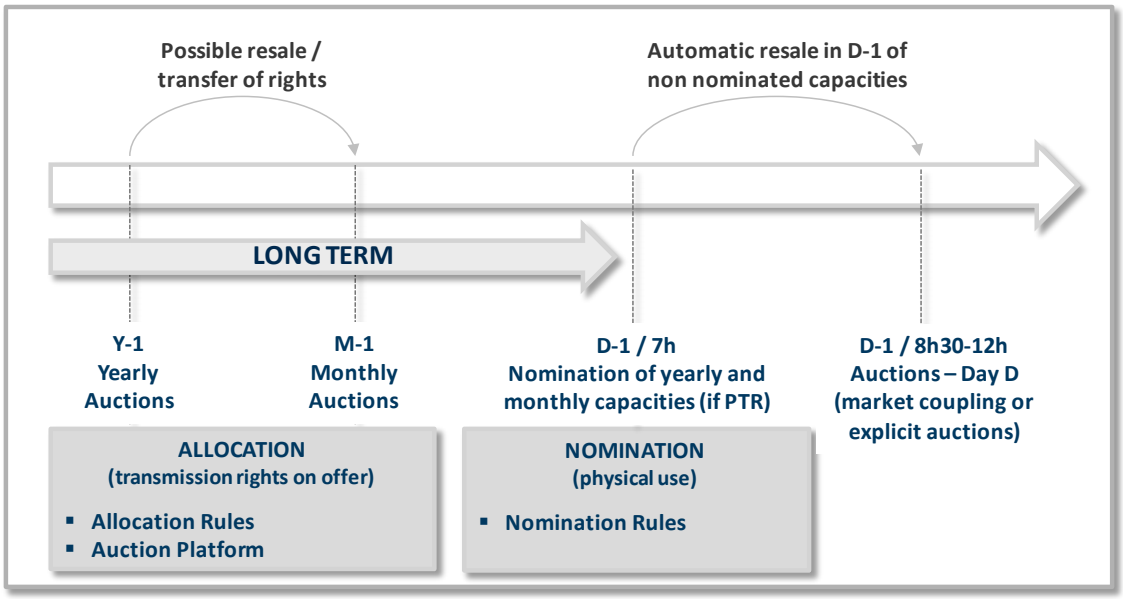
On all French interconnections, capacity allocation is performed according to several timeframes. The following long-term products are on offer:

- **Annual:** at the end of each calendar year, a capacity band is allocated for the entire following year;
- **Monthly:** each month, a capacity band is allocated for the following month.
- The capacity bands (annual or monthly) may be offered with limitations (Italy in export direction) or temporary capacity interruptions (Spain in both directions), or even be broken down into time periods (for example, one band offering the hours of 8am to 8pm on week days and an other one offering the additional period);
- With regard to the France-England interconnection, **seasonal, quarterly,** and annual over the financial year (April to March) and **"weekend"** products are also offered.

At the long-term timeframe interconnection capacities are sold using explicit auction mechanisms (transmission capacity purchase/sale separated from power purchase/sale), and the capacity price is set according to the auction marginal price principle (lowest bid wins).

Long-term products offered on French borders are Physical Transmission Rights (PTRs), allocated by transmission system operators. Figure 14 is a diagram of the allocation and nomination mechanisms for long-term transmission rights. Successful bidders for these rights will have the right to physically transmit a specific quantity of electricity in a given direction through an interconnection. Rights are exercised through a nomination process: either the holder uses its right, or the right is automatically resold on the daily market, and the holder receives the amount of the value of the capacity at the daily timeframe. This rule is called ‘use it or sell it’.

Figure 14: Allocation and nomination mechanisms for long-term transmission rights

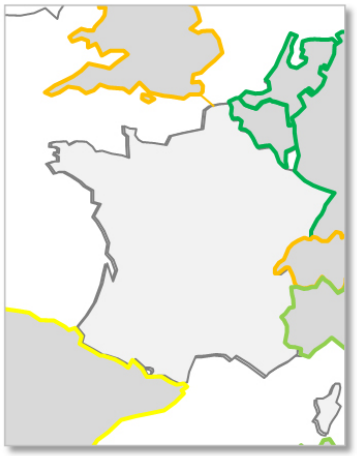


Source: CRE

However, as illustrated by the map below (Figure 15), there are some disparities in the PTRs auction schemes on the French borders:

- PTRs are allocated by the Capacity Allocating Service Company (CASC) auction platform along the Belgium, German, Swiss and Italian borders, under harmonised auction rules (since 2009) and according to annual and monthly timeframes;
- PTRs are allocated by French (RTE) and British (National Grid) transmission system operators along the France-England interconnection, which is subject to specific rules; several products for different timeframes are on offer (annual, monthly, seasonal, quarterly, financial year, weekly for the weekend).
- Similarly, PTRs allocation along the France-Spain interconnection is governed by rules specific to this border.

Figure 15: Status on French borders in terms of harmonising allocation rules for long-term rights



	Products	Harmonised Auction Rules	CASC Platform	Firmness*
Germany	PTR	Yes	Yes	Yes
Belgium	PTR	Yes	Yes	Yes
Spain	PTR	Planned in 2013	Planned in 2013	Yes
Italy	PTR	Yes	Yes	No
Switzerland (excluding LTC)**	PTR	Yes	Yes	No
England	PTR	No	No	No

** Firmness shall be understood as "complying with Framework-Guidelines for capacity allocation and congestion management"*

*** The France-Switzerland border is specific: only a small share of capacity is not allocated to long-term contracts (in terms of long-term timeframe capacity allocation, only 400 MW available for export since 2012, 0 MW for import)*

Source: CRE

1.2. Analysis of existing mechanisms

Valuation and competition for yearly auctions

At yearly auctions, all capacities on offer are allocated, and the market players generally request five to nine times more capacity than that sold by the TSOs.

Figure 16 shows that for the year 2012 (auction took place in December 2011), the yearly capacities were valued higher than those in 2011 (+18%, i.e. €254 M in total – €127 M for RTE), but less than in 2010 (€289 M in total) or than 2008 (€382 M in total).

€20.3 /MWh

(+67% compared with 2011).

The price of Italian export capacity at yearly auction for 2012.

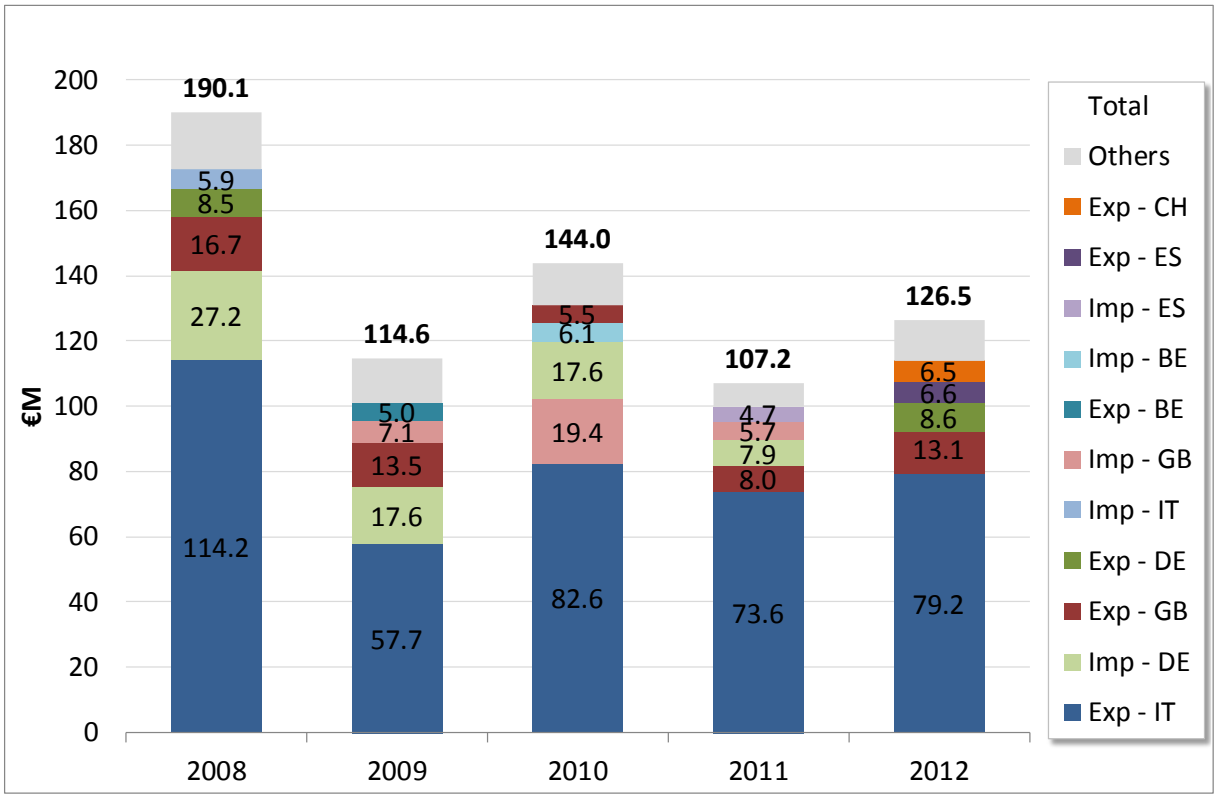
The highest valued interconnection.

Border by border, the main trends are as follows:

Germany	Unlike in previous years, export capacities have been valued higher than import capacities in 2012 (€2.5/MWh compared with 1.2), what is probably to be linked with the German nuclear moratium.
Belgium	Allocation prices for yearly interconnection capacities with Belgium are low in both directions, market participants anticipate good price convergence (87% of time 2012, and almost 100% in 2011) through market coupling mechanism.
Spain	Price trends reversed: the export capacity price exceeded the import capacity one for 2012 (€5.5 /MWh compared with 4.5) whereas, in previous years, it only accounted for 25% to 50% of the import capacity price.
Italy	Exports towards Italy alone account for more than 60% of the total income of yearly auctions. This border experiences by far the highest export price (€20.3/MWh in 2012). Compared with previous years, this price, which was already high, increased massively (+67% compared to 2011), probably in relation with the significant decrease in the amount of capacity available at the yearly auction in export direction (330 MW in 2012; 1000 MW in 2011).
Switzerland	Only 200 MW (approximately 7% of the annual NTC assessed for the yearly auction) are allocated to the long-term export auction, for the first time in 2012 (no import capacity), since the rest of the capacity is reserved for long-term contracts benefiting from priority access. With a price of €7.5/MWh, the auction provided TSOs with €13.1M in 2012.
England	Exports to England make up 11% of total revenue. The export capacity price has almost doubled in 2012 (€5.7/MWh compared with 3.5 in 2011).

With regard to the yearly auctions in 2012, export capacity is valued higher than import capacity, indicating that market participants anticipate lower electricity prices in France than in neighbouring countries, probably forecasting high availability of the French nuclear fleet.

Figure 16: Annual auction income for French borders, RTE between 2008-2012



Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

In theory, the marginal price resulting from a long-term auction shall, indicate the exchange direction with the highest value, and be consistent with the forward products price differential observed when the auction was held, which reveals market players' anticipation for the forward price differential, between France and its neighbouring countries.

The average spot price differential indicates the price differential actually observed and can be used to assess the adequacy of player forecasts for price differentials.

Table 5 thus compares the marginal prices from an auction for a given border and direction with these two indicators. For example:

Italy	On the Italian border in 2012, market players valued the interconnection export capacity at €20.33/MW/h, in line with a price differential of forward products at €26.30/MWh in this direction. The average spot price differential observed during the year (€28.53/MWh) shows that the players had underestimated the price differential, and the capacity holders were able to benefit from this arbitrage.
Spain	On the Spanish border in 2011, the players had valued imports higher than exports over the annual timeframe, both in terms of interconnection capacity auction prices (€6.69/MWh for imports compared with €2.11/MWh for exports) and of forward products (positive price differential in Spain-France direction at €4.50/MWh). However, the average spot price differential indicated that Spanish prices are slightly higher than French prices (differential in export direction: +€1.03/MWh). With regard to 2012 auctions, market players may have taken account this trend, since they then valued export interconnection capacity higher (annual auction price: €5.52/MWh for exports compared with €4.47 for imports, in line with a positive forward price differential in the France-Spain direction).

Germany	On the German border, it is worth noting that the value of the interconnection capacity in 2012 (higher in the export direction than import direction) was not in line with the forward price differential at the date of the auction (positive in the import direction). The forward price differential observed when at the time of the auction (first two weeks in December) has always been positive in the import direction in the previous years.

Table 5: Results of annual auctions 2009-2012: Number of participants and users, capacity on offer, annual auction price, forward price differential at the time of the auction and average spot price differential

		2012					2011					2010				2009			
		Number of participants / Number of participants who obtained capacities	Capacity sold at the yearly auction	Yearly product price	Forward differential	Average hourly spot price differential	Number of participants / Number of participants who obtained capacities	Capacity sold at the yearly auction	Yearly product price	Forward differential	Average hourly spot price differential	Number of participants / Number of participants who obtained capacities	Capacity sold at the yearly auction	Yearly product price	Forward differential	Number of participants / Number of participants who obtained capacities	Capacity sold at the yearly auction	Yearly product price	Forward differential
			MW	€/MWh	€/MWh	€/MWh		MW	€/MWh	€/MWh	€/MWh		MW	€/MWh	€/MWh		MW	€/MWh	€/MWh
Germany	Export	33 / 15	800	2.44	-1.55	0.39	29 / 12	900	0.42	-1.95	3.09	33 / 16	900	0.90	-3.70	28 / 15	900	1.24	-3.18
	Import	38 / 15	600	1.21	1.55	4.74	30 / 14	800	2.25	1.95	0.86	34 / 20	1000	4.01	3.70	28 / 14	1000	4.02	3.18
Belgium	Export	17 / 12	1,450	0.10	-0.01	1.42	16 / 13	1,150	0.06	-0.46	0.48	18 / 15	1,300	0.16	-3.40	13 / 12	1,300	0.88	1.25
	Import	19 / 12	400	0.52	0.01	1.38	16 / 8	400	0.69	0.46	0.01	17 / 8	400	3.46	3.40	15 / 7	400	0.81	-1.25
Spain	Export	14 / 8	300*	5.52	2.45	5.86	11 / 5	200*	2.11	-4.50	6.11	13 / 6	300*	2.69	7.28	11 / 7	200*	4.77	-7.60
	Import	17 / 8	200*	4.47	-2.45	5.57	15 / 5	200*	6.69	4.50	5.06	16 / 6	100*	9.17	-7.28	15 / 8	100*	9.41	7.60
Italy	Export	42 / 17	330 + 680*	20.33	26.30	29.53	45 / 20	1 000 + 700*	12.19	15.25	23.42	43 / 23	1 000 + 700*	12.90	16.65	36 / 22	1 000 + 800*	7.71	-
	Import	24 / 13	700	0.12	-26.30	1.00	36 / 6	700	0.82	-15.25	0.09	31 / 14	700	0.51	-16.65		700	0.37	-
Switzerland	Export	24 / 11	200	7.45	-	4.85	-	-	-	-	7.94	-	-	-	-	-	-	-	-
	Import	-	-	-	-	2.27	-	-	-	-	0.65	-	-	-	-	-	-	-	-
England	Export	14 /7	550	5.69	-	11.05	14 / 5	550	3.48	-	-	15 / 7	550	2.39	-		550	5.86	-
	Import	14 / 5	550	1.55	-	2.34	16 / 5	550	2.40	-	-	14 / 4	550	8.04	-		550	2.95	-

** Capacity on offer with maintenance periods*

Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

With regards to competition, Table 6 shows that the level of competition in the annual transmission rights market is acceptable (apart from the Belgium and UK borders in the import direction): Herfindahl-Hirschman index is lower than (or equal to) 2000, indicating average market concentration.

- On the Swiss border, the concentration level indicator has a quite acceptable value but only concerns the small capacity share offered to the market. and does not take account long-term contracts (contracts which also explain the lack of import auctions);
- In the export direction, the Italian border again stands out, with a low concentration level (HHI = 816) and thus a fierce competition. It should be remembered that this is the border and direction where the annual capacity price is markedly higher. In this way, demand for hedging against price differential in the France-Italy direction is high, since electricity price is forecast as significantly higher in Italy than in France.

Table 6: Competition for yearly auctions in 2012[11]

				Level of competition and HHI		
		Number of auction participants	Largest share	Low (HHI < 1,000)	Medium (1,000 < HHI < 2,000)	High (HHI > 2,000)
Germany	Export	15	28%		**1,377**	
	Import	15	25%		**1,419**	
Belgium	Export	12	22%		**1,439**	
	Import	7	38%			**2,716**
Spain	Export	8	25%		**1,639**	
	Import	8	25%		**1,600**	
Italy	Export	24	16%	**816**		
	Import	13	35%		**1,847**	
Switzerland	Export	11	32%		**1,560**	
	Import					
England	Export	10	27%		**1,828**	
	Import	7	41%			**3,049**

Sources: RTE – Analysis: CRE

[11] The HHI (Herfindahl-Hirschman Index) provides a measure of market concentration: this is the sum of the squares of the players' market shares (as a %). If it is lower than 1000, the concentration is said to be low; if it is comprised between 1000 and 2000, concentration is said to be moderate; if it is comprised between 2000 and 10,000, concentration is said to be high.

Valuation and competition for monthly auctions

The results of monthly auctions provide similar conclusions:

- Interconnection capacity is generally well valued in export direction in 2012 (Table 7);
- Concentration is low or medium on the interconnections: HHI < 2000 apart from imports from England (Table 8).

Furthermore, changes in monthly prices (Table 7) demonstrate trend developments during the course of the years, or the impact of unpredictable events:

Germany	On the German border, import capacity prices increase sharply at the end of the year 2012 (€8.66/MWh in December compared with an average of €2.93/MWh over the year), probably in anticipation of French consumption peaks in winter.
Belgium	Export prices to Belgium are multiplied by 10 from October 2012 (at ~€3/MWh), probably owing to the difficulties encountered on the Belgian nuclear fleet (several reactors shutdown in second half of 2012) generating tensions in the supply-demand balance.
Spain	The increase in export capacity prices to Spain in the summer of 2012 may be correlated with a curtailment in power volume available on this interconnection in this direction (e.g.: 14,400 MWh available in August, 327,400 MWh in January). As for the increase in export prices during the fourth quarter, this can also be attributed to the anticipation of high consumption levels in France during the winter
Italy	Conversely, more capacity is available for export to Italy at the end of the year. Together with forecasts of strong rise in price in France, this phenomena may explain the drops in price (€7.86/MWh in December, 17.94 on average in monthly auctions).
Switzerland	It should be noted that for the Swiss border, the first ever monthly auctions were held in 2012. Valuation for this capacity was high for the first three months of the year, before the operators revised their forecasts downwards.

Table 7: Price of yearly and monthly auctions in 2012

		Price of monthly products in 2012															
€/MWh		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Monthly product price in 2012	Yearly product price in 2012	Monthly product price in 2011	Yearly product price in 2011
Germany	Export	0.48	0.67	0.85	1.01	2.21	1.74	1.21	1.34	1.05	0.52	0.38	0.42	1.00	2.44	*1.44*	*0.42*
	Import	1.89	1.95	3.15	2.51	1.18	0.98	1.60	1.01	1.52	4.36	6.22	8.66	2.93	1.21	*1.95*	*2.25*
Belgium	Export	0.04	0.07	0.23	0.65	0.31	0.37	0.32	0.36	0.62	2.15	3.00	3.72	1.00	0.10	*0.15*	*0.06*
	Import	0.08	0.15	0.23	0.22	0.20	0.15	0.30	0.10	0.18	0.55	0.25	0.31	0.22	0.52	*0.25*	*0.69*
Spain	Export	3.35	4.47	4.77	4.75	10.57	14.52	16.07	13.21	3.77	2.57	0.55	0.78	5.72	5.52	*3.70*	*2.11*
	Import	3.28	1.52	1.78	1.17	0.97	0.55	0.45	0.27	0.91	5.13	9.92	8.27	2.49	4.47	*6.13*	*6.69*
Italy	Export	17.44	21.14	22.90	22.24	28.12	26.30	36.72	30.70	31.71	12.82	9.58	7.86	17.96	20.33	*10.95*	*12.19*
	Import	0.17	0.03	0.15	0.07	0.01	0.02	0.01	0.01	0.04	0.10	0.36	0.50	0.15	0.12	*0.29*	*0.82*
Switzerland	Export	9.33	12.08	15.51	2.85	2.51	1.35	1.05	0.80	0.75	4.25	6.15	1.51	4.83	7.45	*0.00*	*0.00*
	Import													-	-	-	-
England	Export	1.31	1.33						12.65	4.79	2.57			6.02	5.69	*2.01*	*3.48*
	Import	1.30	0.75						0.06	0.32	0.93			0.53	1.55	*1.48*	*2.40*

Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

Table 8: Competition for monthly auctions in 2012

				Level of competition and HHI		
		Number of auction participants	Largest share	Low (HHI < 1,000)	Medium (1,000 < HHI < 2,000)	High (HHI > 2,000)
Germany	Export	24	40%		**1,936**	
	Import	25	24%		**1,231**	
Belgium	Export	17	18%		**1,149**	
	Import	17	31%		**1,397**	
Spain	Export	14	26%		**1,481**	
	Import	15	14%	**981**		
Italy	Export	41	14%	**675**		
	Import	22	24%		**1,153**	
Switzerland	Export	27	34%		**1,538**	
	Import					
England	Export	15	31%		**1,653**	
	Import	15	47%			**2,540**

Sources: RTE – Analysis: CRE

Use of capacities and resale

For PTRs used on French borders, an automatic resale mechanism, *'use it or sell it'*, is applicable whenever the right is not nominated:

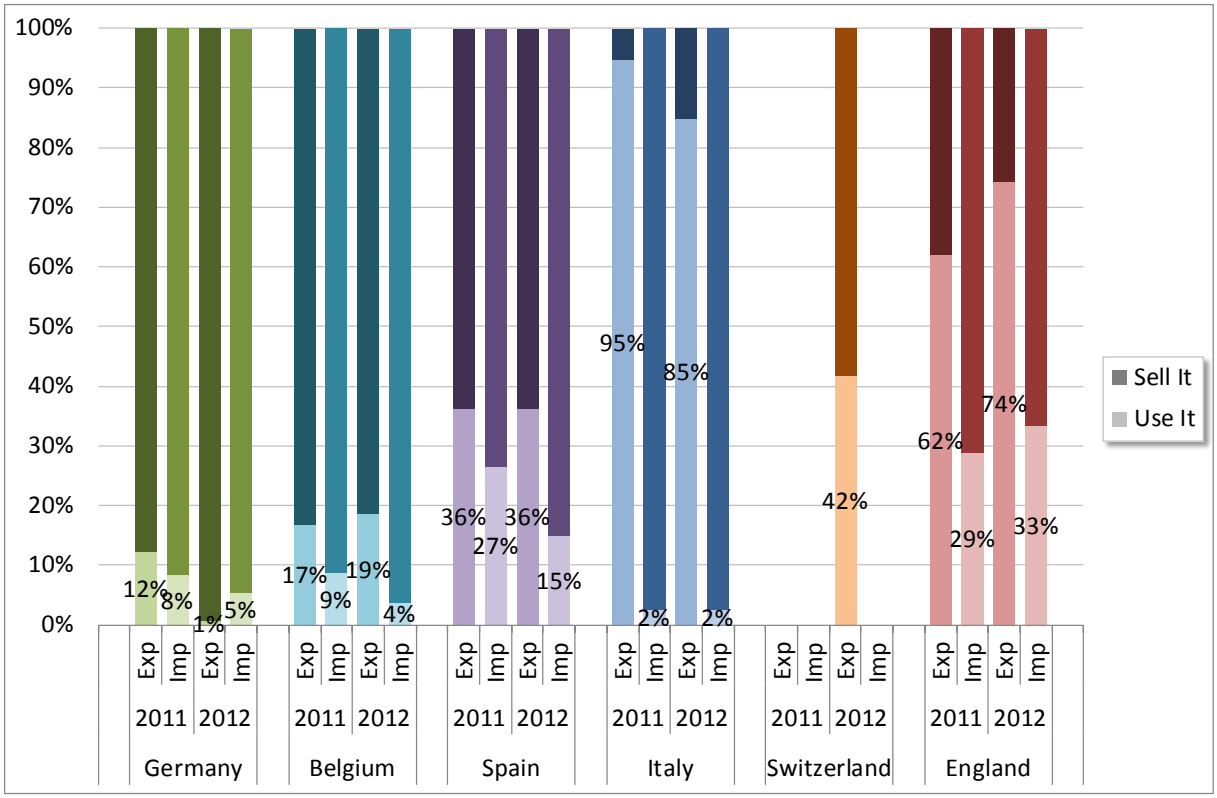
- The holder of a PTR may use it to physically transmit a specific quantity of electricity in a given direction through an interconnection, thus nominating its right ('*use it*');
- If the holder does not nominate his right, the interconnection is not physically used by the PTR holder. The capacity released in this manner is automatically made available at the daily timeframe. The capacity right holder is then entitled to receive ('*sell it*'):
    - The price differential, if positive, between the two markets if they are coupled;
    - The resale price at the next explicit auction, if the markets are not coupled.

When '*sell it*' is applied, the PTR holders may perform their cross-border exchanges by taking positions on markets and purchasing and selling on the power exchange on both sides of the border: thus "implicitly" performing a risk-free cross-border transaction, since the price differential between the two markets is hedged by the resale. The PTR simply undertakes the role of a hedging product, as would a "Financial Transmission Right Option" or FTR Option. FTRs Options are hedging products that entitle their holder to receive the same financial compensation as that provided by a PTR when "*sell it*" is applied, but does not allow for the physical use of the capacity.

As illustrated by Figure 17, exercising the right to physically use capacity differs widely from border to border:

- Less than 20% of Physical Transmission Rights with Germany and Belgium are used physically: market coupling on these borders allows for an effective use of the interconnection capacity at daily auctions (through implicit auctions, i.e. allocating the transmission capacity jointly with the electricity purchase/sale) and thus reduces the benefits of nominating transmission capacities acquired at the long-term timeframe;
- On other borders, the physical use of PTRs still represents a significant, or even dominant, share (export towards Italy) of how rights are exercised.

Figure 17: Share of the physical use of long-term transmission rights
"Use it": physical use - "Sell it": resale at daily auctions



Sources: RTE, CASC, IESOE, CMS – Analysis: CRE

It should be noted that yearly capacities may also be resold, as bands at monthly auctions.These practices remain marginal, with less than 2% of monthly capacities on offer originating from the resale of annual capacities in 2012.

Capacity transfers

Market participants may trade long-term capacities over a period of their choice (hourly time intervals).These transfer mechanisms are not often used at French interconnections, except in the export direction towards Italy where transfers account for 20% of volumes allocated in 2012. On other borders, there were no or only few (3-4% of volumes on the Spanish border) such mechanisms used.

1.3. Implementation of European target model

For the long-term timeframe, the cross-regional roadmap discussed and endorsed by the 21st Forum of Florence in December 2011 included four areas of work with regard to the allocation of long term transmission rights, in order to achieve early implementation of the European target-model, as defined in the Framework-Guidelines adopted by ACER in July 2011:

- Harmonisation of auction rules at European level;
- Implementation of a single allocation platform (single point of contact for participation in auctions);
- Harmonisation of PTRs nomination procedures;
- Possible FTRs implementation.

Although harmonisation of product types (PTRs, FTRs options or obligations, or even hedge products through financial markets, such as 'Contracts for Differences') is not compulsory for the European target-model, harmonising practices to allocate a given product will be critical to ensure an effective and efficient access for market players to the European market. In this regard, priority is given to harmonizing auction rules and setting up a single allocation platform at European level.

Alongside the Swedish regulator, CRE is co-chair of the European task force for the early implementation of the target-model. In this

context, National Regulators Authorities and ACER held in 2012 a public consultation with market players on hedge products and allocation rules harmonisation. The outcome of this consultation, as well as a comparision exercise between the different sets of rules in force in European, allowed regulators to set up a list of requirements (or '*wish-list'*) that the harmonised set of auction rules at a European level shall comply with (first step to complete the target-model). CRE was involved to draft the public consultation document, as well as the '*wish list*' requirements and conclusions. The '*wish-list'* and the Framework-Guidelines are based on "good practices" already being applied on some French borders thanks to CRE's involvement and activities.

This wish-list also reiterates some key principles set out in the Framework-Guidelines on Capacity Allocation and Congestion Management, which were adopted by ACER in July 2011. These principles are essential since they provide effective hedging. Indeed, the Framework-Guidelines provide provisions regarding:

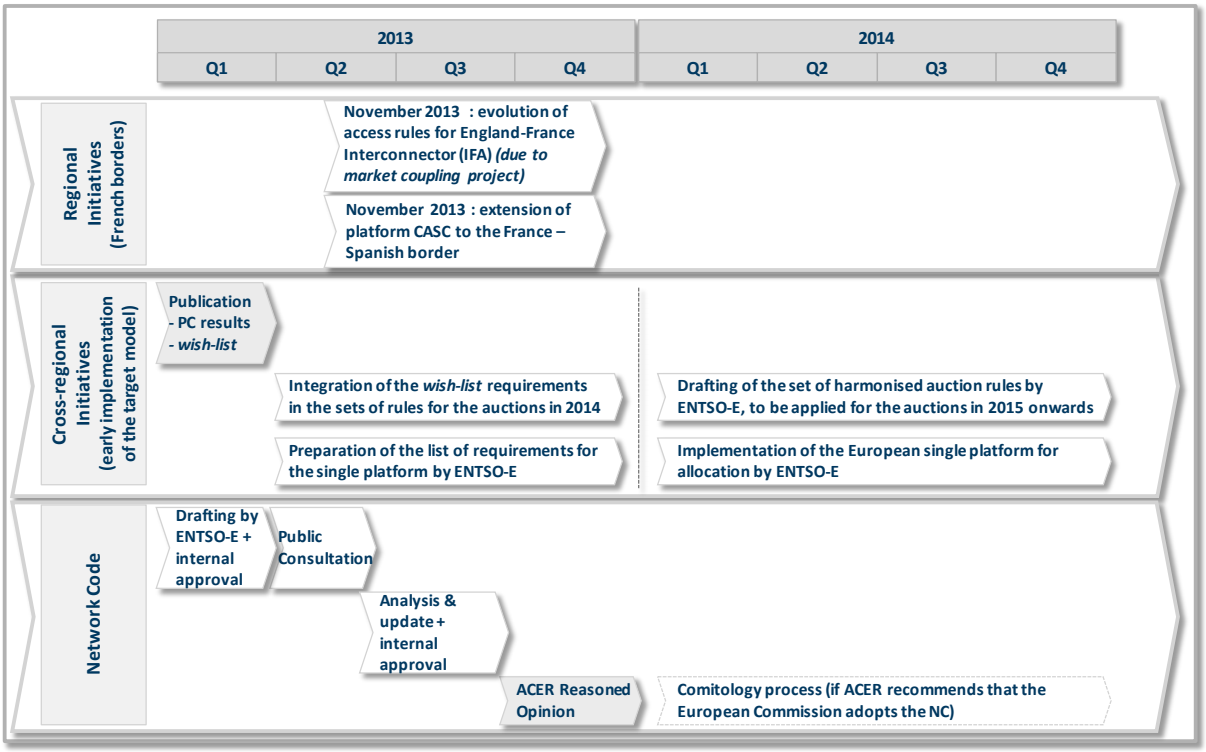
- Transmission rights allocation: TSOs shall issue such rights (PTRs or FTRs), unless appropriate cross-border financial hedging is offered in liquid financial markets on both sides of the border;
- Payout for transmission rights (FTRs and '*sell it*' for PTRs): the right holder shall be entitled to receive a financial payment equivalent to the capacity value at the daily auction;
- Firmness: in the case of capacity curtailment, the right holder shall be entitled to receive a financial compensation equal to the financial payment described above. This compensation can only be capped if capacity curtailment is announced sufficiently in advance (i.e. before the nomination deadline) so that right holders can adjust their cross-border positions.

These principles guarantee that transmission rights represent efficient hedging tools. It is therefore essential that auction rules which will be adopted at a European level comply with such key principles. CRE, as the co-chair of ACER task force dedicated to long-term transmission rights, is heavily involved to ensure that auctions rules will be in line with the principles defined above.

The timeline below (Figure 18) summarizes the next steps to harmonise capacity allocation mechanisms at the long-term timeframe.

- On the French-Spanish border, provisions are already in place to reach concrete progress towards harmonisation in the fourth quarter in 2013: physical transmission rights will then be allocated through the CASC (*Capacity Allocating Service Company*) platform, which already manages long-term auctions on the Belgium, German, Swiss and Italian borders. Extending the platform to the French-Spanish border will go hand-in-hand with auction rules harmonisation, which represents a milestone towards rules harmonisation at a European level;
- Harmonising auction rules and implementing a single allocation platform at a European level should be set up in time for the 2015 yearly actions;
- In parallel to the early implementation of the target-model, the Network Code on Forward Capacity Allocation will be drafted by ENTSO-E and investigated by ACER to assess its compliance with the Framework-Guidelines.

Figure 18: Next steps for the Electricity Regional Initiatives: long-term timeframe



Source: CRE

2. Day-ahead capacities

In close correlation with spot energy markets, the daily timeframe is the reference timeframe that can be used to optimize (day-ahead) electricity exchanges and programme production, while striving to use the most effective and cheapest systems at European level.The capacity given to this timeframe is calculated by taking account of long-term capacities that have been allocated and nominated by market players, with a view to maximizing exchange possibilities.

2.1. Overview of current mechanisms

There are two types of allocation systems for the daily timeframe: through explicit and implicit auctions. With an explicit auction system, market players acquire interconnection capacities and take position separately on different national markets, before being informed of the results of organized markets. On these markets, supply and demand are then compared separately on each side of the interconnection.

Unlike explicit auctions, market coupling compares the supply and demand from all coupled areas and simultaneously - implicitly - allocates interconnection capacities.

By guaranteeing an optimum use of interconnections, implicit capacity allocation through market coupling constitutes a fundamental and structuring element of the target-model, as described in the Framework-Guidelines on Capacity Allocation and Congestion Management (CACM Framework-Guideline, published by ACER on 29 July 2011).

Figure 19 presents a schematic overview of the existing mechanisms on French borders for the daily timeframe:
A first step was achieved in November 2006 with trilateral price-based market coupling between France, Belgium and the Netherlands. At the end of 2010, trilateral coupling was extended to Germany and the Central-West region of Europe (CWE) was coupled "through volumes" with the northern market;
On other borders, with England, Switzerland, Italy and Spain, the daily capacities are still allocated via explicit auctions. There are day-ahead auctions, allocation and nomination.

Figure 19: Status of auction systems for daily timeframe

	Status in 2012
Germany	Implicit auction in the price-**coupled Central-West region***
Belgium	
England	**Explicit auctions**
Spain	
Italy	
Switzerland	**Explicit auctions, only for one part** of the total capacity

* Scandinavia is volume-coupled to CWE

Source: CRE

2.2 Analysis of existing mechanisms

Use of daily capacities

An ideal use of daily capacities would be as follows, for each hour of the year:

- Capacity never used in the opposite direction to the price differential: no capacity used in wrong direction and no hours impacted;
- Capacity is at least used in the direction of the price differential: no unused capacities in the direction of the price differential (if one exists) and no hours impacted.

In Figures 20 and 21 below, this ideal use is translated by two “S-shaped” point clouds, i.e. a maximum use (rate of use equal to 1) in the direction of the price differential and no use in the opposite direction (rate of use at 0).

- ***Use of daily capacities in the case of coupled markets***

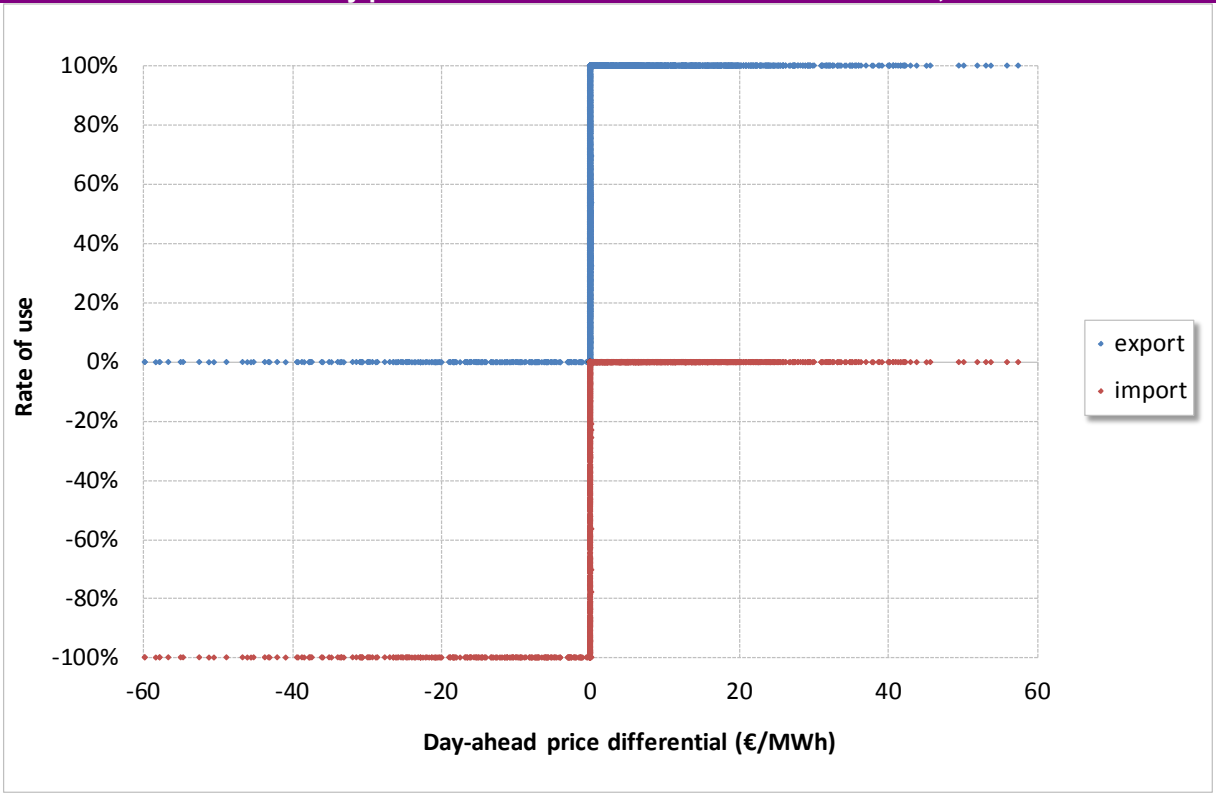
In the case of coupled markets (France, Germany, Belgium), capacities are allocated through implicit auctions: the market coupling mechanism implicitly attributes the interconnection capacity to the most effective cross-border energy transactions. By optimizing the cross-border exchanges, electricity supply costs are reduced and the least expensive generation systems are used.

As illustrated by Figure 20, this efficient use of the interconnection capacity translates into the following results on the Belgium border:

- Prices converge as soon as the interconnection capacity is sufficient;
- As soon as the French and Belgium prices diverge, the interconnection capacity between France and Belgium is used to its maximum in the direction of the price differential (the energy flow is always directed to the cheapest market).

An identical graph, and thus equivalent results, can be observed on the German border.

Figure 20: Rate of use of net daily capacities on the France-Belgium interconnection compared with the hourly price differential between BELPEX and EPEX, in 2012



Sources: RTE, EPEX Spot – Analysis: CRE

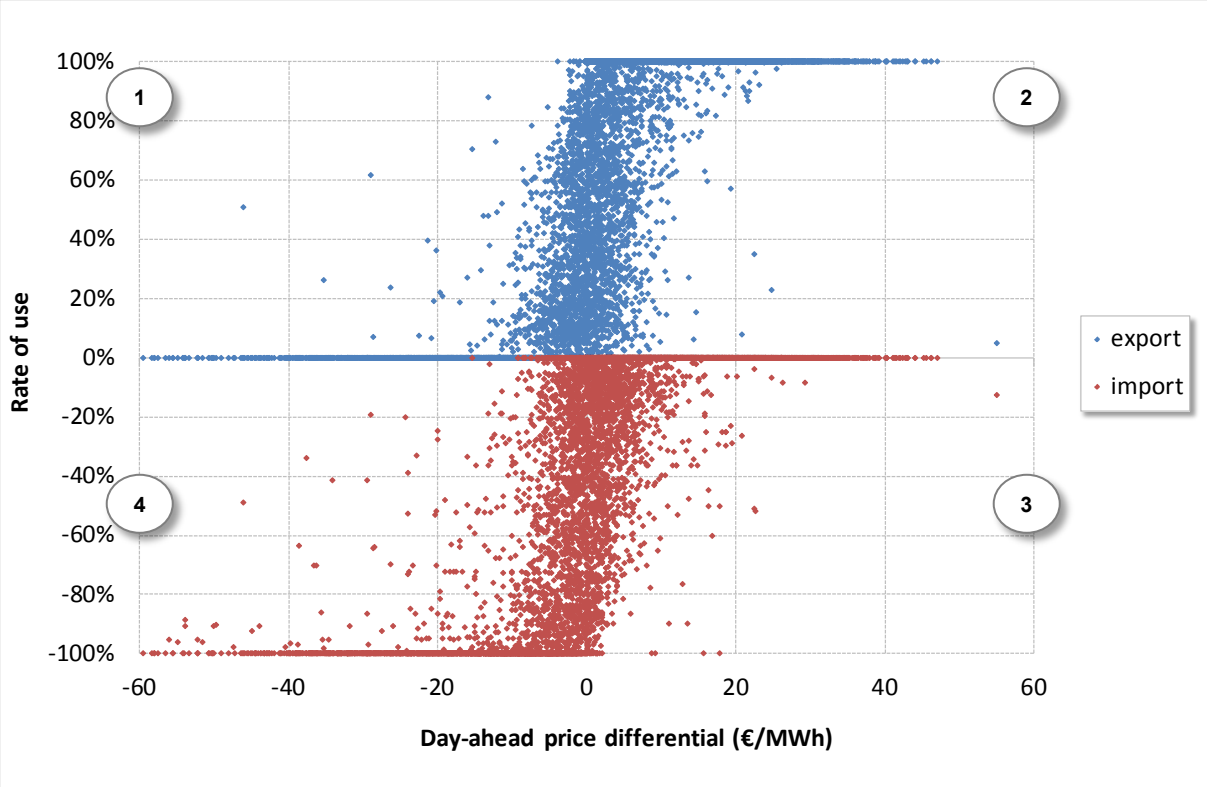
- ***Use of daily capacities in the case of non-coupled markets***

When markets are not coupled, the use of the interconnection capacity at the daily timeframe requires arbitrages from the market players. (Figure 21):

- Prices converge much less often (9% of the time with Spain in 2012);
- Flows in the opposite direction of the price differential are observed (areas 1 and 3 in the figure);
- Flows in the correct direction cannot be performed for the total capacity of the interconnection (areas 2 and 4 in the figure).

An identical graph, and thus equivalent results, can be observed on the Italian, Swiss and GB borders.

Figure 21: Rate of use of net daily capacities on the France-Spain interconnection compared with the hourly price differential between OMEL and EPEX, in 2012

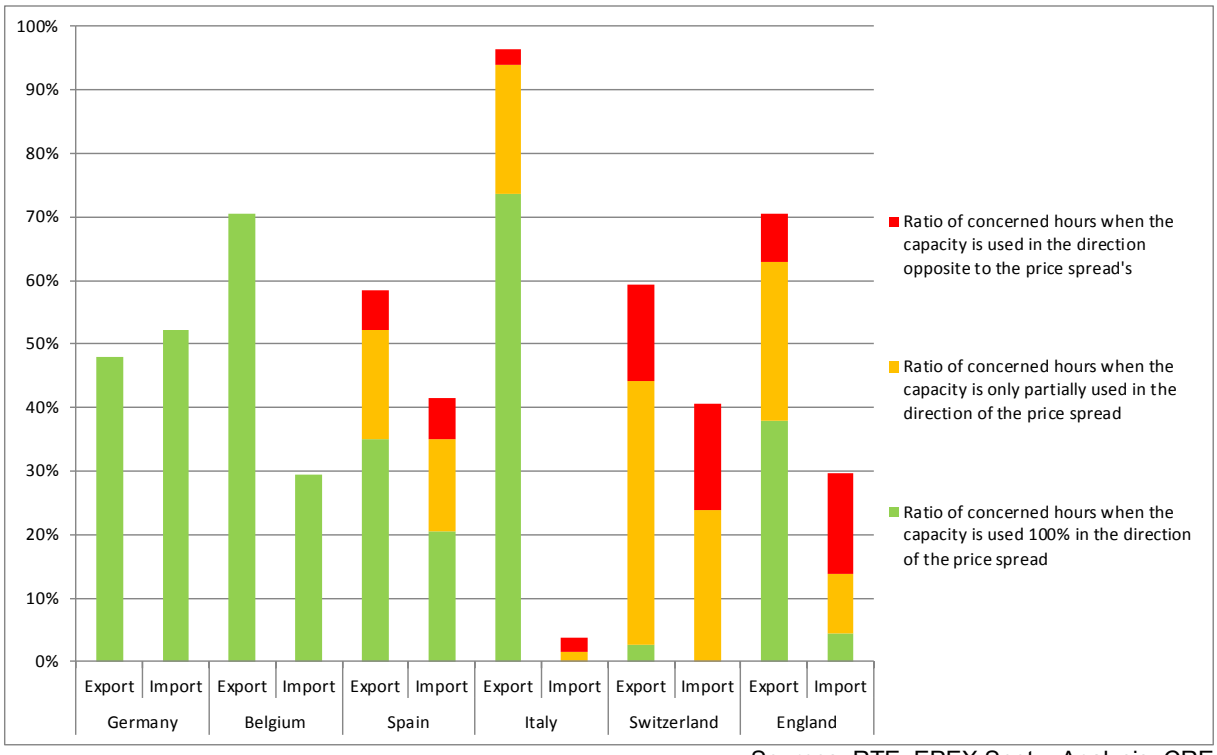


Sources: RTE, EPEX Spot – Analysis: CRE

As illustrated by Figure 22:

- At the Spanish, British, Swiss and Italian borders, non-optimization cases are frequently observed and the capacity is:
  - Either partially used (up to 42% of the time on the Swiss border in the export direction);
  - Or used in the opposite direction to the price differential (up to 17% of the time in export direction on Swiss border);
- Thus, on the borders with Spain, Italy, Switzerland and England, improvement is still required in terms of using daily capacities. On average, for all hours in the year on these four borders, 45 MW are used in the opposite direction to the price differential;
- It should also be noted that, thanks to market coupling, France-Germany and France-Belgium interconnections are used permanently in the direction of the price differential.

Figure 22: Use in opposite direction to price differential and under-use of daily capacities in 2012



Sources: RTE, EPEX Spot – Analysis: CRE

In addition to the previous diagram, the table below highlights changes between 2011 and 2012. Furthermore, it provides an estimate of the unused capacity that could have been capitalized in situations where it would have been economically viable. As such, in 2012, for 23.4% of the hours in the year, exchanges in the France-Spain border were justified and yet they did not saturate the NTC. This means that, on average, 361 MW were not used.

Table 9: Poor use of capacities in 2012 (and 2011)

2012 (2011)		Cases where the capacity available in day-ahead is not optimally used			Cases where the commercial flow resulting from day-ahead nominations is in the direction of the spread, 100% of the capacity nevertheless not being used	Cases where the commercial flow resulting from day-ahead nominations is in the direction opposite to the price spread's
		ratio of concerned hours	ratio of concerned hours (depending on the direction -export or import- that should have been saturated)	mean value of the capacity which could have been used during these hours (MW)*	ratio of concerned hours	ratio of concerned hours
Espagne	Export	44,4% (39,5%)	23,4% (19,6%)	261 (235)	17,1% (14,9%)	6,2% (4,8%)
	Import		21% (19,8%)	376 (226)	14,5% (12,5%)	6,5% (7,3%)
Italie	Export	26,4% (14,6%)	22,7% (12%)	111 (96)	20,4% (9,2%)	2,3% (2,7%)
	Import		3,7% (2,6%)	1970 (3200)	1,5% (0,5%)	2,2% (2,1%)
Suisse	Export	97,4% (99,5%)	56,8% (77,5%)	416 (176)	41,7% (0%)	15,1% (77,5%)
	Import		40,7% (21,9%)	563 (3855)	23,8% (18,4%)	16,9% (3,5%)
Angleterre	Export	57,6% (72%)	32,4% (43,2%)	218 (446)	25% (28,4%)	7,4% (14,8%)
	Import		25,2% (28,8%)	593 (1489)	9,4% (12,2%)	15,8% (16,6%)

**différence between the ATC and the net commercial flow resulting from day-ahead nomination*

Price convergence in the coupled Central-West region

Market coupling encourages price convergence for the markets concerned. Prices in the exporting country increase since the most costly production systems are activated and inversely in the importing country. This results in the two prices being equal unless the interconnection is saturated: in this last case, the two prices, although closer than with no coupling, still remain different.

The following elements can be observed on Table 10:

- Coupling in the Central-West region brings the prices closer together in the four areas, and even makes them equal (price spread smaller than €0.01/MWh) to a large extent;
- The strongest convergence occurred between the French and Belgium prices that were equal for 86% of the year;
- Convergence between France and Germany remains high, with a convergence rate of 65%;
- In 2012, there was total convergence for half the year, i.e. the four markets (French, Germany, Belgium and the Netherlands) even provided identical prices for 50% of the time.

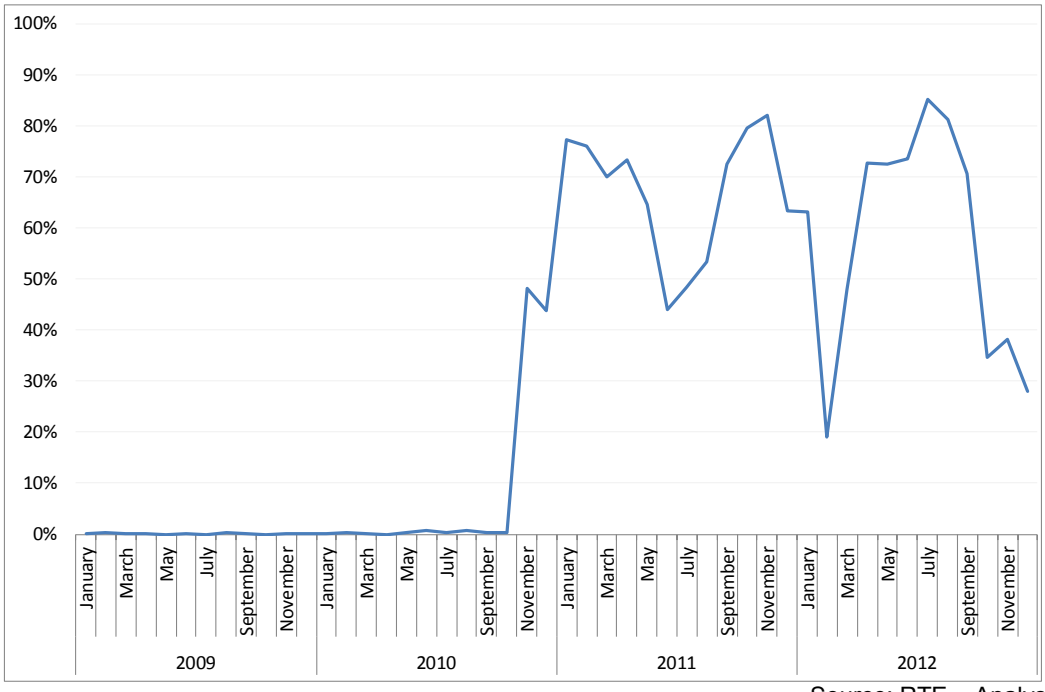
Table 10: Price convergence in 2012 in the coupled centre-west region (to the nearest €0.01/MWh)

France-Germany	France-Belgium	France-Netherlands	Germany-Netherlands	Total convergence	Total divergence
65.00%	86.00%	74.00%	59.00%	50.00%	0.40%

Source: RTE – Analysis: CRE

Figure 23 provides a dynamic vision of the total convergence between France, Germany and Belgium (three equal prices). Extending trilateral coupling to Germany in December 2010 had a clear effect, increasing convergence from approx. 1% to almost 50%.

Figure 23: Convergence rate between France, Germany and Belgium



Source: RTE – Analysis: CRE

Estimation of extra supply costs related to lack of market coupling in daily timeframe

Social welfare losses related to the absence of market coupling represents additional supply costs caused by poor use of interconnections.

It is estimated in the following manner: for each hour, it is the product of the positive part of the price differential between the power exchanges and the daily capacity that is not used (if part of the capacity is not used, then favourable exchanges have not been performed) or used in the opposite direction (if part of the capacity was used in the opposite direction, exchanges destroying collective surplus have been performed).

This estimate is used to obtain a value for the additional supply costs on each border. However, it is to be considered with caution. Indeed, this estimate does not take account of possible changes in market players' behaviour on organized markets and their strategy for sales and purchasing offers further to the introduction of market coupling.

Neither does this estimate take account of market resilience, i.e. the impact on prices of changes in volumes exchanged. Improved use of daily capacities would lead to increased price convergence; in this way, the figures provided are the upper bounds of the actual additional supply costs, which could only be accurately estimated using aggregated supply/demand curves for each market, or net export curves.

€110 million

Additional supply costs related to a lack of market coupling stand at €110 M in 2012.

Figure 24 provides an estimate of the additional costs related to a lack of market coupling between 2009 and 2012 and can be used to observe the following elements:

- The German interconnection is not affected from the end of 2010 onwards, thanks to the market coupling implemented in November 2010, whereas the extra costs stood at €59.8 M in 2009 and €36.6M in 2012.
- Switzerland is the country for which the additional supply costs are (on average) highest (€54.9 M on average). This can be explained by the significant share of the capacity that is still used in a priority manner by long-term contracts, which strongly damages the efficience of this interconnection. The use of the interconnection by these contracts' holders is only slightly correlated to the market price, meaning that significant flows are generated in the opposite direction to the price differential. The manner in which the contracts are currently managed means that no netting is possible before the daily auctions; netting that would, in theory be a sufficient tool to counterbalance the effects of these contracts.

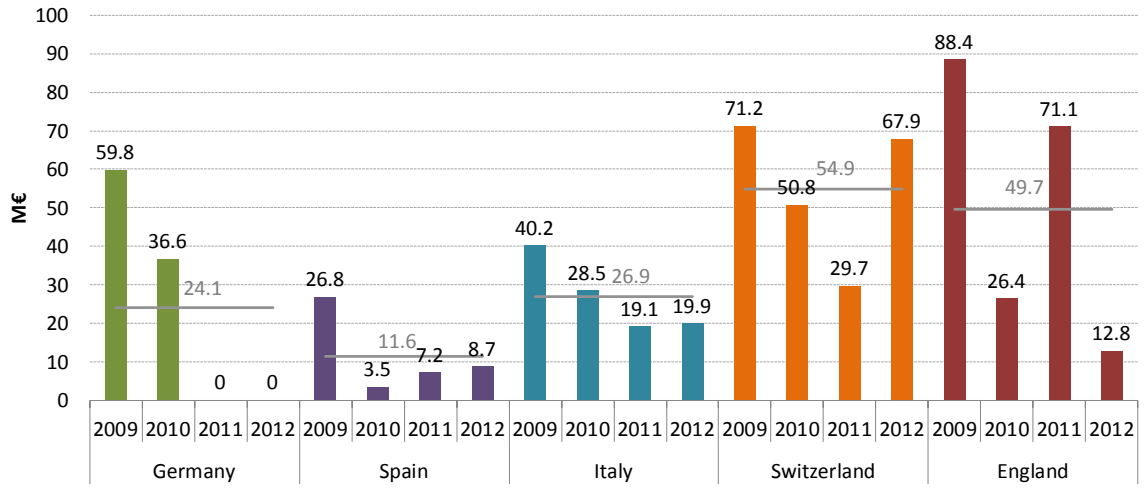
Between 2011 and 2012, several observations can be made on Figure 24.

- The increase in additional costs on the Swiss border (from €29.7 million to €67.9 million) is striking.
    - Losses, unavoidably entailed by the existence of priority long-term contracts, were worsened in 2012 by the impact on prices. Indeed, making the capacity available would have made it possible to perform imports at times when the French market was tense, or more expensive than the Swiss market. And yet this was only the case 22% of the time in 2011, compared with 41% in 2012;
    - This phenomenon is especially clear during the cold spell in February. Poor use of the interconnection, whether in the opposite direction to the price differential, or not fully using the available capacity in the right direction, generated much greater additional costs simply because there was a significant price differential. The additional cost for this single month was €22 million in 2012 compared with €1.5 million in 2011.
- Reduced additional supply costs at the France-England interconnection is to be considered just before the price reference is changed in the calculation method (since the British spot was not considered as representative before

2012, it was replaced by the OTC price). Furthermore, since April 2011, coupling with England through the Netherlands-England interconnection has helped bring French and British prices closer together;

- It can be noted that the additional costs related to the lack of coupling for Italy and Spain are relatively stable between 2011 and 2012.

Figure 24: Estimate of additional supply costs related to lack of market coupling, 2009-2012



Source: RTE – Analysis: CRE

Comparison of capacity prices and price differentials for non-coupled borders

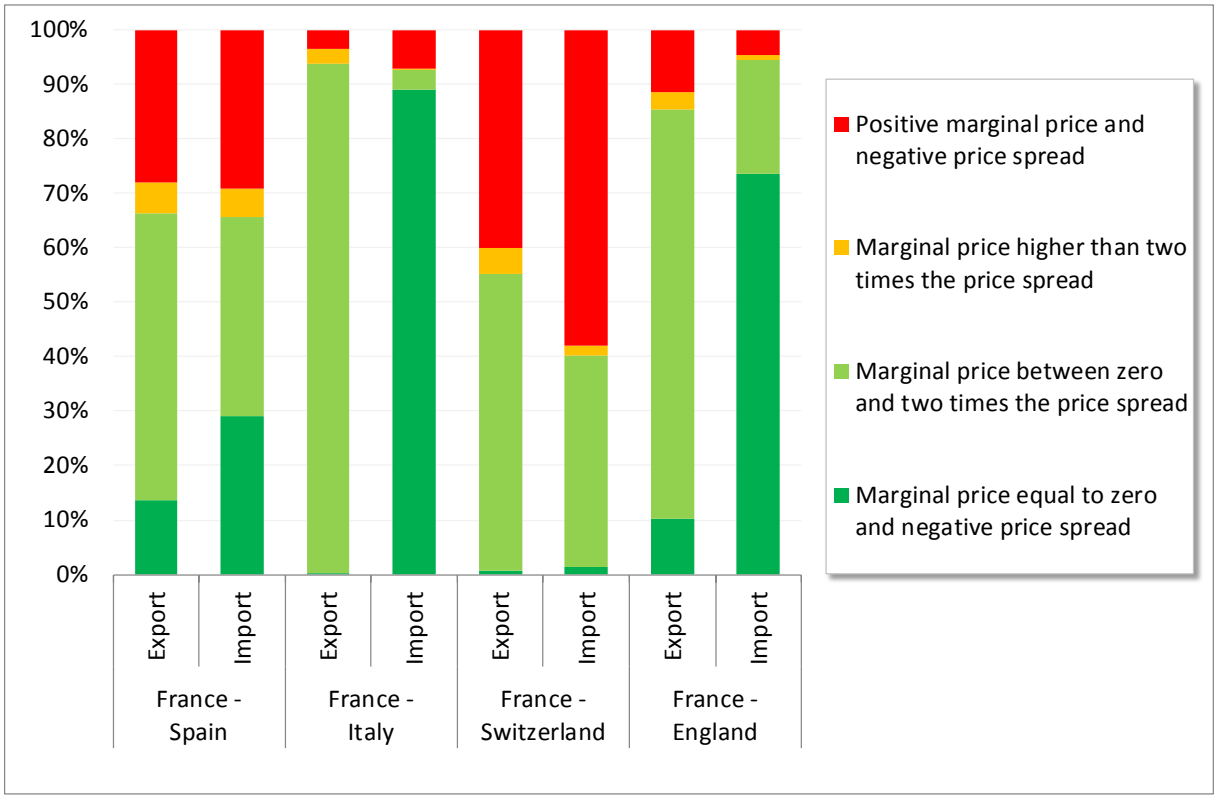
The value of daily capacities, hour by hour, is to be compared with the hourly price differential between national markets. If market players made faultless forecasts, the prices of daily capacities should be equal to the price differential on daily markets (when the latter is in the right direction) and should have zero value (when the price differential is in the opposite direction).

In reality, since explicit daily auctions performed before the prices were set on organized markets, auction participants could not rely on the price differential estimates, which explains, at least in part, the deviations observed between the auction results and the price differential. In this way, when there is no market coupling between the two border countries, consistency is not systematically ensured between the capacity price and the price differential on national markets.

Figure 25 aims to highlight the percentage of hours where the price differential is either inverse to the capacity price, far from it or near to it.

- The Swiss border has the most pronounced gaps between the capacity price and the price differential. In 2012, the price given to the capacity on this border was in the opposite direction to the price differential almost 40% of the time in the export direction and more than 55% in the import direction. This ineffective use of the interconnection is explained by long-term contracts that make most of the capacity inflexible;
- In 2012, the price given to the capacity on the France-Spain border was in the opposite direction to the price differential for 25% of the time (on average). On this border there is no discernible trend (one of the price not being systematically higher than the other), making it difficult to value the capacity at the time of the daily auction, which occurs before the results of national power exchanges are published.

Figure 25: Capacity price and price differential in 2012



Source: RTE – Analysis: CRE

With regard to competition (Table 11):

- Two directions have poorly developed competition: export to Spain and import from England;
- The case of Italy is analysed here in the same way as it is for the annual and monthly timeframes;
- The correct indicator for Swiss imports must not conceal the fact that it only focuses on a very limited capacity (priority access and nomination flexibility of long-term contracts are not taken into account in the indicator computation).

Table 11: Competition for explicit daily in auctions 2012[12]

				Concentration level		
		Number of auctions participants who obtained capacity	Largest share	Low (HHI < 1000)	Medium (1000 < HHI < 2000)	High (HHI > 2000)
Spain	Export	16	35%		1900	
	Import	19	30%		1627	
Italy	Export	40	9%	466		
	Import	31	20%		1314	
Switzerland	Export	29	26%		1270	
	Import	26	18%	991		
England	Export	19	30%		1356	
	Import	17	47%			2589

Source: RTE – Analysis: CRE

[12] The first column of the table indicates the number of players involved in daily auctions in 2012

2.3. Implementation of the European target model

The explicit auction mechanisms used to allocate daily interconnection capacities entail inefficient use of interconnections, since the auctions do not integrate the information that constitute the energy prices on organised markets.

This is why CRE recommends implementing implicit auctions through price-based market coupling, in accordance with the target-model described in the Framework-Guidelines on Capacity Allocation and Congestion Management (CACM) published by ACER on 29 July 2011. CRE has been working on such an implementation on all French borders since 2006.

Market coupling is an important step forward towards integrated European electricity markets. Its implementation will ensure more efficient cross-border exchanges by guaranteeing optimal use of daily capacities – whilst taking account of the physical limits at the interconnections - and will thus generate substantial gains in terms of welfare gain in the coupled area.

Flow-based market-coupling

The target-model recommends a solution that goes a step further than the implicit auction mechanism: the target-model is, at least with regard to interconnected systems, flow-based market coupling.

The implicit auctions in place between France, Belgium, Germany and the Netherlands (CWE region), for example, are based on a method that uses NTCs, in an extension of what exists in explicit mechanisms. The flow-based methodology does not define the maximum acceptable flows between France and Germany and between France and Belgium in advance, but provides a range of possible exchanges. By capitalizing on the interdependence between the capacities, it is possible to offer market players a wider choice and to maximise, within the system security limits, exchanges with the most economic value.

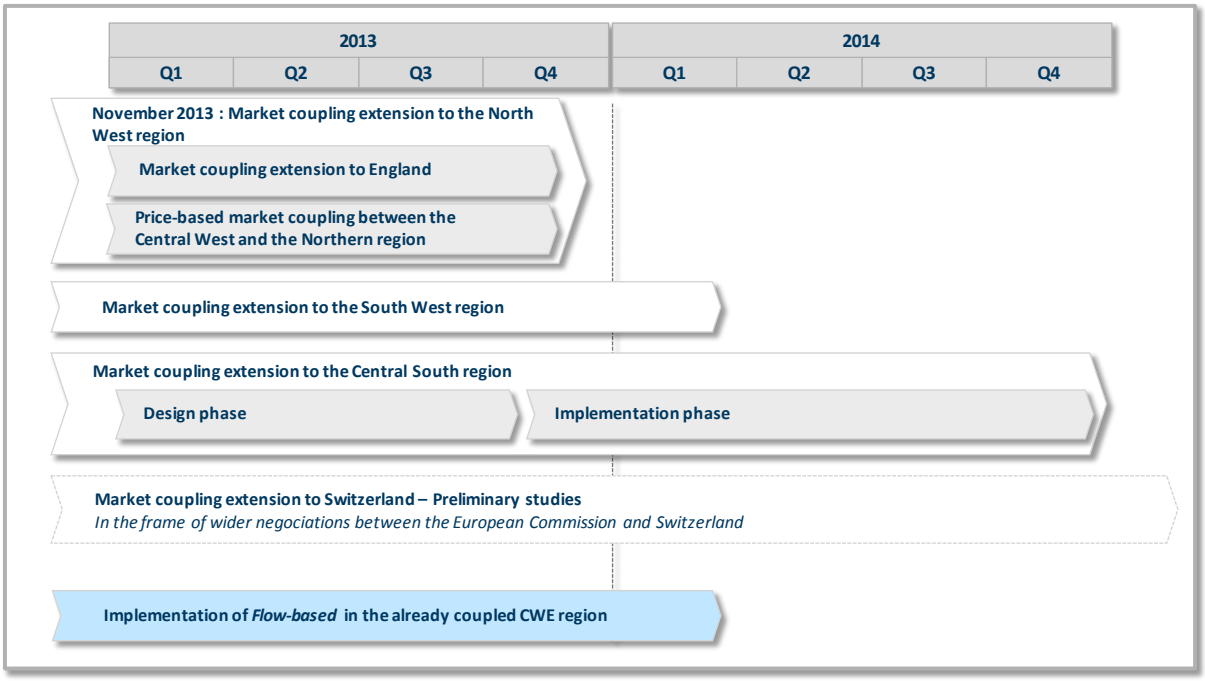
In the CWE region, CRE and its counterparts made every effort to ensure this project will be completed at the beginning of 2014. At the beginning of 2013, it entered a full-scale experiment phase, with market results published showing what this methodology could have achieved on a weekly, then daily, basis. The results of the first weeks indicate an annual social surplus released by implementing this method that is expected to be greater than previous estimates (that stood at €50 million per year). This surplus is also a result of increased price convergence.

Issues related to transparency and technical configuration of this method are closely monitored by CRE, since they are crucial to the project's successful delivery of the expected gains.

Figure 26 presents a summarized schedule of the next steps in the implementation of the target-model for the day-ahead timeframe:

- A market coupling project for the North-West region was launched and aims to change volume-based coupling to price-based coupling between the Central-West region and the northern region, as well as extending market coupling to England. After several rescheduling issues, the project should get underway in November 2013 in the North-West region;
- Other border countries with France (Spain, Italy and Switzerland) should progressively join market coupling in 2014. To respect the objective of an integrated European market for 2014, CRE, along with other regulators from the South-West and Central-South regions, planned the works required for future coupling extensions in advance. Market coupling in the South-West region is expected to begin soon after that in the North-West region. With regards to the Centre-South region, provisions from the regional roadmap specify that coupling is to be launched at the end of 2014.

Figure 26: Next steps for the Electricity Regional Initiatives: daily timeframe



Source: CRE

3. Intraday capacities

The intraday timeframe makes it possible for players to adjust their positions taken in day-ahead, depending on any different unforeseen events that may occur and upset their balance perimeters. More specifically, changes in an expected consumption level, the unplanned shutdown of a generation unit, or (and increasingly) the variation of climate conditions that affect the expected production from renewable energies, may lead players to modify their cross-border exchange programmes. It is therefore a timeframe that can be used to manage the non-valued capacity residue on a daily basis. The rate of use of the remaining capacity illustrates this specific feature, with a remaining intraday interconnection capacity that is used at less than 20% by market players.

The role of the intraday market

As shown by Figure 27 and Table 12, the price of electricity on the French intraday market regularly deviates from the reference day-ahead spot price. 80% of the time, this deviation exceeds €1.5/MWh, and in some extreme cases, such as the price peak on 9 February 2012 during the cold spell, the deviation can be massive. During the peak at €1938.5/MWh on 9 February 2012 from 10am to 11am on the spot market, the intraday price was at €985/MWh. This extreme example and the figure below illustrate the arbitrage opportunities that may exist in real-time, and the impact of unforeseen events on the markets and therefore on cross-border exchange programmes.

Figure 27: Variations in intraday price compared with spot prices in France in 2012

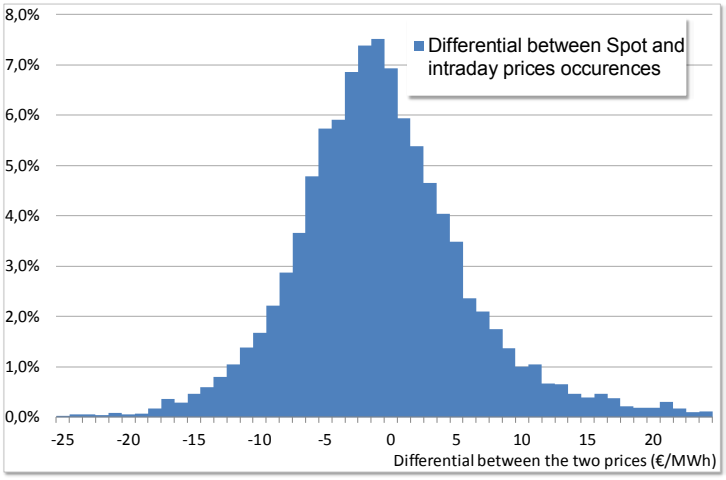


Table 12: Deviation range between the intraday price and the French spot price in 2012

Differential < than	Occurrence
0,50 €	7,5%
1,50 €	21,8%
2,50 €	45,9%
3,50 €	56,3%
4,50 €	65,1%
…	…
25 €	98,9%

Source: EPEX Spot – Analysis: CRE

The analysis of intraday cross-border exchange volumes illustrates the increasing importance of this timeframe for market players (Figure 28).

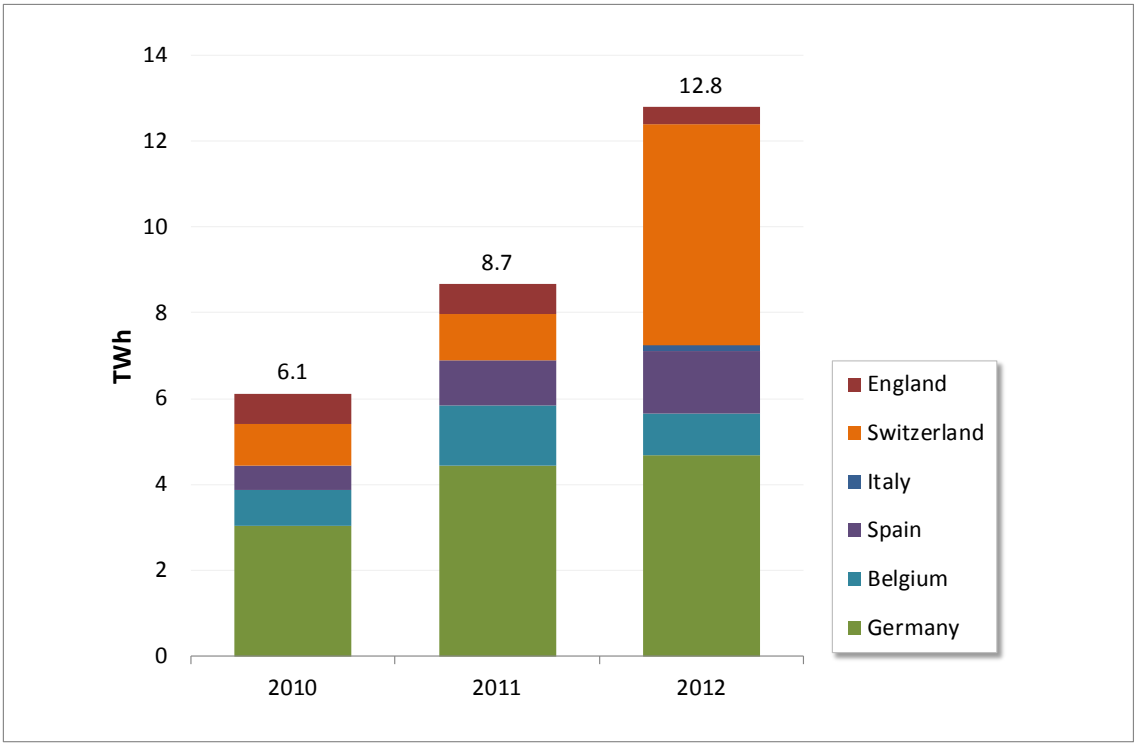
- A strong increase in exchanges in the intraday timeframe has been observed over the last three years, with exchanges doubling in two years, passing from 6 TWh in 2010 to more than 12 TWh in 2012. This strong increase is largely carried by the increase in exchanges on borders with Germany and Switzerland, where changes in mechanisms promoted by CRE were implemented to switch from improved prorata-based allocations to continuous obligation-based allocations. The intraday market, particularly in France and Germany, is currently experiencing considerable development, pushed forward by the massive developments in renewable energies. As an example, the volumes exchanges in France on EPEX Spot intraday have increased by 65% in 2011 and 30% in 2012;

- In 2012, intraday exchanges between France and Switzerland were multiplied by five, passing from 1 to 5 TWh. This increase is especially sharp in the import direction (from 0.17 to 4 TWh), and is explained by the mechanism change, which came into force on 18 January 2012 and makes it possible to draw maximum benefit from the flexibility of the Swiss hydraulic fleet following closure of the spot markets. However, a large part of the available capacity that is used on this border in the intraday timeframe results from special management terms and conditions of long-term contracts that prevent optimization of capacities on a daily basis, unlike other french borders.

x5

Intraday exchanges between France and Switzerland in 2011 and 2012 further to the implementation of mechanisms for continuous access to the capacity

Figure 28: Development of intraday exchanges since 2010



Source: RTE – Analysis: CRE

3.1. Overview of current mechanisms

The map below (Figure 29) illustrates disparities between mechanisms in force on 31 December 2012 to allocate capacities available at French borders at the intraday timeframe.

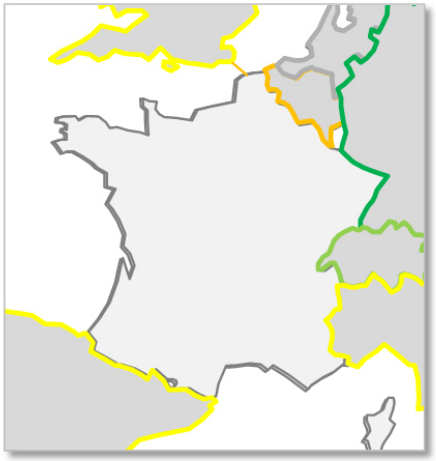
- Allocation mechanisms for intraday capacities through explicit auctions are used on borders with England, Spain, and Italy.The use of acquired capacities is optional. Two sessions are organized on each of the borders, one on D-1 and the other on D, with a view to providing players access to the associated auctions on Spanish and Italian electricity markets;
- An "improved prorata[13]" allocation type is used on the border with Belgium.

[13] This mechanism is used to allocate capacity to players in proportion to their demands, and by favouring the smallest demands and by ensuring that the players do not formulate unreasonable demands to obtain the greatest share of the capacity.

Nomination is also optional in this case. The capacity available at this timeframe is attributed to players in accordance with the capacity requested during twelve gates;

- Mechanisms to allocate obligations (compulsory use) continuously, on a "first come first served" basis, are used on borders with Germany and Switzerland.The two mechanisms differ in terms of access to the capacity, which is only performed in an explicit manner for Switzerland, whereas implicit access - i.e. when the allocation is automatically associated with a cross-border energy purchase/sale order between the intraday markets in both countries - is also set up for the border with Germany. This last mechanism corresponds with the European target-model.

Figure 29: Intraday capacity allocation mechanisms at the French border in 2012



	Allocation
Germany	Continuous implicit and explicit access
Belgium	Explicit auctions with improved prorata
Spain	Two explicit auctions
Italy	Two explicit auctions
Switzerland	Continuous explicit access
England	Two explicit auctions

Source: CRE

3.2. Analysis of existing mechanisms

Use of intraday capacities

Table 13 details how players use the remaining capacity available after the day-ahead timeframe, which is made then available for the intraday timeframe. This average rate of use of the available capacity does not take account of the price differential, since intraday price may change in relation to the day-ahead spot price. The rate of use does not necessarily reflect the economic benefit of the exchange, but it does make it possible to highlight trends:

- Except on the Italian border, the rate of use of available intraday capacity remains low. However, borders with a continuous capacity allocation mechanism have higher rates of use, with between 10.3% and 14.6% for France-Germany, 17.1% and 13.2% for France-Switzerland, for imports and exports respectively;
- On the border with Italy, the extremely high rate of use of remaining import capacity may be explained in part by the fact that as an absolute value, this capacity is low in relation to the other borders (only 116 MW for exports) and that the export capacity is almost always valued highly in this direction. The small volume of capacity that it was not possible to allocate in day-ahead is thus used almost systematically in intraday;
- Generally speaking, and as showed by the following analysis into intraday capacity valuation, on borders where allocation is performed through auctioning (France-Spain, France-Italy and France-England), the players do not use all the capacity that they have procured for hedging purposes in near-real-time.

Table 13: Remaining capacity for the intraday timeframe and use by players

		Average remaining capacity (MW) after day-ahead	Average capacity used in intraday (MW)	Rate of use
Germany	Export	2563	263	10.3%
	Import	1692	247	14.6%
Belgium	Export	1579	106	6.7%
	Import	2738	7	0.2%
Spain	Export	760	71	9.4%
	Import	1148	93	8.1%
Italy*	Export	116	102	87.9%
	Import	2511	11	0.4%
Switzerland	Export	749	128	17.1%
	Import	3469	459	13.2%
England	Export	561	27	4.8%
	Import	1917	19	1.0%

** On the France-Italy border, the mechanism was only implemented from 20 June 2012 onwards, so the data is not complete.*

Source: RTE – Analysis: CRE

Valuation and competition for intraday capacities

As foremention the available intraday capacity is allocated through explicit auctions for France-Spain, France-Italy and France-England. Table 14, which illustrates how this capacity is valued by market players, shows the low price that results from these actions: the players ultimately only use a small part of the acquired capacity without the cost of this strategy climbing too high.

Table 14: Results and prices of intraday auctions in 2012

		Average capacity available / average capacity allocated	Average marginal price (€/MWh)
Spain	Export	815 / 811	0.13
	Import	1136 / 1134	0.09
England	Export	636 / 632	0.32
	Import	2078 / 1965	0.02
Italy	Export	166 / 165	0.58
	Import	1364 / 907	0.00

Source: RTE – Analysis: CRE

- Since the intraday capacity is acquired using diverse mechanisms (auctions, continuous, gates), analysing competition in this timeframe is based on the market share of each player regarding the nominated (instead of allocated). This approach differs from that used for the previous timescales, but it does best illustrate the competition in terms of access to the remaining capacity at the intraday timescale;
- Analysing concentration of intraday markets at French interconnections shows a low level of competition. Only the export capacity of the France-Switzerland and France-England interconnections has a slightly better level of competition, with the largest market player share of less than 30%.

Table 15: Competition for intraday capacities 2012

				Level of competition and HHI		
		Number of auction participants in 2012	Largest share	Low (HHI < 1000)	Medium (1000 < HHI < 2000)	High (HHI > 2000)
Germany	Export	12	51%			**2 872**
	Import	13	43%			**2 293**
Belgium	Export	9	57%			**3 800**
	Import	9	57%			**3 841**
Spain	Export	7	32%			**2 632**
	Import	9	44%			**2 834**
Italy	Export	18	35%			**2 543**
	Import	14	46%			**3 018**
Switzerland	Export	18	27%		**1 853**	
	Import	17	37%			**2 281**
England	Export	18	27%		**1 968**	
	Import	14	56%			**3 659**

Source: RTE – Analysis: CRE

Specific features of the existing mechanisms

- ***Continuous allocation mechanisms that close to the target-model on France-Switzerland and France-Germany borders***

Pending the enhancement of products proposed to players in the power exchange, explicit access to the interconnection capacity, in parallel to implicit access mechanisms, makes it possible for market players to perform bilateral exchanges of a large selection of products, which best match their quasi real-time balancing requirements.

Between France and Germany, the intraday market shares between the implicit and explicit access are equal: In 2012, 54% of import exchanges and 46% of export exchanges were performed through implicit access. Today it is therefore essential to maintain this modality. The importance of intraday exchanges between France and Germany, indicative of the effectiveness of the European target-model, owe much to the vigour and the strong liquidity of the intraday electricity market in Germany.

However, in 2011 and 2012, CRE identified some suspicious behaviour from market players, specific to the possibility of continuous and explicit access to the capacity. Some players retained the capacity available in one direction, held it for a few hours, before "releasing" it just before real-time, while reserving an equivalent quantity in the other direction, thus cancelling their exchange. This behaviour (i.e. not releasing the capacity until the last minute) meant other actors were deprived from the possibility of performing exchanges of the available capacity, and, as a consequence, this reduced exchanges that could create value. This is why CRE, after its deliberation on 19 July 2012, approved a modification to capacity allocation rules on the France-Germany border (as well as on the France-Switzerland border, where identical behaviour was detected) with a view to preventing this type of practice.

- ***Mechanisms with poor performance on other borders***

Irrespective of whether prorata allocation mechanisms (such as the interconnection with Belgium) or explicit allocation mechanisms (such as those on the three remaining borders) are used, mechanisms on other french borders all have low performance since they present at least one of the following faults: the allocated product is not an obligation, or allocation is completed too far off from real-time. However, the very existence of these mechanisms is a step in the right direction, and is preferable to a complete lack of any mechanisms. It is in this mind-set that CRE requested and approved the implementation of an intraday mechanism on the France-Italy border, for which work admittedly remains, but still makes it possible for players to review their positions at this timeframe and to improve their use of this interconnection.

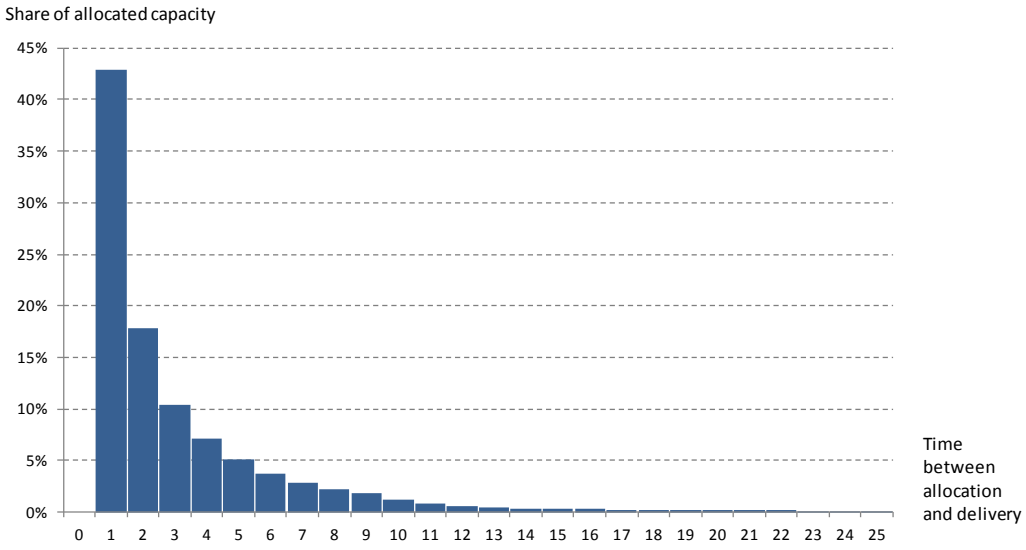
Capacity use on France-Germany border

Figure 30 shows the time that lapses between capacity allocation and delivery for intraday implicit and explicit exchanges (excluding exchanges performed within the framework of the balancing mechanism) on the France-Germany border.

The major share of the capacity (61%) is requested and allocated between one and three hours before the delivery time. This shows how players tend to request capacity as close as possible to real-time. As it is the case on the France-Germany border, it is possible to acquire capacity up to one hour before real-time (and up to thirty minutes before for balancing exchanges), a significant share of the capacity (43%) is allocated during the last hour that can be accessed by the players.

These results show the importance of implementing mechanisms that can be used to perform exchanges as close as possible to real-time, thus providing players with more flexibility in terms of balancing. This possibility for near real-time balancing is crucial in terms of the development of wind and solar power. Mechanisms with little flexibility that do not enable near real-time exchanges cannot be used by players to correct their positioning in accordance with wind and solar energy production forecasts.

Figure 30: Capacity use on France-Germany border in 2012



Source: EPEX Spot – Analysis: CRE

Launch of mechanism on France-Italy border in 2012

In its deliberation of 26 April 2012, CRE validated the implementation of an intraday capacity allocation mechanism on the France-Italy border, which began on 20 June 2012. The intraday mechanism now in force is composed of two explicit auction sales performed by CASC.EU (the shared auction platform of the TSOs), one on D-1 covering all of Day D and one on Day D covering the hours between 16:00 and 24:00 (as for the France-Spain border).

The implemented mechanism was highly criticised by market players during the public consultation conducted on 17 February to 16 March 2012: time incompatibly preventing players from participating in all intraday auctions on the Italian market, or even a neutralization lead-time of 5 hours stopping them from best balancing their positions. CRE thus approved the implementation of this mechanism for a period of one year only, and asked RTE to take account of the players' comments to improve the mechanism and work in parallel to implement the target-model. CRE regrets that today its requests have not been followed-up by RTE and its counterparts.

Initial feedback from the last six months of 2012 does however gauge the benefit of this mechanism despite its imperfections.

Intraday exchanges on this border thus represented 87.7 GWh (export) and 51.5 GWh (imports).

Although these volumes remain low in comparison with volumes exchanged on other borders, the specific case of the France-Italy border partly substantiates this difference. CRE analysis thus reveals that the mechanism makes it possible for players to use the major share of the capacity that remained available for export after day-ahead: almost 90% of the available export capacity for the intraday timeframe was used by the players. A mechanism of this kind could also have undertaken a key role during the price peaks observed during the cold spell in February 2012.

Although this review today appears positive, the changes in fundamentals, especially the strong development of variable energy by the Italians, will lead to even more frequent changes to the France-Italy price differential, and thus justifying import flows.

The automatic use of exports by market players fits well with a rigid mechanism (as shown by the 2102 review), but the latter cannot satisfy the increasing need for near real-time adaptability and position balancing.

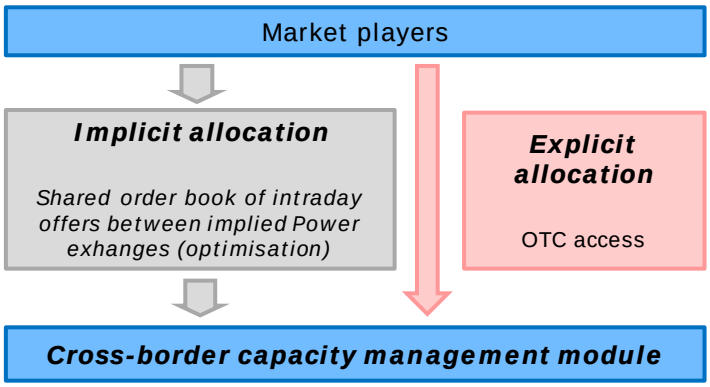
3.3. Implementation of the European target model

At the intraday timeframe, the model adopted is an implicit mechanism to allocate the interconnection capacity through continuous exchanges on the electricity stock markets. This mechanism integrates intraday markets operated by the electricity stock markets in different Member States and groups together the liquidity of these markets in a shared order book. Any player on the market can thus access the cheapest offer, subject to the interconnection capacity availability. The interconnection capacity is taken into account and allocated in a transparent and automatic manner using a capacity management module (CMM).

This mechanism was implemented between France and Germany on 14 December 2010, further to CRE approval on 28 October 2010. The solution adopted for the French-German border is different in that it allows players (in addition and in parallel to implicit access to the interconnection capacity through the stock exchange) explicit access to the interconnection capacity and, as such, over-the-counter (OTC) exchanges between a player in France and a player in Germany or for a player with interests on both sides of the border.
The access principle is first come first served.

In the Framework-Guidelines on Capacity Allocation and Congestion Management, provisions are made (when applicable and on a temporary basis) so that the CMM can be used for explicit access to the capacities. Furthermore, it is specified that along borders where explicit access has been authorized, if sophisticated products meet market player needs, these products must replace the direct access to capacities, further to public consultation and approval from the regulators.

Figure 31: Target-model function for intraday timeframe with explicit access



Source: CRE

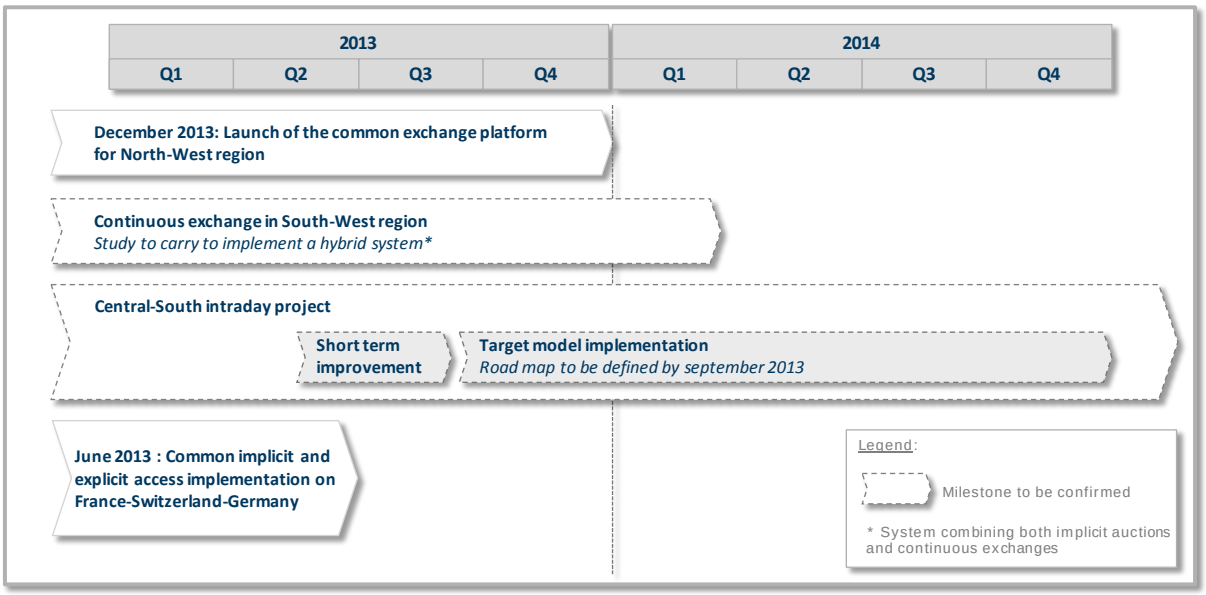
As part of discussion into the implementation of the pilot-project in the North-West region of Europe and into its future extension, the question is raised as to whether explicit and continuous access should be (temporarily) implemented in parallel to continuous implicit allocation through the intraday market organized by the electricity stock exchanges. At this stage, the situations vary depending on the considered interconnections, both in the North-West region and at a European level: on some borders, continuous explicit access is permitted whereas, on others, only implicit access is authorized. Furthermore, ACER asked CRE whether it would like to authorize explicit access to French interconnections or not.

In addition to the discussion and consultation process conducted with the players as part of the north-west project (and its future extensions), CRE launched a further consultation in July 2012 to gather the opinion of active players on French interconnections, and, more specifically, the issue of explicit access. Market players were mostly in favour of sustaining continuous explicit access for the intraday timeframe, in parallel to continuous implicit allocation, at least during the period where sophisticated products are not implemented.

Figure 32 presents a summarized schedule of the next steps in the implementation of the target-model intraday:

- Discussions launched in 2012 into the choice of the European Exchange Platform, held between power exchanges, and between TSOs and power exchanges, are still yet to conclude. On one side, an exchange platform, managed by the Nord Pool Spot (NPS), exists between Scandinavian countries since the 1990s. On the other side, the French-German market created in 2010 and extended to Austria in 2011, uses an exchange platform set up by the EPEX Spot;
- In light of the disagreement between power exchanges concerning the platform to be selected, a decision was made to launch a call for tender that is coordinated by the electricity power exchanges to select the intraday exchange platform; the results should be known by May 2013. This platform should ultimately operate the entire European market, and at least the North-West region before the beginning of 2014. CRE will ensure that the selection process is conducted transparently and that it is based on a cost-benefit analysis.

Figure 32: Next steps for the Electricity Regional Initiatives (intraday timeframe)



Source: CRE

4. Balancing exchanges

Close to real time, the balancing mechanism is used to ensure balance between supply and demand on the electric system: balancing refers to the process from which TSOs provide this physical balance in power and energy.

In France, RTE, having procured the necessary reserve to ensure balancing in its control are, operates this mechanism by using (close to real-time and in real-time) energy from reserves or other generation / demand resources provided by French and foreign players.

In the past, the existing balance mechanisms in Europe were designed on a national basis, with very limited cross-border exchange possibilities.
Several mechanisms to exchange balancing energy have therefore progressively been implemented on several borders, including French ones.

In order to to reinforce supply security, develop competition and improve economic efficiency, the integration of balancing markets is a key step towards the achievement of the internal electricity market.

4.1. Status of current mechanisms

As part of frequency containment process

The frequency containment process (automatic and simultaneous speed regulators for specific production groups installed on synchronous systems in Benelux, France and Germany) already makes it possible to socialise the risk of blackouts and increase operational security within different interconnected systems. Mechanisms may also be used to transfer the frequency containment reserve between countries: since 2011, for example, RTE and SWISSGRID operate a device used by French generators to transfer the frequency containment reserve to Switzerland by participating in the supply mechanism implemented by the Swiss TSO, within a volume limit of 25 MW.

As part of the balancing mechanism

In theory, all market players operating within cross-border countries can participate in the balancing mechanism operated by RTE. In practice, only German and Swiss players and the British system operator (National Grid) bid upwards and downwards offers which are regularly called: the offers are mixed with those from French players and are activated according to the merit order list.

Figure 33 presents a summary of existing mechanisms at French borders for the exchange[14] of balancing energy in 2012.

[14] In particular, the figure does not tackle the issue of balancing reserve exchanges.

Figure 33: Cross-border balancing mechanisms at French borders in 2012

	Existing mechanisms in 2012*
Germany	Unilateral exchanges of surpluses based on a TSO-BSP model
Belgium	No mechanism
England	Bilateral exchanges of surpluses based on a TSO-TSO model
Spain	No mechanism
Italy	No mechanism
Swiss	Unilateral exchanges of surpluses based on a TSO-BSP model

* Nordic TSOs exchange balancing energy on the basis of a TSO-TSO model with a common merit order list

Source: CRE

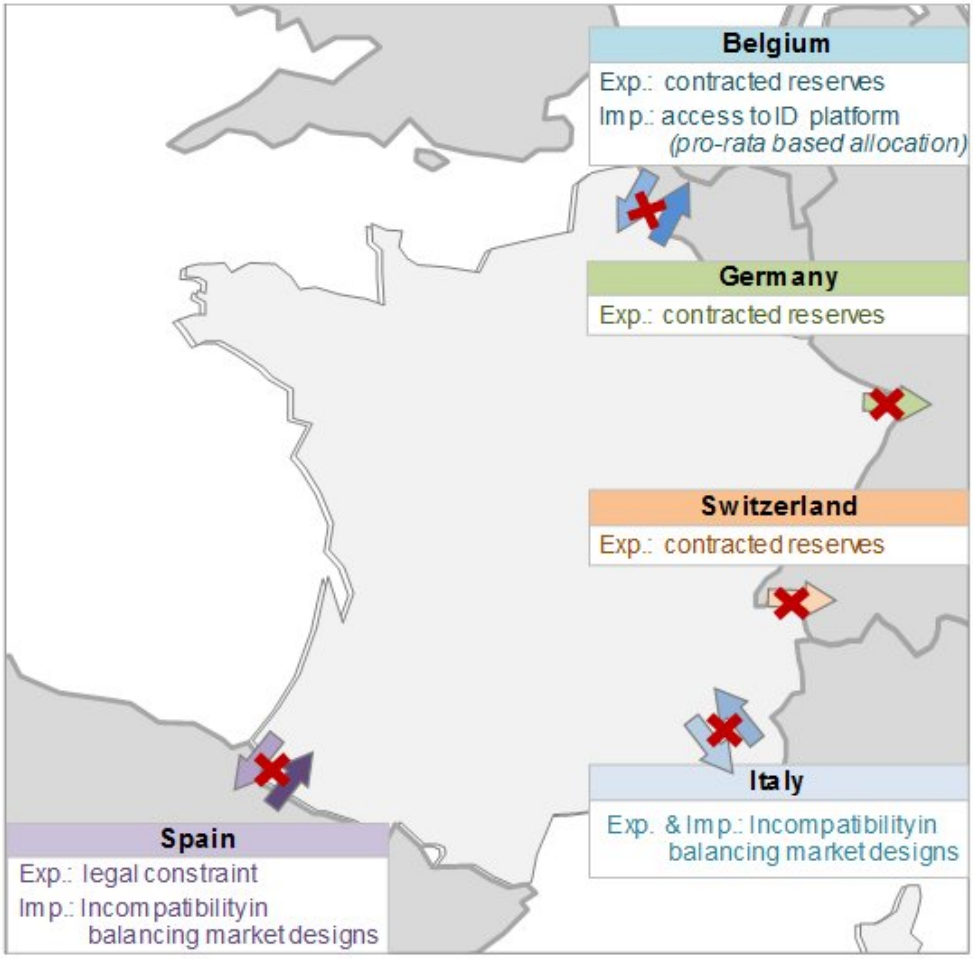
On the one hand, German and Swiss players benefit from specific procedures that allow them to operate the available interconnection capacity at the intraday timeframe (up to 30 minutes before real-time), based on an explicit allocation and, as a consequence, to issue balancing offers to RTE.

On the other hand, British players can contribute to the French balance using the Balancing Inter TSOs (BALIT) mechanism, which has been used for several years by the National Grid and RTE.

Furthermore, today, actors on the French market do not have the possibility to participate in balance mechanisms from neighbouring TSOs:

- In Spain, due to a legal obstacle, only generators connected to the Spanish grid can bid balancing offers;
- In Germany, Switzerland and Belgium, balancing is based almost exclusively on contracted automatic reserves. Procurement of reserve across the border may be subject to the availability of interconnection capacity to guarantee contractual reliability. Although the Framework Guidelines on Electricity Balancing, adopted by ACER on 18 September 2012, do not exclude this option in some specific cases, in practice, it is currently not implemented at French borders;
- In Italy, the (recently implemented) intraday market does not allow players to modify their offers sufficiently close to real-time.

Figure 34: Obstacles in existing balancing market designs that hinder exchange of balancing energy across French borders (2012)



Source: CRE

As part of emergency contracts between adjacent TSOs

In the event of degraded situations on the balancing mechanisms - once alert messages, degraded mode devices and non conventional offers have not proven sufficient to reduce significantly the risk on system security - RTE may call emergency contracts agreed with other TSOs.

4.2. Analysis of active mechanisms

Participation of foreign players

Since the implementation of balancing mechanism, offers from players operating abroad have made up the lion's share of competition for the imcubent operator. The recent development of competition from other operators has begun to progressively dampen this dominant position.

However, Table 16 shows that, following the same downward trend of the average power of activated bids on the balancing mechanism (-36%), the contribution of foreign offers has decreased, both in terms of average activated power and market share.

Table 16: Participation of foreign players in balancing mechanism since 2012

		Average power of all activated bids [15]	Average power of activated bids from foreign actors	Average power of activated German bids	Average power of activated Swiss bids	Average power of activated National Grid bids
Upward offer	2010	581	141 (24%)	65 (11%)	66 (11%)	10 (2%)
	2011	387	130 (22%)	69 (12%)	54 (9%)	7 (1%)
	2012	372	88 (15%)	47 (8%)	40 (7%)	1 (0%)
Downward offer	2010	370	46 (8%)	19 (3%)	8 (1%)	19 (3%)
	2011	386	28 (5%)	19 (3%)	2 (0%)	7 (1%)
	2012	448	26 (4%)	17 3%)	6 (1%)	3 (1%)

Source: RTE – Analysis: CRE

It remains challenging to justify exhaustively the general downturn of the average power offered by foreign players. At first glance, it seems that a reduction in balancing needs expressed by RTE over the period, combined with the development of competition from French market players, have contributed to this trend. Other elements may also boost this trend:

- Less flexibility in the French balancing mechanism;
- Less flexibility in the cross-border mechanisms;
- Increased economic value of flexibility from the intraday market, thanks to changes in the mechanisms promoted by CRE.

Estimated gains from balancing exchanges in 2012

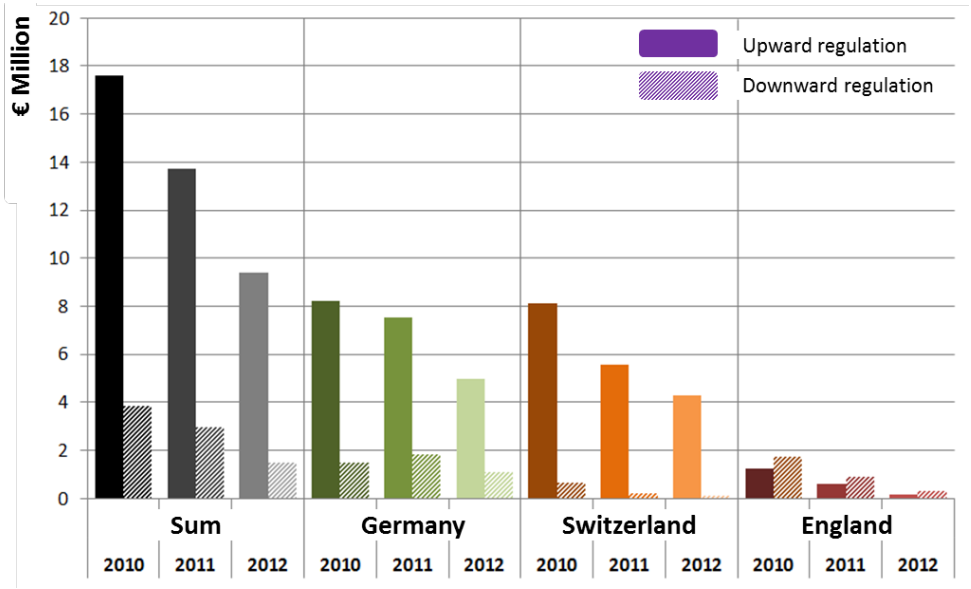
As a first step, the gains from calling a foreign offer can be estimated by combing the volume of the offer with the difference between the balancing marginal price and the price of the offer (for each hourly period).

Figure 35 reveals a clear reduction of the benefits based on the existing models.

With regard to the market for upward regulation, gains from all calls were reduced by half in two years, with the United Kingdom first (-87%), followed by Switzerland (-47%) and Germany (-40%). With regard to the market for downward regulation, gains from all calls were divided in three in two years, with Switzerland first (-87%), followed by the UK (-82%) and then Germany (-27%). On the France-United Kingdom border, the majority of gains from the BALIT device is received by British BRPs: on average since 2010, more than 85% of the total exchange volumes correspond with exports from France to England.

[15] All types of activations, excluding the reconstitution of system services

Figure 35: Estimated gains generated by the activation of foreign offers since 2010



Source: RTE – Analysis: CRE

This downward trend can be partially explained by the following factors:

- Compared to 2010, the French electric system is not as critical as in 2012, despite the cold spell at the beginning of the year, leading to lower balancing costs;
- The development of competition at national level, combined with the reduced volume of foreign offers available for the French system;
- Changes in price patterns that tend to reduce balancing exchanges from these countries.

Table 17 illustrates the contribution of foreign players in reducing net balancing costs[16], by an average of 3.5% over the 2010-2012 period.

Table 17: Contribution of foreign offers to the reduction of balancing costs

	Gains from calling foreign offers	Total balancing costs for the TSO (net balancing)	Contribution to cost reduction
2010	k€ 21 433	k€ 524 507	3.9 %
2011	k€ 16 667	k€ 374 396	4.3 %
2012	k€ 10 864	k€ 387 598	2.7 %

Source: RTE – Analysis: CRE

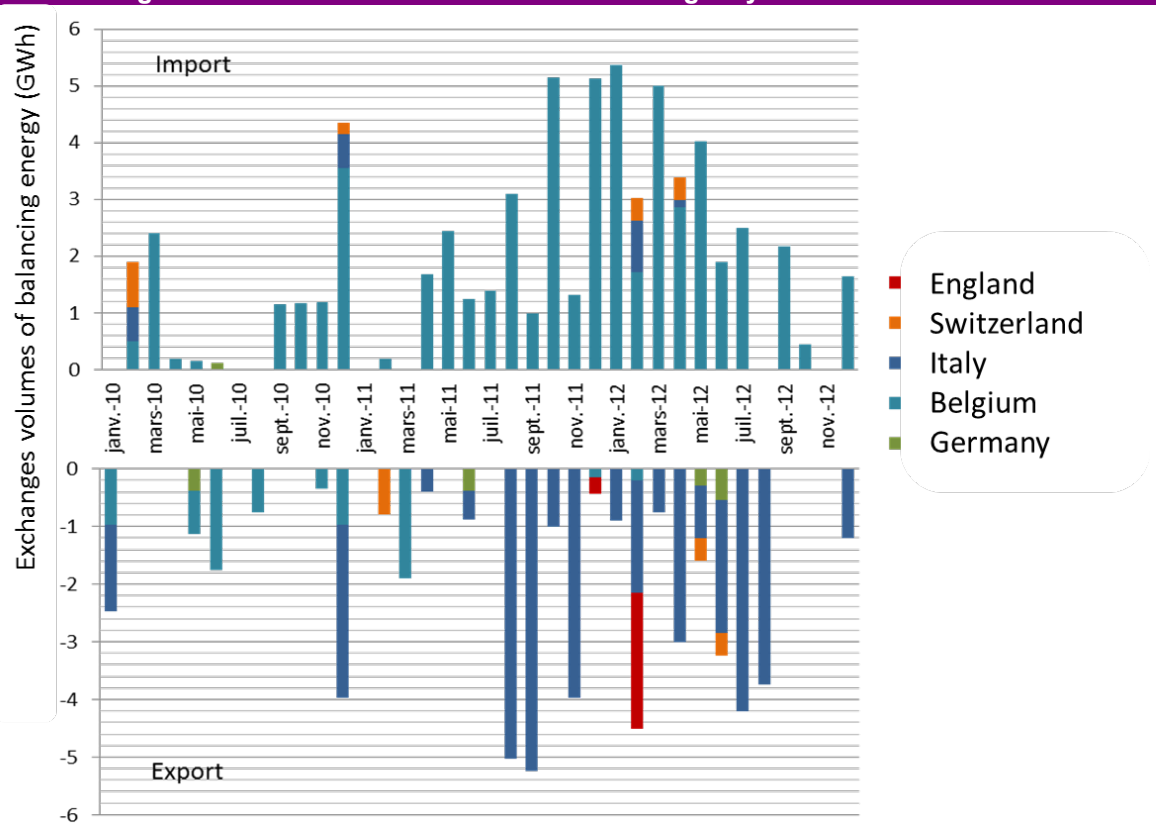
[16] A net balance is an upward or downward call for "balancing" purposes, excluding additional costs for network or system services, and its cost corresponds with the price of the offer proposed by BSP.

Use of emergency contracts in 2012

Analysis of the exchanged volumes from emergency reserve contracts signed between RTE and other TSOs over the period 2010-2012 (Figure 36) shows the following:

- Imports mainly occurred on the Belgium border (94% on average in 2010-2012);
- Exports mainly occurred on the Italian border (78% on average in 2010-2012).

Figure 36: Distribution of volumes from emergency contracts since 2010



Source: RTE – Analysis: CRE

What potential to develop the exchange of balancing services?

The elements described previously tend to call for a rapid implementation of an integrated market in Europe. In particular, cross-border exchange of balancing energy only operates within the limit of the interconnection capacity available in real-time.

As such, since transmission power is regularly unused by market players after the closure of the energy market ("neutralisation" period), there is room for manoeuvre to develop balancing exchanges and to benefit from the complementarity of existing resources in Europe.

There is still significant potential for balancing exchanges France (see Tables 18 and 19) and the neighbouring systems after intraday gate closure:

- For foreign players wishing to participate in the French mechanism, the available interconnection capacity for export is, on average, greater than 100 MW more than 72% of the time;
- For French players wishing to participate in neighbouring mechanisms, the availability is a bit lower (particularly on France-Italy and France-England interconnections), but the potential for exchanges remains significant.

Table 18: Unused interconnection capacity, available for importing balancing energy in 2012 (*compared with 2011)*

From…	Percentage of hourly periods when available capacity for import is not zero (%)	Average capacity available for import during these hourly periods(MW)	Percentage of hourly periods when available capacity is above 100 MW (%)
Germany	77.6 (-16 %)	1895 (- 35 %)	73.7
Belgium	97.7 (+ 1.8 %)	2853 (+ 39 %)	96.4
Spain	79.1 (+ 16.6 %)	1424 (+ 30 %)	72.5
Italy	99.9 (stable)	2734 (- 4 %)	99.9
Switzerland	99.1 (stable)	3129 (- 23 %)	98.7
England	92.9 (- 3.5 %)	2102 (+ 14 %)	91.9

Source: RTE – Analysis: CRE

Table 19: Unused interconnection capacity, available for exporting balancing energy

To…	Percentage of hourly periods when available capacity for export is not zero (%)	Average capacity available for export in these hourly periods (MW)	Percentage of hourly periods whenavailable capacity is above 100 MW (%)
Germany	97.4 (+ 14.7 %)	2864 (+ 36 %)	95.4
Belgium	89.4 % (- 10.3 %)	1707 MW (- 23 %)	86.2
Spain	68.9 % (- 7.6 %)	1135 MW (+ 9 %)	60.8
Italy	26.5 % (-11.2 %)	**521 MW (+ 59 %)**	16.3
Switzerland	85.3 % (+ 5.6 %)	1311 MW (+ 528 %)	76.2
England	55 % (- 22.8 %)	958 MW (- 5 %)	40.7

Source: RTE – Analysis: CRE

This data shows to what extent it is possible to develop balancing exchanges today. Focus must be on removing the current exchange barriers (legal, market architecture, etc.), benefiting from an improved use of balancing resources and, ultimately, a better economic efficiency for the final user.

Depending on the model used to exchange balancing services and specificities of neighbouring markets, one can expect to save from a few million to several tens of millions of Euros per year[17]. For instance:

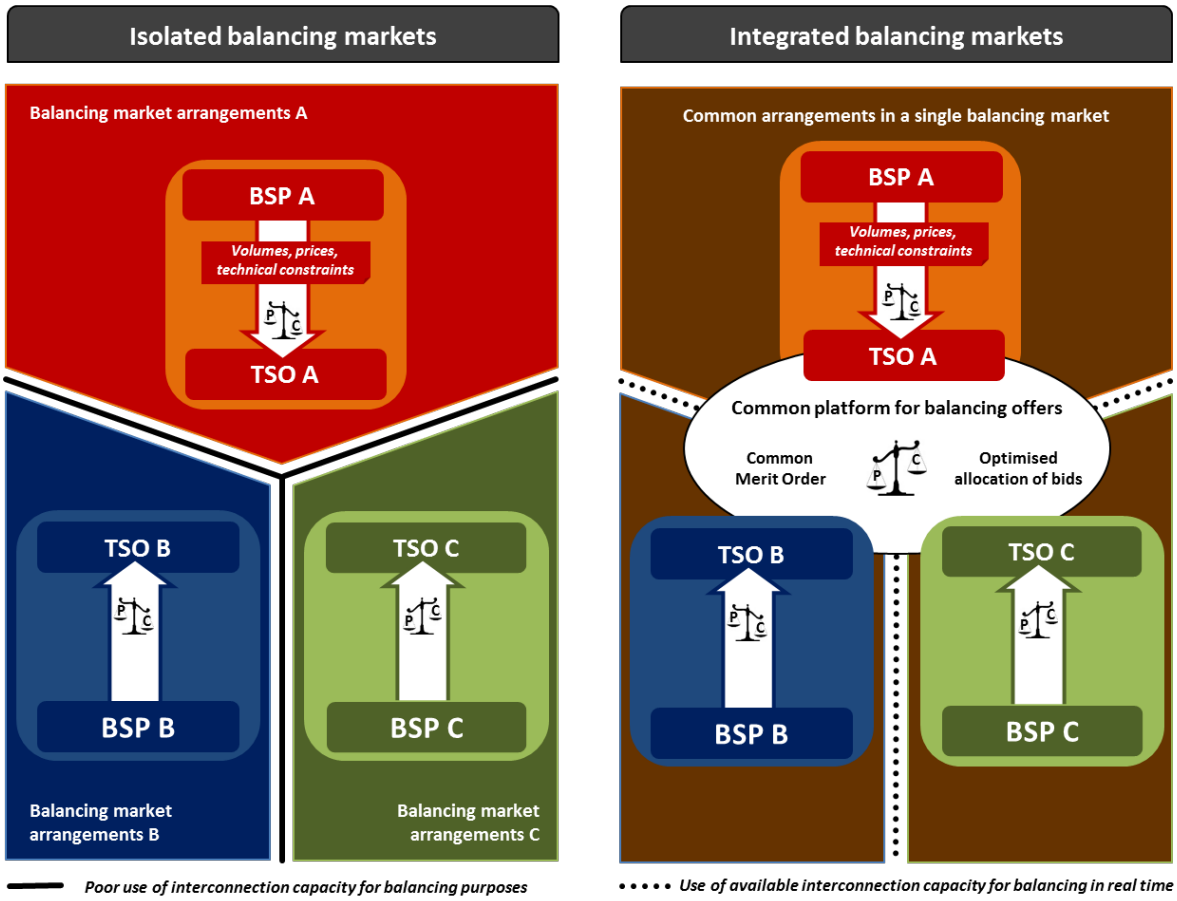
- Feedback from the BALIT device over the 2011-2012 period reveals gains of almost €2M for the French BRPs, with markedly higher gains for BRPs in Great Britain;
- Impact analysis conducted in 2012 by the European Commission estimates that the integration of nordic balancing markets – including Denmark, Sweden, Norway and Finland - allowed to save almost €200 million compared to an isolated situation.

4.3. Implementation of target model

Implementation of the 3rd Package includes the development of a Network Code on Electricity Balancing. The ACER Framework Guidelines, achieved in September 2012, define an essential regulatory framework for the progressive development of balancing service exchanges. The specific features of the target model will be described in the Network Code in 2013.

[17] Initial Impact Assessment for the Framework Guidelines on Electricity Balancing (ACER, 18 September 2012).

Figure 37: Common management of balancing energy in a single market



Source : CRE

The target model is likely to include the following elements:

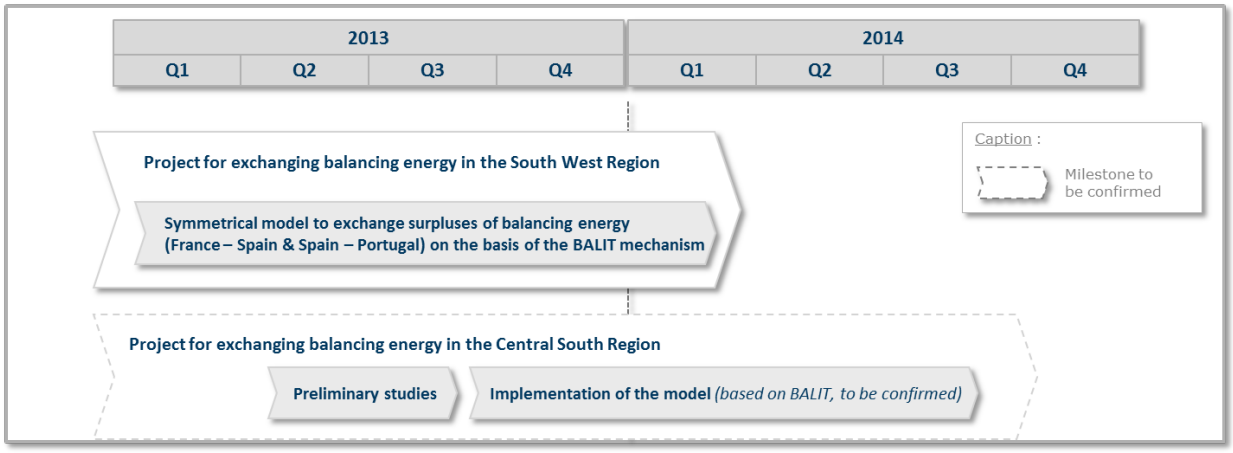
- Strong harmonisation of TSO practices and balancing arrangements, to strengthen economic efficiency;
- Strong coordination between TSOs and implementation of effective incentives for market players;
- Clear milestones to elaborate a common platform where the most economic resources will be used to satisfy TSO balancing needs.

Meeting these requirements will require significant changes in the operating rules of the French balancing mechanism.

Upcoming pilot projects

In line with the drafting process for the Network Code on Electricity Balancing, ENTSO-E launched, a call for projects in early 2013, with the objective of streamlining the integration process. On top of these projects, preliminary developments on the French borders were initiated in the South-West area (France-Spain-Portugal) with a view to extending the BALIT mechanism.

Figure 38: Next steps for the Electricity Regional Initiatives (balancing timeframe)



Source: CRE

Conclusion

Interconnections have an essential role to play in the construction of the European electricity market. By enabling efficient exchanges between countries, they contribute to guaranteeing security of supply and to providing effective competition between players, as well as to encouraging the integration of renewable energies. It is for this reason that the European Council set an objective of creating a single integrated market between now and 2014, paving the way for the most effective possible use of interconnections between the transmission systems in European electricity systems.

Managing these interconnections efficiently is far from straightforward. For several years, CRE has made huge efforts to work towards achieving this objective. Significant projects have thus emerged and are a sure sign of progress since the markets have begun to open. However, the mechanisms in place at our borders, and more generally throughout Europe, could be made more effective. Indeed, the projects currently in progress conducted by CRE and its partners should result in increased effectiveness.

- Market coupling with Belgium and the Netherlands in 2007, then Germany in 2010, can now optimize the use of interconnection capacities at the day-ahead timeframe and ensure price convergence that is ten times more frequent (86% and 65% of the time in 2012, with Belgium and Germany,[18], compared with less than 1% before coupling) than at other borders. At British, Swiss, Italian and Spanish borders, the lack of market coupling has entailed a social welfare loss of €110 million in 2012. This sum, combined with the rates of "poor" use of these capacities, clearly show that the mechanisms currently in place are not sufficient and should be significantly improved through market coupling and provide an indication of the gains expected from projects in progress;

- At the long-term timeframe, implementing explicit auctions for long-term rights on a dedicated platform, CASC, at the Belgium and German borders in 2008, followed by Swiss and Italian in 2011, makes it possible for players to acquire capacity to secure power exchanges at annual and monthly timeframes and to hedge against the daily price differential, through a unique point of contact and using a single set of harmonized rules; a platform of this kind, extended throughout Europe, encourages the development of competitiveness between players;

- The revenue generated by long-term auctions in 2012, €221.5 million, including €126.5 million and €72.5 million for annual and monthly auctions respectively, is a clear indication of the interest players have for allocating capacity at this timeframe;

- The increase of intraday exchanges at French borders, where volumes have doubled between 2010 and 2012, also reveal the increasing importance of this timeframe, as well as the relevance of improvements made for this timeframe over the last two years;

- Indeed, this strong growth is mainly driven forward by the increase in exchanges at the German and Swiss border, where continuous mechanisms, getting close to the target-model, have been implemented.

- Initial feedback, following the implementation of auctions at the Italian border in April 2012, can also be used to measure the interest in this intraday timeframe (87.7 GWh in export direction and 51.5 GWh in import direction over a 6-month period). However, since this mechanism has imperfections, CRE requested the installation of a continuous exchange mechanism on this border.

[18] Indicator: price differential greater than €0.01/MWh

Analysing how interconnections operate highlights how important it is to conduct projects to improve their use. Target-models continue to be progressively implemented at our borders, by prioritizing whenever possible in accordance with expected gains. 2013 should see the completion of several large-scale projects involving France, which will achieve a given number of milestones before they are extended throughout Europe.

- Extending market coupling to the North-West region, planned for November 2013, will mean this mechanism, which is already in place in France, Belgium, the Netherlands and Germany, will also be present in England and northern countries, making it possible to procure the cheapest energy, in accordance with available exchange capacities. It should be followed, in 2014, by an extension to the South-West region (France, Spain, Portugal), and then to the Central-South region (France, Germany, Austria, Italy, Slovenia, Greece);

- In addition to market coupling extension, the South-West region should also make significant progress by the end of 2013. Allocating long-term capacities through explicit auctions should be integrated into the CASC platform, which already manages this type of auctioning at several borders (including French borders with Belgium, Germany, Italy and Switzerland). The BALIT mechanism for balancing energy exchanges between French and British system operators should also be extended to the France and Spanish border (and to the border between Spain and Portugal);

- At the border with Switzerland, plans are in place for the end of June 2013 to extend the mechanism that already exists between France and Germany, for intraday capacity allocation in a continuous and implicit manner (in accordance with the mechanism recommended by the target-model for this timeframe). However, the specific situation at this border, between an EU Member State and non-Member State, means that complex changes are required to best benefit from this interconnection. However, analysis of its operation shows very substantial gains related to the improvement of the way it is used, and therefore the importance of addressing the fundamental issues on this border.

To accompany and ensure the implementation of target-models, the 3rd Energy Packet has provisions to strengthen the regulatory framework through Network Codes:

- These codes will be applied directly as soon as they come into force, and will be the crux of tomorrow's regulation on interconnections: CRE contribution to their creation is therefore essential, particularly to capitalize on experience at French interconnections, including the results of interconnection operations' analysis conducted by CRE;

- These Codes are developed by the European Network of Transmission System Operators (ENTSO-E) and are subject to inspections from the Agency for Cooperation of Energy Regulators (ACER), which checks compliance with the target-models described in the Framework-Guidelines. This compliance is fundamental to guarantee that the European Regulatory Framework has effective provisions for the implementation of the most efficient market models for cross-border exchanges. For this reason, CRE is heavily involved in monitoring the development process of these Codes and in the numerous exchanges between system operators and market players and ensures that the information and feedback is provided from these players in France, through regular progress presentations on the Network Codes;

- Three Codes describe the mechanisms to be introduced to allocate the capacities to different timeframes (long-term, day-ahead and intraday, balancing) and perform congestion management;

- The most advanced Network Code 'CACM' (Capacity Allocation and Congestion Management, for day-ahead and intraday timeframes), is now being reviewed by the European Commission and will come into force at the end of the comitology procedure

that should kick-off during the summer 2013. The two Network Codes for forward capacity allocation and balancing are still undergoing ENTSO-E development and will not come into force until 2014 at the earliest.

The implementation of target-models will lead to more effective use of interconnections. But the completion of these kinds of projects is also a real challenge for CRE and its European counterparts. Several obstacles must be cleared to pave the way for implementation and to maximize all its effects:

- The drive for European harmonization is ambitious: wide-scale works must be initiated as a consequence to coordinate mechanisms that are not, in theory, compatible. Their structural modification on several borders entails large-scale operational changes, for which all market players must be prepared. This is why CRE is encouraging TSOs to be as transparent as possible with the players, particularly with regard to complex projects, such as the flow-based coupling project;

- Increased cooperation is also required between regulators: although target-models have gained consensus from an economic point of view, there is still much debate into how implementation should actually be performed; this now represents one of the new challenges for European integration. The selection process for a shared platform for intraday exchanges in the North-West region in spring 2013 is a striking example of this issue;

- At the borders with some countries that do not belong to the European Union, the legacy from the past still remains strong. These countries are not involved in the same maner in the implementation of target-models, which means ad hoc solutions are required to improve interconnection use at their borders. To this end, the current situation of long-term contracts with Switzerland must resolved within the next few years.

In addition, the benefits of interconnections are indisputable in terms of the three pillars of the European Energy Policy - system security, integration of renewable energies and reduction of supply costs - and this will be increasingly true once the target-models are implemented. The gains generated by the interconnections are transferred to end-consumers through electricity sales prices proposed by the suppliers. Optimizing generation pattern through the markets rationalizes supplier procurement costs and increases generators benefits. In the case of France, the gains of EDF are redistributed to the consumer through the Regulated Sales Prices (*Tarif Régulé de Vente, TRV*). The non-regulated supply offers are de facto encouraged to integrate these advantages in the prices proposed to consumers.

Work by CRE and its European counterparts is therefore essential to clear obstacles for the implementation of target-models and promote the harmonization of market architectures, the development of an efficient interconnection management system, and to ensure that the generated gains do actually benefit the end-consumer.

Appendix 1: Indicator on proximity of current market design with the target-model, per timeframe and per border

The objective of this indicator is to assess the proximity with the target-model of each timeframe (long-term, daily, intraday and balancing). The different levels of the indicator were defined for information purposes.

	Long-term timeframe	Daily timeframe	Intraday timeframe	Balancing
Compliant	Harmonized rules, shared platform; Firmness in line with the Framework-Guidelines	Price-based market coupling	Continuous implicit access	Single exchange platform with Common Merit Order
Close	Harmonized rules, shared platform; Firmness requires improvement	Volume-based market coupling	Continuous explicit access	Multilateral exchanges of balancing energy surplus TSO - TSO
Mid-way	Firmness in line with the Framework-Guidelines; No harmonized rules or shared platform	Explicit auctions	Explicit auctions	Bilateral exchanges of balancing energy surplus TSO - TSO
Far removed	Auctioning does exist, but is far removed from target-model	Explicit auctions limited to part of the capacity	Improved prorata explicit auctions	Bilateral exchanges of balancing energy surplus player - TSO
Inexistent	No exchange	No exchange	No exchange	No exchange

Appendix 2: Regions involving France for Regional Initiatives for Electricity

In February 2006, ERGEG (European Regulators' Group for Electricity and Gas), now known as CEER (Council of European Energy Regulators) had launched Regional Initiatives for Electricity to speed up market integration at a regional level and move in the direction of setting up an internal electricity market on a European scale.

France is part of four out of the seven regions that were defined by the EC and ERGEG:

Central-West

Central-South

South-West

France – United Kingdom – Ireland

The extended scope of some projects overlaps several regional initiatives, for example, for the projects in the North-West region in which CRE is involved. The North-West region groups together, the Central-West region, the UK and the Scandinavian countries.

List of abbreviations

ACER	Agency for Cooperation of Energy Regulators, created by the Third Energy Package (Regulation No. 713/2009 of the European Parliament and Council of 13 July 2009)
ATC	Available Transfer Capacity – Available commercial capacity, calculated for each timeframe
BALIT	Balancing Inter TSO – Balancing energy exchange mechanisms between RTE and National Grid
CASC	Capacity Allocation Service Company – Shared explicit auction platform for allocation of interconnection capacities, used for borders with Germany, Belgium, Switzerland and Italy
ENTSO-E	European Network of Transmission System Operators for Electricity
FTR	Financial Transmission Right
TSO	Transmission System Operator
IFA	*Interconnexion France-Angleterre* – Interconnection between France and England
D-1	Day preceding the day when electricity is delivered
D-2	Day preceding D-1
NTC	Net Transfer Capacity – Maximum permitted capacity at an interconnection
OTC	Over The Counter
PTR	Physical Transmission Right
RTE	*Réseau de Transport d'Electricité* – French Transmission System Operator
TLC	TriLateral Coupling – Market coupling between France, Belgium and the Netherlands

Glossary

Allocation	Provision of interconnection capacity to market, further to implicit or explicit auctions.
Congestion	Situation when the available commercial capacity is saturated at an interconnection where the capacity demand is greater than the supply. Congestion translates by non-zero explicit auction prices, or by non-zero price differentials in the case of market coupling. In both cases, the scarcity of capacity creates congestion income, revenue that is shared by the system operators. Pursuant to article 16.6 of Regulation No.714/2009, this revenue must be used to improve availability of interconnections, increase exchange capacities (particularly through new investments) and possibly by decreasing the tariff for using the system.
Market coupling	Sharing electricity supply and demand order books from two or several national markets, which automatically allocates the available interconnection capacity when a cross-border order is completed. Market coupling optimizes the selection of accepted offers (and as a result any related production plans) within the scope of the coupled markets. The French market is coupled with the German, Belgian and Dutch markets.
Explicit auctions	Auctions organised to allocate the available interconnection capacity to a market. Explicit auctions are different from implicit auctions, where the capacity is allocated automatically when a cross-border electricity exchange is completed.
Firmness	Quality of a cross-border exchange capacity to translate the risk incurred by its holder in the event that one of the system operators were to be faced with an unscheduled incident that would compromise the guarantee of the capacity level initially expected. In the case of physical firmness the system operations must guarantee the right. In the case of financial firmness, the holder will be reimbursed for the capacity that it has not been able to transmit (compensation equivalent to price differential). Other compensatory mechanisms are founded on reimbursements equivalent to the auction price.
Pooling effect	Qualifies, for variable – and essentially decentralized – energies, the advantages resulting from their geographical dispersal that makes it possible to profit from different generation rhythms, as well as to reduce statistic dispersion of the cumulated production variability.
Target-model	Defines, for a given exchange timeframe, the mechanism used to calculate, allocate and manage in the the most suitable and effective way the interconnection capacity, for electricity exchanges at this timeframe. European target models are described in Framework-Guidelines and the Networks Codes.
Nomination	A player exercises its right to use an interconnection capacity allocated through auctioning (allocation step). Nomination is binding in the frame of the balance responsible party mechanism. If there is no nomination, the capacity is again available to the market players at the next timeframe, and possibly opens to a compensation.
Electricity Spot Price	Electricity price, fixed day-ahead for hours from 0 h to 24 h the next day

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