International Journal on
"Technical and Physical Problems of Engineering"
(IJTPE)
Published by International Organization on TPE (IOTPE)

ISSN 2077-3528
IJTPE Journal
www.iotpe.com
ijtpe@iotpe.com

September 2011 | Issue 8 | Volume 3 | Number 3 | Pages 106-109

ELECTRIC ENERGY SYSTEM SPANISH INTERCONNECTION AND THEIR REGULATIONS

J. Bilbao E. Bravo O. Garcia C. Varela M. Rodriguez P. Gonzalez

Applied Mathematics Department, University of the Basque Country, Bilbao, Spain
javier.bilbao@ehu.es

Abstract- Spanish-Portuguese interconnection and French-Spanish interconnection are been improved to fit that at least 10% of the production capacity installed in each Member State has to be in the interconnection capacity. In Spain, the relevant congestions appear in the cross-border links, especially in the French-Spanish border. Portugal and Spain are the two price areas into which the single electricity Iberian market is split if congestion arises. On the other hand, distribution costs are computed for each distribution company.

Keywords: Interconnection, Interconnection Capacity, Congestion, Distribution Cost.

I. INTRODUCTION

During 2009, the works in interconnections have followed, especially in the Spanish-Portuguese interconnection where works are ongoing as planned. The objective is to reach 3.000 MW of interconnection capacity in 2014.

As far as the new line of the French-Spanish interconnection is concerned, the engineering project has been defined but the works on site have suffered delays. It is expected that in 2014, there will be around 2.000 MW from FR to ES and 1.000 MW from ES to FR.

While the level of interconnection capacity will be significant in the Spanish-Portuguese border, the Spanish-French one will remain under the target agreed by the European Council at the Barcelona summit of March 2002 (at least 10% of the production capacity installed in each Member State) [1], [2].

II. MANAGEMENT AND ALLOCATION OF INTERCONNECTION CAPACITY AND MECHANISMS TO DEAL WITH CONGESTION

In Spain, the relevant congestions appear in the cross-border links, especially in the French-Spanish border, while internal congestions are not structural and they are solved (as network constrains) when needed by means of specific markets (day-ahead and intraday security markets, managed by the System Operator). The degree of congestion in the Portuguese-Spanish interconnection has decreased significantly. Indeed, in the beginning of the full integration of Portuguese and Spanish wholesale markets (second half of 2007), the number of hours under market splitting stood close to 80%; more recently, in the second half of 2009, same indicator fell below 20% (average price spread just around 0,5 Eur/MWh), and has even decreased in the first months of 2010. Behind this there are reasons linked to generation mix and economic juncture: gas-fired combined cycles have established as marginal technology on both price areas, and reserve margin has increased notably since demand has fallen in a humid, windy year,

On the other hand, across the Pyrenees interconnection sustains significant congestion. Given price sunk in Iberian market, since last months of 2009 congestion rents gathered from Spain to France, even though capacity is three times as small as in reverse direction, are several times greater than from France to Spain [3].

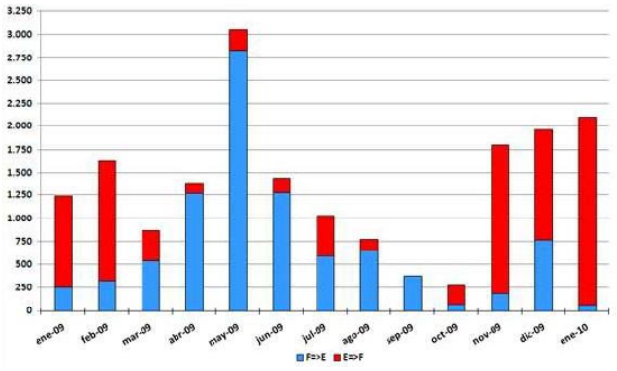

Figure 1. Monthly congestion rents in French-Spanish interconnection, in thousands of Euros, 2009 (Source: REE)

Current version of IFE (Interconnection France - Spain) rules came into force on 1st June 2009 regulating annual, monthly, daily and intraday Physical Transmission Rights. The main improvements achieved in this already third version of the rules include:

- New compensation scheme in case of capacity curtailment before nomination, based on the market spread, subject to certain capping provisions
- New compensation scheme in case of cancellation of daily auction, also market-spread based, relating to resale of long term capacities

- Secondary market: introduction of automatic resale of non-nominated capacities at daily auction, thus applying Use-It-Or-Sell-It principle (versus previously applied Use-It-Or-Lose-It principle)
- More precise definition of long-term products, with the introduction of both annual and monthly discontinuous products.
- Physical firmness for daily and intraday capacities is now granted (unless *force majeure*) from the very communication of auction results, instead of from programming authorizations.
- Improvement of transparency with new publications: capacity calculation and allocation details for different timeframes, as well as bid-ask curves for each auction.
- Clarification of TSOs' liabilities
- Increased financial security on bank guarantees

As for the interconnection with Portugal, capacity is fully implicitly allocated day-ahead (and intraday) by means of a market splitting mechanism: Portugal and Spain are the two price areas into which the single electricity Iberian market (MIBEL) is split if congestion arises.

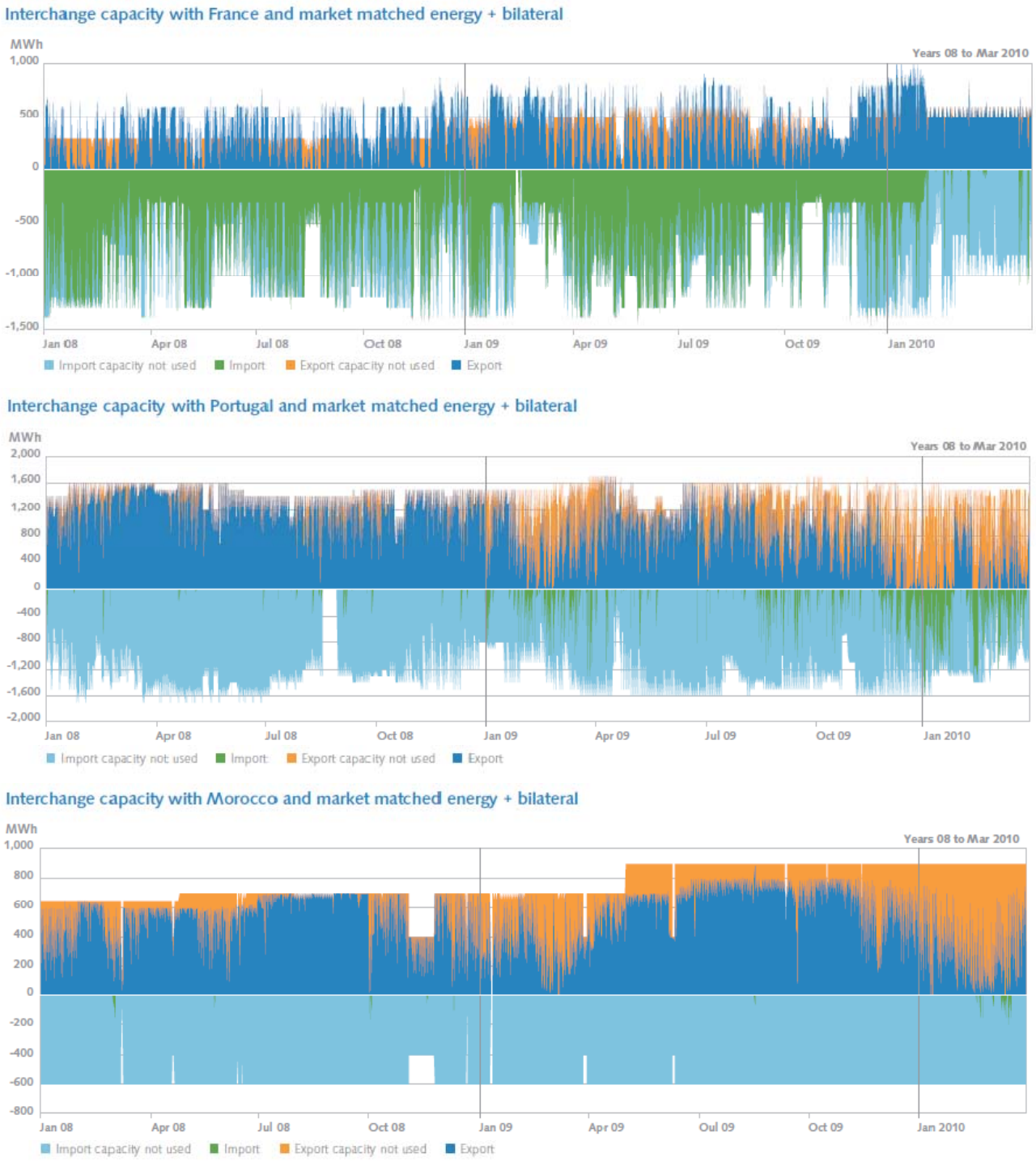

Figure 2. Exchange capacity and market matched energy, including bilateral - France, Portugal and Morocco (Source: OMEL)

In the Portuguese-Spanish interconnection, as of July 1st 2009, a long-term transmission capacity product has been introduced by Order ITC/1549/2009, of 10 June, updating Annex III of Order ITC/4112/2005. It consists on auctions of financial hedging products. These financial products are export/import contracts for differences (both forwards and options), valued in accordance with observed hourly day-ahead market spread between Portuguese and Spanish zones. The first auction was held on June 29th, valid for forward contracts covering the second semester of 2009. The second auction took place on 18th December 2009, and two types of contracts were auctioned: one covering the whole year 2010 and another covering the first semester of 2010. The third auction was celebrated on 24th June 2010 and the contracts cover the second semester of 2010 [4].

The MIBEL Board of Regulators has worked during 2009 and the first part of 2010 aiming to implement coordinated FTRs in MIBEL. In July 2010, the formal proposal was submitted to the Spanish and Portuguese Governments. No relevant changes happened this year on computation of transmission capacity [5].

III. THE REGULATION OF THE TASKS OF TRANSMISSION AND DISTRIBUTION COMPANIES

Distribution costs are computed for each distribution company according to the Reference Network Model as established in article 8 of Royal Decree 222/2008. Remuneration scheme for distribution includes incentives that evaluate losses reduction and quality of service.

Real, registered losses are yearly compared with an individual losses target set for each company in advance; the 80% of this positive or negative difference is valued at a loss-energy price and added to remuneration, with a cap of ±1% vs. due global income.

Quality is gauged through two main indexes, TIEPI and NIEPI, which measure, respectively, the time and number of supply interruptions (in terms of equivalent power interrupted). Both are calculated for up to four geographical categories: urban, semi-urban, rural and scatter rural areas; for each area, a specific quality target is set and used as reference. Quality incentive may turn in a bonus or penalty up to ±3% of global income.

As for transmission service quality indices, their measured values and reference limits are determined by Royal Decree 1955/2000, namely: non-supplied energy (ENS), mean Interruption time (TIM, equal to ENS over average system power) and grid availability index (ID). Last available data (for 2008) are: ENS, 574 MWh; TIM 1.15 minutes, and ID= 98.19%.

The Royal Decree 1955/2000, dated December 1st, establishes that distributors have to inform and advise consumers in the regulated market at the time of contracting about the most suitable tariff and capacity to contract according to their need.

In 2009, the Order ITC/3801/2008, dated December 26th, established the access tariffs from 1st January to 30th June 2009, and the Order ITC/1723/2009, dated June 26th, established the access tariffs from 1st July to 31th December 2009. The access tariffs (network charges) include transmission, distribution and distributors commercial management costs (attending connected consumers) in addition to other levies included in the access tariff as per Spanish Electric Power Act 54/1997 and Royal Decree 1164/2001. G charge is not applied in Spain.

These tariffs usually have a fix load component (€/kW) and a variable energy component (€/kWh). Due to its complexity, the following tables show the average values that the access tariffs represent according to the settlements made taking into account the real consumption of all consumers by category.

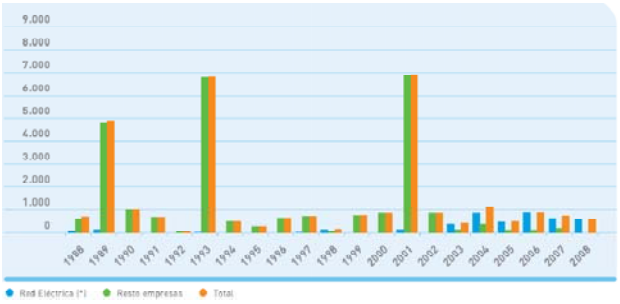

Figure 3. Energy not supplied (MWh), years 1988-2008 (Source: REE)

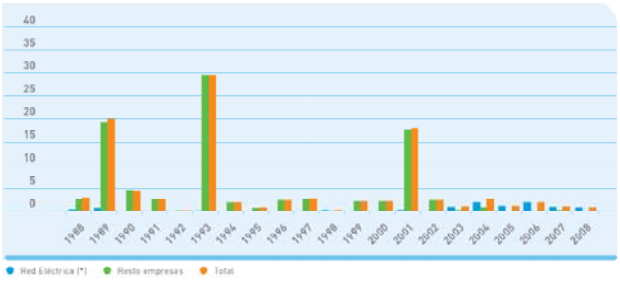

Figure 4. Mean interruption time (minutes), years 1988-2008 (Source: REE)

VI. CONCLUSIONS

In 2009, there was an agreement between France and Spain to build a new electricity interconnection through the Pyrenees. But it is necessary more physical interconnection between Spain and France towards the 10% goal established by European Council in 2002. Related to MIBEL, work is progressing well creating a good investment climate which is already delivering a remarkable decrease of congestion hours at the Spanish-Portuguese interconnection. More physical interconnection is crucial if we want the EU Internal Energy Market happens.

REFERENCES

[1] http://europa.eu/legislation_summaries/energy/ internal_ energy_market/index_en.htm

[2] Directive 2009/72/EC of the European Parliament and Of the Council of 13 July 2009 Concerning Common Rules for the Internal Market in Electricity. Eur-lex.europa.eu. Retrieved 23 April 2011. http://eur-lex.europa.eu/ LexUriServ/ LexUriServ.do?uri= OJ:L:2009: 211:0055:0093:EN:PDF

[3] http://www.ree.es/
[4] http://www.omel.es/inicio
[5] http://www.cne.es

BIOGRAPHIES

Javier Bilbao obtained the degree in Electrical Engineering from University of the Basque Country, Bilbao, Spain, in 1991. At present he is Ph.D. in Applied Mathematics and professor at the department of Applied Mathematics of that university. He has been General Chairman of some conferences of WSEAS organization. His current and previous research interests are Distribution overhead electrical lines compensation, Optimization of series capacitor batteries in electrical lines, Modelization of a leakage flux transformer, Losses in the electric distribution Networks, Artificial Neural Networks, Modelization of fishing trawls, E-learning, Noise of electrical wind turbines, Light pollution, Health risk of radiofrequencies. He is the General Chairman of the International Conferences on Engineering and Mathematics (ENMA) and member of the committees of International Conferences on Technical and Physical Problems of Power Engineering (ICTPE).

Eugenio Bravo obtained the degree in Electrical Engineering from University of the Basque Country, Bilbao, Spain, in 1991. At present he is Ph.D. in Applied Mathematics and professor at the department of Applied Mathematics of that university. His current and previous research interests are Distribution overhead electrical lines compensation, Optimization of series capacitor batteries in electrical lines, Modelization of a leakage flux transformer, Losses in the electric distribution Networks, Artificial Neural Networks, Modelization of fishing trawls, E-learning, Noise of electrical wind turbines.

Olatz Garcia obtained the degree in Mathematics from University of the Basque Country, Bilbao, Spain, in 1989. At present she is Ph.D. in Applied Mathematics and professor at the department of Applied Mathematics of that university. Her current and previous research interests are E-Learning, Optimization of series capacitor batteries in electrical lines, Noise of electrical wind turbines.

Concepcion Varela obtained the degree in Mathematics from UNED, Spain, in 1986. At present she is Ph.D. in Economics and Statistics and professor at the department of Applied Mathematics of the University of the Basque Country, Bilbao, Spain. Her current and previous research interests are E-Learning, Optimization of series capacitor batteries in electrical lines, Noise of electrical wind turbines.

Miguel Rodriguez obtained the degree in Physics from University of Navarra, Spain, in 1978. At present he is Ph.D. in Electronic Engineering and professor at the department of Applied Mathematics of the University of the Basque Country, Bilbao, Spain. He is author of various books about software, particularly about .NET and C#. His current and previous research interests are Electronics, Software design and development, E-Learning, Noise of electrical wind turbines.

Purificacion Gonzalez obtained the degree in Energetics Engineering from University of the Basque Country, Bilbao, Spain, in 1979. At present she is Ph.D. in Applied Mathematics and professor at the department of Applied Mathematics of that university. She is now the Head of the Applied Mathematics Department of that university. She is also co-chairwoman of the ICTPE International Conferences from 2009.