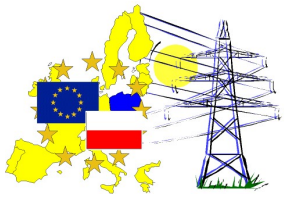

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GAS-ELECTRICITY MERGERS AND INPUT FORECLOSURE: A QUANTITATIVE STUDY

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Abstract

Recent acquisition proposal of Endesa (an electricity generator) by Gas Natural (a natural gas company) in Spain has arisen concerns about possible anticompetitive effects, both horizontal and vertical ones. This paper addresses the quantification of a vertical effect, coming from the dominant position of Gas Natural in the gas procurement market in Spain. Basic intuition is that Gas Natural, after the acquisition, could have an additional incentive to limit gas procurement, as the resulting gas price increment in the domestic market could induce an electricity price increment that would benefit to the newly acquired Gas Natural non-gas fired electricity generation. Numerical simulations are done in order to quantify this incentive.

1. INTRODUCTION

Mergers between gas and electricity companies, actual or attempted ones, seem to have been of late fashionable in the European Union [1]. Usually, these mergers are uphold on the basis of efficiency gains coming from gas procurement for both electricity generation and other industrial or residential ends, as well as from synergies coming from dual fuel supply in the retail sector. On the other hand, possible anticompetitive effects, both horizontal and vertical, are also possible.

Simulation tools aimed to quantify market power arising from horizontal effects in electricity markets have been developed and used for both regulatory and entrepreneurial purposes. However, there seems to be a lack of tools aimed to quantify vertical effects. In absence of quantitative assessments, it is likely that regulatory decisions are going to be biased, either because these effects are ignored (and the market power of the new merged company is therefore underestimated) or because they are going to be considered of paramount importance (in which case market power can be overestimated).

One particular vertical effect is known as "input foreclosure". This kind of market power exercise is present whenever the merged company raises the cost of an input required by the competitors (gas) or otherwise restrict its access in order to damage competitors' performance in other market (electricity) [2].

The acquisition offer of Endesa by Gas Natural has been the motivation for the research presented in this paper. The Spanish market is simulated in order to estimate the incentives that the merged company could have to exercise market power by input foreclosure. However, I think that the presented technique can be applied at a wider range of cases, helping regulators in other possible mergers.

An important result is that the new integrated company could have an incentive to buy natural gas from the non-integrated

companies at a market price that exceed its own upstream cost, that in the paper is identified with an "international" gas price. This effect has been previously discussed in the literature [3]. It is sometimes known as Raising Rival Costs (RRC) strategy.

The sequel of the paper is organized as follows. Next section discusses the electricity and gas markets structures in Spain, and explains how the proposed acquisition is expected to affect it. Then, competitive concerns arisen by the operation are explained. Section 4 explains the proposed simulation procedure, and then results are shown in section 5. Finally, I conclude.

2. THE GAS NATURAL / ENDESA MERGER

Previous to the merger, two big companies (Endesa and Iberdrola) dominate Spanish electricity market. They have similar sizes and jointly produce about two thirds of the total electricity generation. In addition, there are a number of smaller companies, including Gas Natural that produces around 7% of the total generated power by using Combined Cycle Gas Turbine (CCGT) plants. The system is quite isolated: peak demand is somewhat below 40 GW whereas commercial transmission capacity with France is about 1 GW [4].

Basic gas transport and storage infrastructure is operated by an Independent Operator (Enagas). Gas Natural is the main incumbent in the gas market, where sells about two thirds of the total consumption. There is almost no gas production in Spain. Imports come mainly through the North African gas duct, the less important Larrau gas duct from France, and as Liquefied Natural Gas (LNG). There are four main regasification facilities. Import capacity is allocated by “first come, first served” contracts. Cost of regasification contracts is low, although there are penalties if reserved capacity is not fully used. However, it is allowed to be somewhat below (15%) of contracted capacity without charges. On the other hand, regulations require that 25% of total capacity to be allocated for short-term contracts (less than 2 years in advance) [5].

Presently, electricity companies have long-term contracts with foreign suppliers that cover their needs, mainly for electricity production but as well for selling to other industrial and non-industrial customers. There are, besides the electricity companies, other agents in the gas market that also own long-term supply contracts. A balancing market, based on swap agreements, is presently developing among all these minor agents, as physical operation of regasification facilities is very rigid and there is scarce storage capacity [6].

A relevant exception is Endesa. Most of the gas used by its CCGT is supplied by Gas Natural, under a medium-term contract with a price resembling a rolling average of international gas prices. Contract establishes that the gas bought under this agreement can be only used for electricity generation in Spain [7].

Both electricity and gas markets are in a transient period. However, there have been peculiarities in the Spanish market, such as the so-called "Competition Transition Costs" and "Tariff Deficit" that have had a strong impact on agents behaviour. The Spanish government has, as March 2006, modified the regulation in order to address these issues. However, further regulatory changes are expected.

Gas consumers can be divided in three groups: electricity generators, other huge consumers (over 100 GWh/year) and all the rest. There is a regulated price that effectively competes with the market price. Huge consumers who has switched from regulated price to market price or viceversa must remain in the new regime for at least 3 years, and all the other consumers at least for 1 year.

The study shown in this paper is based on the initial announcements made by Gas Natural and Iberdrola. So, in the post-merger scenario it is assumed that Gas Natural will sell a set of electricity generation assets previously owned by Endesa to Iberdrola (mainly coal and fuel plants totalling 3,100 MW in the Spanish peninsular system), as well as gas distribution assets (service to 1.25 millions customers in the peninsula) [8]. However, it should be emphasized that if the acquisition offer succeeds, the final outcome is going possibly to be very different of the one assumed in this paper. Actually, at the time of writing, Spanish government has imposed a set of conditions that oblige the new entity to sell a set of assets significantly greater than the one assumed in this paper. Moreover, it is required further government authorisation to carry out these divestiture transactions.

All these features are likely to strongly influence the actual agents' behaviour. On the

other hand, this paper is based on an electricity generation market Cournot model that do not take into account most of these issues. So, the results herein reported should not be considered appropriate to make specific policy recommendations. Its main policy value could be to highlight certain possible competition problems.

3. INPUT FORECLOSURE CONCERNS

Input foreclosure is only possible if Gas Natural can raise the gas price or otherwise restrict its access to the competitors. Therefore, it is required that Gas Natural can make exercise of market power in the gas market. So, an examination of the possible sources of market power is in order.

Gas infrastructure, as remarked above, is operated in a very rigid way, even more than usual in Europe because of the relatively low underground storage capacity and high proportion of gas imported as LNG. Contracts with foreign suppliers are also rigid: from the beginning of the negotiation to the arrival of the first boat, elapsed times of two or three years are not unusual. Contracts are usually long-term ones, and specify purchased volumes rather huge. They very often include “take or pay” clauses as well. As remarked also above, regasification capacity reservation is cheap but rigid because or the “use it or lose it” clause.

Therefore, risk can be very high for agents who intend to play speculative strategies. For instance, let us assume that an electricity generator thinks that Gas Natural intends in the future to withhold gas from the market, raising the domestic gas price. Then, the electricity company could consider the possibility of buying additional gas in the international markets in order to resell it in the domestic market. Because of the long lead times and the required early procedures to reserve regasification capacity, this move will be known by the other players long before the first boat arrives. So, Gas Natural could decide, after all, to do not try to rise the domestic price and the electricity company will be forced to sell at a discount to customers previously serviced by other companies, mainly Gas Natural itself.

Gas Natural could be possibly subject to these constraints in a much lesser degree, mainly for three reasons. Firstly, because of their international activities, it could possibly divert part of the gas from Spain to foreign markets, which is difficult to do for the electricity companies (although not for most of the other companies with small quotas in the gas market). Secondly, because of the possibility of not making use without penalties of a fraction of reserved capacity, Gas Natural has more room to manoeuvre because of its much greater volume. Thirdly, also because of its much greater size, its balancing costs could be significantly lower than those of its competitors, which could allow a credible “price war” threat.

So, it could be expected that electricity companies are going to follow a “prudent” strategy, buying the gas needed for the operation of its CCGT plants, meet their long-term commitments and possibly keeping a foothold in the wider domestic gas market. This conclusion will be strengthen if the exercise of market power by Gas Natural in the gas market would bring additional profits for the electricity companies, as shown in the sequel. The study reported in the paper is based in the assumption that this could be the likely strategy of Gas Natural competitors.

4. THE MARKET SIMULATIONS

The purpose of the exercise is to quantify the additional incentive that the possession of an extensive electricity portfolio would bring for Gas Natural to exercise whatever market power could it have in the gas market. For this task, a detailed electricity market model is used. On the other hand, no forecast is done, as they would require an adequate model of the gas market, that it is not addressed.

A number of scenarios built by modifying key assumption are analysed. It is assumed that if an effect is present in every case with a consistent magnitude, there is a strong reason of concern about its actual existence in reality. Specifically, we aim to quantify the existence and an order-of-magnitude estimate of the input foreclosure effect.

It is assumed that, because of the reasons given in the previous section, electricity companies are going to buy the gas they require to produce electricity under the assumption that domestic price is going to be equal to the international price. So, the possibility of buying more gas (because of higher expected prices) is foregone because it is deemed to be too risky: it may force Gas Natural to sell finally at Spain at international

price in order to do not lose too much market quota.

It is further assumed that once the electricity companies have bought the gas, Gas Natural can act in the gas market in order to raise the price. Electricity companies will see the new domestic price, now higher than the international price, as the opportunity cost for the operation of their CCGT, because they have the possibility of selling their gas in the domestic market at the new and higher price. It is assumed that, because of their relative small size in the gas market, they behave as price-takers. The price-taking behaviour could be questioned in the case of Iberdrola in the post-merger hypothesis. This is because, in the Gas Natural-Iberdrola agreements, the gas assets sold to Iberdrola could lead to a gas market more alike to an imperfect duopoly that an imperfect monopoly, as it is assumed here. Nevertheless, it seems likely that the resulting gas duopoly is unbalanced enough to make the monopoly hypothesis tenable. Note that it is assumed that electricity companies do not face further barriers of entry to the domestic gas market.

An exception to this general rule on the Gas Natural competitors is Endesa in the pre-merger simulations, as it sees always the international price as its opportunity cost because of the nature of its contract with Gas Natural.

So, Gas Natural acting as an oligopolist must balance three effects:

1. The decrease of gas demand because of the higher prices.
2. The increase of gas sold by electricity companies in the domestic gas market. Because of the higher domestic price, they will divert gas initially intended for use in the CCGT to the domestic gas market.
3. The increase of profits coming from a higher electricity price. This is because the electricity companies internalise the higher domestic gas price as the gas opportunity cost when bidding.

In order to quantify effect 3, electricity market simulations are run for the pre and post-merger structures for different values of domestic gas price (equivalently opportunity cost) for every electricity company, but Gas Natural (as it is the gas market only strategic agent, its opportunity cost is the international price) and Endesa (because of its gas contract with Gas Natural, that do not allow to divert gas to the domestic market). Simulation model is described in [9]. It computes the Cournot equilibrium taking fully into account a complex technical description of the electricity market, including intertemporal constraints such as those coming from thermal units operation and water management, as well a carbon allowances costs. It is perhaps worth to emphasize that even if the equilibrium is computed by assuming a gas opportunity cost as described above, the final reported profit is computed by using the actual international gas price, because this is the actual one that the company had to pay.

Regarding effect 2, electricity companies are going to sell their unused gas in the domestic market. In order to simplify estimation of effect 1, it can be assumed that they resell it to Gas Natural. In that way, electricity companies put in the gas market a constant amount of gas (the one originally bought with the intent of not being used in CCGT). The extra profit earned by the electricity companies is the difference between the gas bought for use in CCGT in the base case (domestic price equal to international price) minus the gas actually used in CCGT when domestic price is higher than international price, times the prices difference. That is, the additional gas sold in the domestic market price times the price difference. The sum of all additional profits earned by the electricity companies is the payment made by Gas Natural, that is, a Gas Natural cost.

Quantification of effect 1 would require a gas market model, and it is not addressed in this paper. However, it can be estimated by using the price elasticity of Gas Natural in the gas market that assumes that only the demand and the minor non-electricity agents respond to a gas withholding by Gas Natural. It is likely that the demand response id going to be the dominant component, because the relatively small size of the other companies and the constraints for importing gas in the Spanish market described above. In any case, more research is needed on this topic.

It is worth to emphasize that the reason of introducing the “buy-back” contracts to quantify effect 2 is to “clean out” the elasticity used to quantify effect 1. That can be seen as just a conceptual device to compute the equilibrium, and do not imply that these “buy-back” contracts actually exist. For instance, it can be assumed that electricity companies sell all the extra gas directly to final customers, so that

there is no "effect 2". However, in this case the elasticity used to compute "effect 1" should be higher, as it should include electricity companies response as well. Standard arguments can show that total profit should be, however, equal under the two scenarios (with and without "buy-back" contracts).

So, the simulation procedure is as follows. For both, pre and post-merger structures:

1. Compute the electricity market equilibrium by assuming a gas cost equal to international gas price. Save prices, profits and used gas for each market agent. This is the base case.
2. Compute the electricity market equilibrium for gas opportunity cost over international cost, as described below. Several scenarios, corresponding to gas cost increases of 10% and 20%, are run. As before, save prices, profits and used gas for each market agent. Take into account that in order to compute profits the international gas price, and not the gas opportunity cost, must be used.
3. Compute for each agent (except Gas Natural) and for each opportunity cost scenario the additional profit obtained by the "buy-back" contracts, as the difference between the gas used in each scenario minus the gas used in the base case times the difference between the opportunity cost and the international price. The sum of all these profits is a Gas Natural cost.
4. Compute, for each opportunity cost, the total Gas Natural net profit, as the difference between the additional electricity market profit and the "buy-back" contracts cost.

The exercise provides the "electricity" incentive that Gas Natural could have to raise the domestic gas price.

5. RESULTS

Simulations were done by using expected demand and generation data for the year 2006, Hydro inflows were assumed to be those of an average year, and the carbon emission allowance cost was set at 20 €\ton. Demand curve was assumed to be linear. For each period, it was assumed that the value of demand for the perfect competition price was known. Demand curve contains this point for each scenario. Several Cournot scenarios, changing the demand curve elasticity (0,1, 0.3 and 0.5) were studied. It was also changed the domestic gas opportunity cost, as described above. Gas cost in the base case was 1.52 c€/kWh, and was also common for every scenario. Domestic price was increased by 10% and 20% in the associated scenarios. Both pre and post-merger structures were analysed.

Table 1 shows the equilibrium price (€/MWh) for the analysed scenarios. It can be observed that post-merger prices are higher than pre-merger ones.

TABLE 1 Electricity price (yearly average, €/MWh).

Pre-merger	0%	10%	20%
COURNOT 0.1	89.82	90.773	92.012
COURNOT 0.3	58.40	59.423	60.553
COURNOT 0.5	52.16	53.128	54.255

Post-merger	0%	10%	20%
COURNOT 0.1	99.36	99.904	100.654
COURNOT 0.3	61.33	62.086	63.157
COURNOT 0.5	53.93	54.816	55.878

Table 2 shows the Gas Natural operational profit (M€) for each scenario.

TABLE 2 GN operational profit.

Pre-merger	0%	10%	20%
COURNOT 0.1	1041,92	1064,64	1093,06
COURNOT 0.3	405,47	429,90	455,17
COURNOT 0.5	283,08	305,65	329,74

Post-merger	0%	10%	20%
COURNOT 0.1	4663,56	4703,81	4759,31
COURNOT 0.3	3046,81	3104,87	3186,60
COURNOT 0.5	2708,94	2773,89	2861,26

Next, table 3 shows the cost for Gas Natural of the "buy-back" contracts. There is no cost if there is no increase in the gas price.

Finally, table 4 shows the Gas Natural incentive to increase the domestic gas price, as the difference of profits between the expensive gas (10% or 20%) scenario and the base scenario minus the "buy-back" cost.

TABLE 3 Gas Natural "buy-back" contracts cost (M€).

Pre-merger	10%	20%
COURNOT 0.1	8,19	45,49
COURNOT 0.3	20,27	89,92
COURNOT 0.5	31,63	122,95

Post-merger	10%	20%
COURNOT 0.1	4,69	34,24
COURNOT 0.3	12,92	79,66
COURNOT 0.5	23,49	115,41

TABLE 4 Gas Natural additional operational profit net of "buy-back" contracts cost (M€).

Pre-merger	10%	20%
COURNOT 0.1	14,53	5,65
COURNOT 0.3	4,16	-40,23
COURNOT 0.5	-9,07	-76,29

Post-merger	10%	20%
COURNOT 0.1	35,57	61,51
COURNOT 0.3	45,14	60,13
COURNOT 0.5	41,46	36,91

The amount of gas bought by Gas Natural by using "buy-back" contracts, net of the own consumption increase, is shown in table 5. To put those figures in context, Gas Natural imported more about 200,000 GWh into Spain during 2004. So, it is conceivable that flexibility clauses in the procurement contracts allow an import reduction of the required magnitude. On the other hand, to increase prices in the domestic gas market in 10% would require, assuming a gas demand elasticity of 0,5, to decrease imports in a 5%, which is likely to be possible without penalties because of not using allocated capacity. Of course, the quantification of the profitability of these practices requires a careful gas market modelling.

TABLE 5 Net gas bought by Gas Natural (GWh).

Pre-merger	10%	20%
COURNOT 0.1	5203,76	14623,86
COURNOT 0.3	12676,00	28550,68
COURNOT 0.5	19916,38	39172,48

Post-merger	10%	20%
COURNOT 0.1	3087,72	11263,58
COURNOT 0.3	8484,76	26137,38
COURNOT 0.5	15305,62	37413,80

Lastly, the remaining companies also profit of Gas Natural rising domestic price. For instance, table 6 shows the Iberdrola additional profit (operational profit in the expensive gas case minus operational profit in the base case plus profit from "buy-back" contracts") in the post-merger scenarios.

TABLE 6 Iberdrola additional operational profit plus "buy-back" contracts profit (M€).

Post-merger	10%	20%
COURNOT 0.1	17,90	57,90
COURNOT 0.3	54,51	134,24
COURNOT 0.5	54,13	137,39

6. CONCLUSION

Simulations aimed to quantify the incentive that new electricity assets can give to Gas Natural for exercising possible market power in gas procurement have been presented. Modelling do not intend to faithfully represent the Spanish system, but highlight possible competition concerns.

It also show vertical integration could significantly increase market power. Therefore, separate horizontal analysis of both gas and electricity markets can be insufficient for a proper assessment of a merger operation. Policies designed taken into account these effects should be pursued.

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