Understanding the electricity tariff deficit and its challenges[1]

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Spain's electricity tariff deficit has reached unsustainable levels. The problem of the deficit must be solved through a combination of consumer price increases, electricity system cost decreases, and energy market reform.

Regulators and market participants have become increasingly concerned about the Spanish electricity tariff deficit due to its size and the difficulties to control its growth. The deficit can be traced to inefficiencies in market organization and solutions should be designed to mitigate those inefficiencies. Tariff deficits have allowed for the transfer of part of the present costs of electricity services to future consumers, but this situation has reached a limit and a deep revision of regulation in this market cannot be postponed. In general, solutions that interfere with market prices and signals are not appropriate.

The tariff deficit

The electricity system in Spain accumulated a deficit of over 30 billion euros by the end of 2012 (see Exhibit 1). A part has been recovered through tariffs but the outstanding debt stands at nearly 22 billion euros, over 2% of Spanish GDP. This debt derives from the financing of the difference between costs and revenues from regulated activities, accumulated in previous years. Most of the outstanding debt (66%) is held by FADE, the Deficit Securitization Fund for the Electricity System, the electricity firms hold 19% and third parties have 15%. The deficit was initially financed by the five largest electricity firms (Endesa, 44.16%; Iberdrola, 35.01%; Gas Natural Fenosa, 13.75%; Hidroeléctrica del Cantábrico, 6.08%; and E.On España, 1.00%), but the firms had transferred most of their deficit collection rights to FADE by the end of 2012. In 2012, FADE issued bonds for 9.9 billion euros at a cost for consumers of 5.617% (CNE, 2012a)[3].

The regulator set two principles for electricity pricing (Royal-Decree 6/2009): (1) the budget constraint has to be fulfilled (revenue must be sufficient to cover costs) and (2) the costs should be assigned to the agents participating in the market in order for the economic signals to be compatible with efficiency. However, in practice,

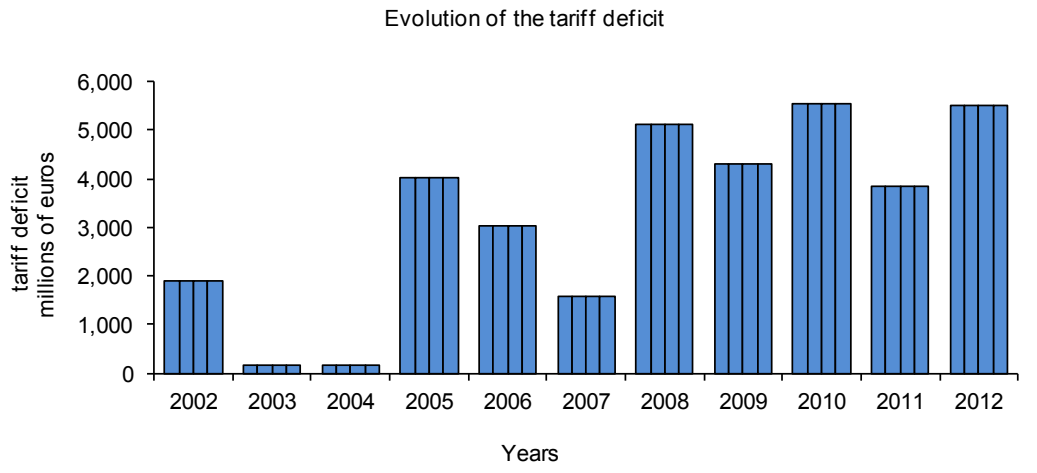
[1] Financial support from MEC (ECO2012-35820), the Basque Government (DEUI, IT-313-07) and UPV/EHU (UFI 11/46 BETS) is gratefully acknowledged.

[2] UPV/EHU.

[3] At the end of 2011, FADE held 44%, electricity companies 39% and third parties 17%.

Exhibit 1

Evolution of the deficit of regulated activities



Source: CNE (2012a).

these two principles have not been followed. The reasons behind the deficit from regulated activities are due to the organization of the electricity system, making it increasingly difficult to reduce its magnitude. In the short term, the solutions to the deficit necessarily involve increasing the price to the end-users and/or decreasing the cost of the electricity services.

Consumer prices

The price paid by most end-users is regulated (TUR, last resort tariff)[4]. The TUR has two components: the cost of energy (determined at the CESUR auction) and the cost of regulated activities which include distribution and transportation costs, capacity payments, incentives for renewable energy and domestic coal, the cost of non-mainland generation, repayment of previous deficits, and other costs of the system. In principle, the regulator should set this tariff so that electricity revenues equal costs. In practice, the tariff has been insufficient to cover all costs, violating the budget constraint principle.

However, solving the deficit through consumer price increases would be difficult to implement, as prices are already very high. Table 1 shows the prices in the Euro area and EU-27. In 2009, the electricity price for Spanish consumers was 168 euros per MWh, 2% above the EU-27 average, while it was 209 euros per MWh in 2011, 13.6% more expensive than the average for EU-27. The price in 2011 for industrial consumers was 116 euros per MWh, which was also higher than the EU-27 average.

The regulated component of the TUR for 2013 includes an escalation clause for users whose consumption exceeds 10% of the average consumption for each level of contracted power (from 3kW to 10kW). Price increases range from 2% to 16% depending on the deviation from average consumption.

[4] At the end of 2012, around 27 million consumers had the right to this tariff (power less than 10kw); 21 million were still under the TUR and 6 million had chosen market prices.

Table 1

Half yearly electricity prices, second half of year, 2009-2011

(EUR per kWh)	Electricity prices					
	Households (1)			Industry (2)		
	2009	**2010**	**2011**	**2009**	**2010**	**2011**
EU-27	0.164	0.173	0.184	0.103	0.105	0.112
Euro area (3)	0.173	0.182	0.193	0.106	0.109	0.118
Denmark	0.255	0.271	0.298	0.093	0.096	0.093
Germany	0.229	0.244	0.253	0.113	0.119	0.124
Cyprus	0.164	0.202	0.241	0.149	0.173	0.211
Belgium	0.186	0.197	0.212	0.108	0.105	0.115
Spain	0.168	0.185	0.209	0.112	0.109	0.116
Ireland	0.186	0.188	0.209	0.118	0.113	0.129
Italy	0.200	0.192	0.207	0.137	0.144	0.167
Sweden	0.165	0.196	0.204	0.069	0.084	0.083
Austria	0.191	0.193	0.197	:	:	:
Portugal	0.159	0.167	0.188	0.094	0.092	0.101
Netherlands	0.184	0.170	0.184	0.111	0.103	0.094
Slovakia	0.156	0.164	0.171	0.140	0.120	0.126
Malta	0.151	0.170	0.170	0.129	0.180	0.180
Luxembourg	0.188	0.175	0.166	0.116	0.102	0.100
United Kingdom	0.141	0.145	0.158	0.101	0.100	0.104
Hungary	0.166	0.157	0.155	0.130	0.105	0.100
Slovenia	0.134	0.143	0.149	0.096	0.101	0.096
Czech Republic	0.139	0.139	0.147	0.112	0.108	0.108
France	0.121	0.135	0.142	0.065	0.072	0.081
Finland	0.129	0.137	0.137	0.068	0.068	0.075
Poland	0.129	0.138	0.135	0.093	0.099	0.094
Latvia	0.105	0.105	0.134	0.089	0.091	0.110
Greece	0.103	0.121	0.124	0.094	0.103	0.111
Lithuania	0.093	0.122	0.122	0.079	0.105	0.104
Romania	0.098	0.105	0.109	0.083	0.081	0.080
Estonia	0.092	0.100	0.104	0.065	0.073	0.075
Bulgaria	0.082	0.083	0.087	0.064	0.066	0.067
Norway	0.156	0.191	0.187	0.080	0.094	0.091
Montenegro	:	:	0.085	:	:	:
Croatia	0.116	0.115	0.115	0.090	0.090	0.089
FYR of Macedonia	:	:	:	:	:	:
Turkey	0.118	0.137	0.115	0.079	0.092	0.076

(1) Annual consumption: 2 500 kWh < consumption < 5 000 kWh.

(2) Annual consumption: 500 MWh < consumption < 2 000 MWh; excluding VAT.

(3) EA-16, 2009 and 2010.

Source: Eurostat.

Given the recent trend of strong increases in consumer electricity prices (double-digit increases in the last three years), and the evolution of the deficit over that period, it does not seem feasible to eliminate the tariff deficit only by further increasing consumer prices.

Given the recent trend of strong increases in consumer electricity prices (double-digit increases in the last three years), and the evolution of the deficit over that period (Exhibit 1), it does not seem feasible to eliminate the tariff deficit only by further increasing consumer prices. Furthermore, electricity prices affect international competitiveness as they may represent a significant component in the cost structure of many service-providing business and industrial firms. Therefore, further policy measures that reduce the costs of providing electricity are likewise necessary.

The cost of electricity

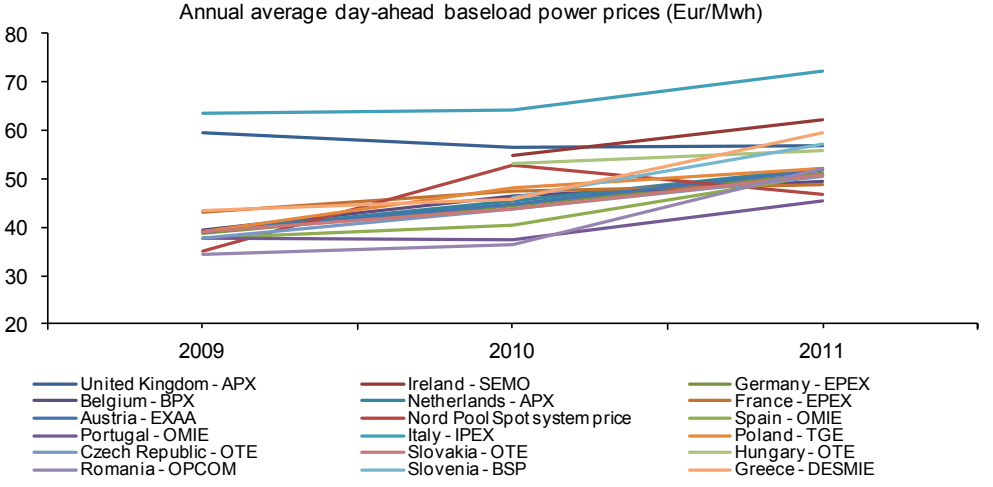
On the supply side, the electricity market is vertically organized and consists of generation, transmission, distribution and retailing activities[5]. In Spain, since July 2009, distribution activities have been formally separated from retailing to end-users. Retailing and generation are liberalized, while transmission and distribution networks are natural monopolies and therefore regulated activities. Regulatory measures could affect the costs at different levels of the vertical structure.

Generation costs

Generation costs for the electricity system are determined by prices at the wholesale market and payments to generators for other services. A moderately concentrated market structure coupled with very inelastic demand and the fact that, from the point of view of electricity, the Iberian market

Exhibit 2

Wholesale prices in the main European markets



Source: European Commission, Energy Markets in the European Union.

[5] Retailing consists of metering and billing the electricity to end-users. Distribution is transportation of low voltage electricity through local networks and consists of overhead lines, cables, switchgear, transformers, control systems and meters to transfer electricity from the transmission system to customers' premises. Transmission activities involve transportation of electricity at high voltage. Generation is the production and conversion of electric power.

is almost an island[6], would suggest that prices are well above marginal prices. However, market power at the electricity pool is currently less of a concern than it was a few years ago due to entry of new capacity with low marginal costs (mainly renewable)[7]. In fact, the Spanish wholesale price is not far from prices in the main European markets (see Exhibit 2).

In any case, measures promoting competition in the wholesale market could only be beneficial for the tariff deficit. It is well known that forward contracting fosters competition in the spot market and implies prices closer to marginal costs (Allaz and Vila, 1993; Powell, 1993). In Spain, electricity forward trading is still underdeveloped compared to other European markets and generator participation in these markets should be promoted.

Capacity payments

Generation capacity in mainland Spain is over 100,000 MW (REE, 2012) and over 65% is firm capacity (always available). On the other hand, peak demand may reach 45,000 MW. Thus, the reserve margin is well above the optimal level (10-20%)[8]. This would justify a reconsideration of the appropriateness of payments for capacity (around 600 million euros in 2012) that are supposed to provide incentives for investment and availability.

Renewable generation incentives

An important component of the electricity costs is the support to renewable energy sources. Subsidies in the form of feed-in tariffs (FIT) for different types of technologies (wind, thermo solar, photovoltaic, biomass,…) have been very successful in fostering investment in clean energy and have produced a large increase in renewable capacity. In 2005, renewable energy stood at 15% of all generation; in 2011, 33% and it is expected to reach 41% by 2020 (Eurostat, 2012; EWEA, 2011). This increase was larger than expected, as it was not envisioned at the time the feed-in tariffs were established that the cost of some of these technologies would go down so rapidly. The number of hours of production was also underestimated. The photovoltaic target was 400 MW, and 500 MW for thermo solar (Spanish Renewable Energy Plan 2005-2010). However, the generosity of the feed-in tariffs has driven much greater investment; the photovoltaic capacity was 4,047 MW and 1,049 MW for thermo solar energy by the end of 2011. The incentives for wind energy have been more modest and capacity at the end of 2011 was 21,091 MW, not far from the target of 20,155 MW set for 2010.

The widespread use of feed-in tariffs to promote photovoltaic energy has likewise produced investment bubbles in other countries (Creti and Joaug, 2012). In 2011, global solar photovoltaic capacity increased by around 30 GW, up 75%. Germany and Italy accounted for around 60% of the additions, with 25 GW and 13 GW of installed capacity, respectively at the end of 2011 (IEA, 2012).

In Spain, investment in renewable energy and the level of the feed-in tariffs implies payments of 8.4 billion euros in 2012 and 9.1 billion euros for 2013, to be added to the cost of other regulated activities. However, the effect of these feed-in tariffs on the total cost of electricity is not clear. Investment in renewable capacity has increased supply at the wholesale market thus decreasing the system marginal price. It has been argued that renewable energy “pays for itself” in the sense that by bidding at the pool at zero prices these units have substantially decreased the system marginal price and therefore the cost of all energy produced for the electricity system. Sáenz

[6] The interconnection capacity with Europe (through France) is relatively low, around 3% of peak consumption in the Iberian maket; it will increase to 6% in 2014 (REE).

[7] See Ciarreta and Espinosa (2010a,b; 2012) and CNE (2012b).

[8] See Marín and García (2012).

de Miera *et al.* (2008) analyzed the effect of the incentives for wind power in 2007 and concluded that the savings in terms of a lower wholesale price offset the tariffs paid to this technology. Ciarreta *et al.* (2012a,b) conducted a similar simulation exercise for the entire special regime in 2010 and concluded that the decrease in the wholesale price, around 29 €/MWh, was able to cover 70% of the feed-in tariff cost.

New regulation introduced in 2012 (Royal Decree 1/2012) has eliminated the incentives for new investment in renewable sources, but the feed-in tariffs to existing production units are still the largest component affecting the electricity cost structure in Spain (44% of the access charges projected for 2013). A regulatory authority sets the feed-in tariffs and it is very difficult to fix and maintain the adequate price for all technologies over time. Different systems of renewable energy promotion (a market for certificates, auctions by technology) should be considered as alternatives, at least for the more mature technologies.

Supply security constraints

The so-called supply-security-constraints mechanism (RGS), which was introduced in 2010 to foster the use of domestic coal, has a projected cost of around 450 million euros for 2013. This mechanism interferes with price formation at the pool and implied a transfer of trade from the day-ahead market to the intraday markets. The RGS drove up the wholesale price, so that the total cost imposed on the system may be even higher than the direct cost of incentives for domestic coal. The promotion of domestic coal should be redesigned so as to deter gaming of incentive regulation mechanisms.

Transmission and distribution costs

Transmission and distribution are natural monopolies and the problem is therefore to design incentive schemes that mitigate the information asymmetry between the firm and the regulator. In Spain, transmission and distribution are under "cost of service" or "rate of return" regulation and the regulator sets the revenue for these activities.

Traditionally, utilities have been regulated either on a cost-plus basis or under a fixed price. Under cost-plus regulation, the utility sees its costs offset and obtains a given rate of return on investment; thus, the firm's viability is guaranteed and the participation constraint is fulfilled. Under a fixed price system, the utility receives a fixed price for its services, which provides high-powered incentives for cost reduction; however, given that the regulator may have less information on the possibilities of cost reduction, the fixed price will potentially leave rents to the firm to ensure the firm's participation.

The optimal regulatory mechanism lies between these two extremes (cost-plus and fixed price) and combines the advantages of both systems. In general, it will take the form of a sliding scale mechanism where the price that the regulated firm can charge is partially responsive to changes in realized costs and partially fixed ex ante. Incentive regulation or performance-based regulation has been introduced in the US, the UK and other countries (Joskow, 2011).

Appropriate regulation is crucial, not only because it affects the price paid by the consumers (around half of the electricity bill paid by Spanish end-users is related to the cost of regulated activities) and the level of the tariff deficit, but also as the prices set in the regulated segment affect competitive segments. The access charges by means of which transmission and distributors recover their authorized costs need to give the correct signals,

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as network users can be induced to make efficient decisions only if they are confronted with the correct prices.

Retailing costs

Most consumers are under TUR pricing (last resort tariff). They pay the same price independently of the generation cost at the time of consumption. A price schedule for the end-user that would vary with the hourly cost of electricity at the pool, time of use (TOU) pricing, would improve the signals that the agents receive from the market. Real time feedback could imply cost reduction, first, by transferring some consumption from the peak hours (expensive) to off-peak hours (less expensive) and, second, by reducing consumption.

TOU pricing requires smart meters. By September 2012, Member States were expected to complete a cost-benefit assessment of the roll-out of smart metering systems (Directive 2009/72/EC). In Spain the meter substitution plan establishes the obligation for distributors to install smart meters for all consumers under 15 kW by 2018. This is a potentially important development for competition in the retail segment of the market. Retailers will be able to compete by setting different price schedules and presumably this could reduce the consumer electricity bill.

Prospects for the future

Table 2 presents the projected revenues and costs from regulated activities for 2013. The estimated revenues amount to 14.9 billion euros, and regulated costs are 20.6 billion euros. The negative balance, 5.7 billion euros, is expected to be covered through tax revenue from taxes to generation (3.0 billion euros), the revenue from CO_2 emission auctions (450 million euros) and other revenues.

This estimate of costs and revenues for 2013 assumes that the Spanish National Budget would

Table 2
Projected costs and revenues from regulated activities for 2013

(million euros)	REVENUES	COSTS	
Regulated revenues	14,884		
Regulated costs (access charges, capacity payments and other regulated activities)		20,561	
Transmission		1,637	
Distribution		5,161	
Feed-in tariffs		9,060	
Recovery deficit from regulated activities		2,271	
Excess deficit previous years		1,952	
Other		480	
Regulated Revenue-Cost			-5,717
Other revenues	5,720		
Tax measures (Law 15/2012)	3,000		
CO2 emission auctions	450		
Other	2,270		

Source: CNE (2012a).

offset the costs in non-mainland generation (RDL 6/2009). However, the Government Budget Bill for 2013 precludes that the compensation for non-mainland generation be included in the National Budget. If this is finally the case, the tariff deficit may be increased by around 1.7 billion euros.

The tax measures introduced by Law 15/2012 (a tax rate of 7% for all energy produced, plus additional taxes differentiated by type of technology) are supposed to generate tax revenue of 3.0 billion euros in 2013. Espinosa and Pizarro-Irizar (2012) simulated the effect of these taxes on the day-ahead market prices and concluded that the average final price would rise by some 11 €/MWh. This price raise translates into a higher cost of the energy produced for the electricity system. Since the estimated increase in the cost of energy is over 2.6 billion euros, the net effect of the taxes is much lower[9]. Furthermore, setting differentiated tax rates to different technologies may change their merit order at the day-ahead market giving rise to cost inefficiencies and sending the wrong signals for investment.

Finally, it is worth noting that over 20% of all regulated costs for 2013 are related to past deficits (4.2 billion euros), which makes it very difficult for the electricity system to generate a surplus that could absorb this deficit.

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Conclusion

The level of the tariff deficit has reached a magnitude that makes it unsustainable and requires effective measures. Through tariff deficits, regulators have allowed transferring part of the present costs of the electricity service to future consumers but this cannot be done indefinitely and a deep revision of regulation in this market is in order. A solution would be to pass at least a part of the accumulated deficit onto the National Budget, but unfortunately this is inconsistent with Spain's current budgetary targets.

The problem of the power tariff deficit cannot be solved in the short run unless consumer prices increase and/or the costs of the system decrease. However, the underlying reasons for the deficit should not be overlooked. The market's organization should be designed so as to prevent any future deficits; in particular, the market agents should be the residual claimants for any surplus or deficit generated. This would require a revision of the regulation concerning the promotion of renewable energy and the regulation of transmission and distribution.

As a final note, in their attempt to solve the tariff deficit, regulators should watch carefully for the side effects of regulatory measures. Some of the proposals to reduce the deficit imply interfering with the market price and the signals it conveys, and may do more harm than good.

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[9] See also Fabra and Fabra (2012).

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