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Electricity Tariff Deficit: Temporary or Permanent Problem in the EU?

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Electricity Tariff Deficit

Temporary or Permanent Problem in the EU?

Åsa Johannesson Linden, Fotios Kalantzis, Emmanuelle Maincent, Jerzy Pieńkowski

Abstract

In the recent years electricity tariff deficits emerged in Spain, Portugal, Greece and in some other Member States. Tariff deficits are shortfalls of revenues in the electricity system, which arise when the tariffs for the regulated components of the retail electricity price are set below the corresponding costs borne by the energy companies.

The objective of this paper is to define and identify the different cases of electricity tariff deficits in Member States. The analysis starts with a description of the functioning of the electricity market in Europe, including price formation and different forms of government intervention, such as support to renewable energy and retail price regulation. Then the paper determines the existence of tariff deficits in the various Member States on the basis of common criteria and describes their common features, as well as particular characteristics of tariff deficits in the countries concerned. An econometric analysis is carried out to identify the drivers of the emergence of a tariff deficit. The final section discusses the impact on the individual firms and on public finances and provides the conclusions. (*)

JEL Classification: Q480, Q430.
Keywords: Electricity, electricity price, electricity tariff, tariff deficit, tariff debt, shortfall, tariff sufficiency, regulated costs, access costs, renewable account, adjustment measures, contingent liability.

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1. INTRODUCTION

In 2010, with the economic crisis, the electricity tariff deficit became a sensitive issue in Spain, Portugal and Greece. The tariff deficits of these countries have been addressed in their respective reform programmes or Memorandum of Understanding. The fall in demand due to the crisis initially contributed to aggravating the deficit as the tariffs had been determined based on a higher projected demand, and as a result the paid tariffs could not cover the total costs of the system. Moreover, in this economic situation it also proved difficult to raise the tariffs accordingly to cover costs. At the same time, the costs for the support of renewable electricity were also increasing and contributed to the overall costs in the system.

In this context, electricity tariff deficits have emerged as an issue for public finances. A tariff deficit implies that a deficit or debt is built up in the electricity sector, often in the regulated segments of transmission or distribution system operators, but in some cases also in the competitive segments, e.g. in incumbent utilities. A deficit is accumulated due to the fact that the regulated tariffs which should cover the system's operating costs, including e.g. support to renewables, are either set too low or not allowed to increase at a pace that cover rising production or service costs. As these deficits accumulate due to government regulation of tariff or price levels, they have been recognised as contingent liabilities of the State in a few Member States. However in some other Member States, they appear as losses on the financial statements of energy companies.

The economic crisis has certainly aggravated the situation. However, more fundamentally, the electricity tariff deficits might be a symptom of dysfunctioning of electricity markets. The structure and the functioning of the EU electricity market have changed considerably in the last 10-20 years. It has moved from national electricity markets with vertically integrated monopolistic firms, to a more competitive and integrated market with a separation between regulated, i.e. transmission and distribution, and generation and retail activities. As a consequence, the regulatory framework for this market has changed considerably, including with the last legislative package in 2009. Despite these evolutions, some Member States are still applying retail price regulation for households and/or SMEs. In parallel to this development, support system has been put in place for renewable electricity, in particular since 2008, in order to achieve the objectives as set out in the Renewable Energy Directive. These support systems have various impacts on the functioning of the electricity market, which concern both regulated and competitive activities.

The objective of this paper is to define and identify the different cases of electricity tariff deficits beyond the well-known cases of Spain, Portugal and Greece. It analyses and assesses various drivers that can explain the emergence of a tariff deficit. The first step includes determining the existence of a tariff deficit in the various Member States on the basis of common criteria, while an econometric analysis is carried out as a second step to identify the drivers of the emergence of a tariff deficit. The paper is organised as follows. This introduction is followed by the second section, which describes the functioning of the electricity market, including price formation and different forms of government intervention in terms of e.g. support to renewable energy and retail price regulation. The third section defines the concept of tariff deficits and describes the situation in the concerned Member States. Section four analyses the relevant determinants and drivers of the emergence of a tariff deficit, while section five discusses the impact on the individual firms and on public finances. Section six concludes the paper.

2. ELECTRICITY MARKET IN EUROPE: FUNCTIONING AND RECENT TRENDS

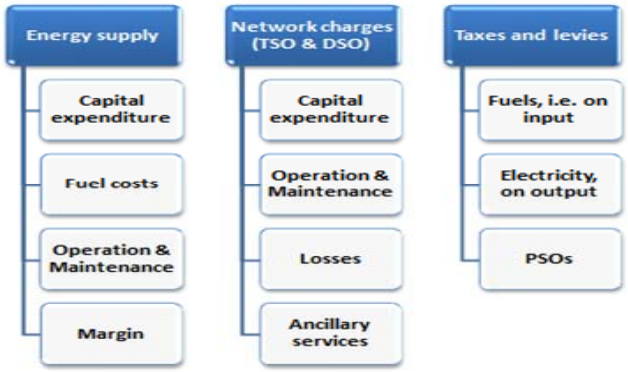
2.1. MARKET OPENING AND PRICE FORMATION IN EU ELECTRICITY MARKETS

The energy market has undergone a process of liberalisation since the 1990's. In the past, the electricity industry was perceived as a natural monopoly, often in the form of a public utility under a so called "universal service obligation". Hence, the sector supplies a commodity that is a necessity that cannot be substituted and acts as a basis for the function of the modern society on a continuous basis. Such service obligations could include e.g. the need to provide minimal service, good quality service at reasonable and/or affordable prices and uniform prices across regions or customer groups. It is the network feature of the transmission and distribution grids that defined the industry as a natural monopoly, as there are both economics of scale and large barrier to entry and exit in the network activities. As a result the four different functions in the energy sector (see Graph 2.1), i.e. generation, transmission, distribution and supply, were normally carried out by the same vertically integrated company or public utility. The final end-user prices integrated the costs of all these activities, and no further information was made available regarding the different cost components.

The EU-level liberalisation of the electricity market was initiated with the First Energy Market Directive, which was adopted in 1996. At that time, both the United Kingdom and the Nordic countries had already started to liberalise their markets. Two additional legislative packages have followed since then, i.e. the Second Energy Market Directive in 2003 and the Third Energy Package, including the Third Electricity Directive, in 2009 ([1]). The process has aimed to separate the network activities, i.e. transmission and distribution, from generation and supply activities. The rules regarding unbundling of these activities into separate entities have become increasingly stringent over this period to properly ensure this separation of activities. This has mainly reflected concerns about the competition, in particular regarding an appropriate pricing of these services as well as fair access to the networks for new entrants. ([2])

Following the separation of the different activities in the supply chain of electricity, the price formation of the final end-user price has also changed. The electricity price now consists of different components relating to the different parts of the supply chain.

Graph 2.1: **Different components of the final electricity price**



Source: Commission Services

([1]) European Economy (2013a).
([2]) Merino. R. (2014).

Thus, the price of electricity consists of the following components, which in turn is determined in different ways: ([3])

- **The price on electricity:**

The wholesale electricity price primarily reflects the costs of the generation of the electricity, which include costs related to *capital expenditure, fuels*, including possible costs for environmental externalities (e.g. for CO2-allowances), and *operation and maintenance* costs. The later consist of both variable and fixed components. Finally, the generating company also has a *wholesale margin* on its production, which can be positive or negative depending on the market conditions.

In Europe today, the price on wholesale electricity is determined on organised markets, in which electricity can be traded among generators, industrial customers and retailers either on voluntary or obligatory basis. The price is settled according to the marginal cost in each trading interval, often corresponding to one hour. Thus, the price will be determined by demand in the form of a load profile by the hour, and the supply, which corresponds to the so-called merit order. That is the aggregated marginal cost profile of the available generation capacity on the relevant market. The cost of the marginal supplier will determine the market price, which implies that the volume-weighted cost of production will differentiate from the average cost of production in a given market at a given time. However, as the price is determined by the marginal cost, the price needs to exceed the marginal costs for some part of the production time in order for the generator to be able to cover the fixed costs. The functioning of this market will also be affected by the degree of competition on the market, the design of the market, including the use of capacity mechanisms ([4]) and the introduction and design of renewable support schemes.

The retail electricity price before network charges and taxes corresponds to the price that is charged of the final consumer for the produced electricity. It mainly consists of the generation cost for the electricity as described above in terms of the wholesale price. However, additional costs also reflect the activities of the retail supplier, which relates to some *costs in relation to marketing of the electricity* to the customer. This also includes a *margin* on behalf of the retailer, which will depend on the degree of competition in this part of the market.

- **Distribution and Transmission network charges**

This part of the costs of electricity relates to the use and operation of the network carried out by the Transmission System Operator (TSO) and the Distribution System Operator (DSO), and hence the regulated part of the sector. Thus, the charges will reflect the regulation in the individual Member States.

The structure and components of the transmission and distribution charges are similar. The main component of network charges are *capital expenditure*, which will reflect factors such as infrastructure costs, the design of the network, local factors (such as climate, geography, and environmental considerations), reliability standards, and cost of capital. Concerning the latter, the regulator normally determines the rate of return for the network operators and often the economic life of investments, which have implications on the capital costs of the system operator. Another important consideration is naturally the need for network expansion, which will depend on the development of the demand for electricity, possible congestion in the network and the integration of new generation capacity, in particular renewable generation.

([3]) See e.g. KEMA Consulting (2012).
([4]) A capacity mechanism rewards provision of additional capacity in the electricity system in order to balance peak loads and be able to ensure security of supply.

Operational and maintenance costs are another component of network charges. It reflects the operating costs of the operator in terms of labour and the need for external services and material.

Costs related to *losses* are also included in network charges. The losses from using the system is often beyond the direct control of the operator, but can be reduced through investments. Thus, there is trade-off between the costs of network investments and the opportunity cost of losses.

One final component of network charges relates to *system service or capacity mechanisms*, which also can be defined a separate charge (see Section 2.3). Such charges should compensate the system operator for purchasing reserve capacity in the market needed to be able to balance the market and ensure a continuous service. However, this can enter the charges in different ways, e.g. as a separate charge or as a component in the network charges.

The most common methodology applied to remunerate electricity transmission and distribution activities is the "cost-plus" formula, which is equal to the total costs plus a profit margin. Currently most of the Member States apply methodologies based on a regulatory asset base. Such methodologies remunerate operators based on a cost structure of efficient operators, which does not necessarily correspond to their own cost structure ([5]). In this way, regulators are putting pressure on network operators to reduce their operational expenses and improve efficiency to achieve a higher return on their investments.

Separately from regulating the remuneration of network operators and energy companies, the regulators or the relevant authorities of the Member States approve the tariffs corresponding to these regulated activities. Normally, these tariffs should be set in line with the principle of tariff sufficiency, i.e. set at a level that ensure to sufficiently cover the allowed remuneration of the electricity companies.

- **Taxes and levies**

Taxes and levies can be levied at different stages in the production of electricity, with different purposes and impacts.

Taxes are defined as a contribution to the financing of public services. Taxes for fiscal purposes are normally levied on the final use of electricity, which impact the final cost of the end-consumer. Taxes (in the form of an environmental policy instrument) on fuels used as input into the generation would, on the other hand, directly impact the generation costs and the wholesale price on the market. However, most Member States tend to tax electricity as an output i.e. as part of the final consumer price. ([6]) Another form of taxation is on the installed capacity itself, i.e. in the form of property taxation or a tax on installed capacity. This will translate into higher fixed operating costs.

Levies are associated with the financing of individual policies or objectives, e.g. *renewable policy, fuel storage, energy efficiency* etc. Depending on the design of the support systems, the related levies will enter differently in the energy system. Thus, as an identifiable part of the retail prices or the network charges, or imbedded in the wholesale price (e.g. fuel levies) and network charges.

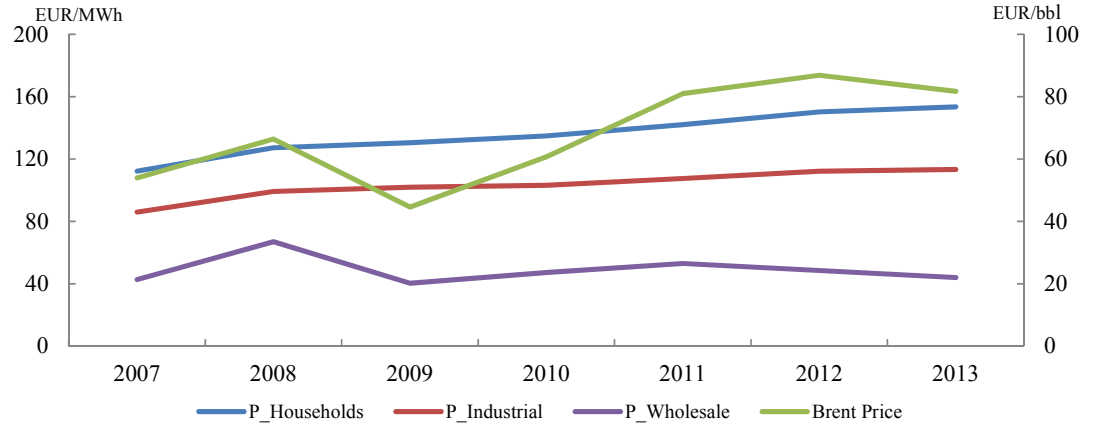
2.2. ELECTRICITY PRICE EVOLUTION OVER THE PAST 6 YEARS

Retail electricity prices have increased considerably over the period 2007-2013, both for industrial and residential customers. EU-28 retail prices have followed a common pattern with crude oil prices, rising by more than 30% since 2007. However, this co-movement appears to be weaker post-2009, as the increasing trend of crude oil prices is not fully reflected in household and industry electricity prices. This

([5]) EY (2013).
([6]) Following the Energy tax directive, i.e. Council Directive 2003/96/EC, October 27, 2003.

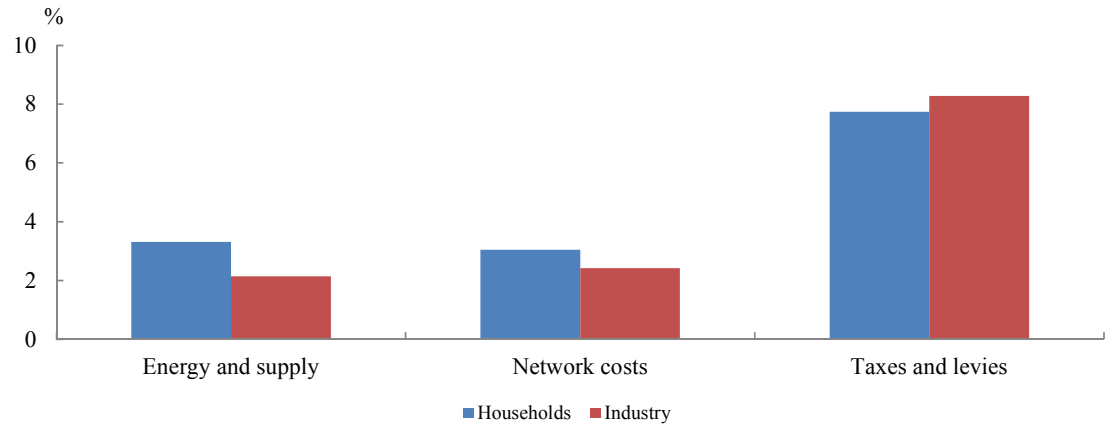
might have been a result of either the price regulation, which may have become less responsive to crude oil volatility ([7]), the downward trend of wholesale prices during the last two years of the sample period or a combination of both these factors.

Graph 2.2: **EU-28 Average domestic and industrial retail electricity price, wholesale price and crude oil price evolution 2007-2013**



Note: The Consumption bands used were DC for Households (2500 kWh < Consumption < 5000 kWh) and IC for Industry (500 MWh < Consumption < 2000 MWh), wholesale prices are average spot prices from different European power exchanges and pools
Source: Eurostat

Graph 2.3: **EU-28 average compounded annual growth rate per electricity tariff component, period 2007-2013**



Note: The Consumption bands used were DC for Households (2500 kWh < Consumption < 5000 kWh) and IC for Industry (500 MWh < Consumption < 2000 MWh), wholesale prices are average spot prices from different European exchanges and pools.
Source: Eurostat

Although all the price components have followed an upward trend since 2007, the increase of the taxes and levies component has been particularly pronounced ([8]) (graph 2.3). On average, for households and industry this component increased on a yearly basis by more than 8%, with variations across consumption bands. For example, increases for some industrial consumption bands even exceeded 30%. As a result the share of taxes and levies in the retail price has increased to more than 50% for both consumer categories. A similar trend is observed for the other two price components. For industrial users

([7]) European Commission (2014a).
([8]) European Commission (2014a), European Commission (2014b)

the average annual growth rate was higher for the network component (below 2.4%) than for the energy and supply component (around 2.1%), while for households the opposite is true.

2.3. PUBLIC SUPPORT IN THE ELECTRICITY GENERATION SEGMENT

The reforms of electricity markets in the EU aimed to open up markets and to increase wholesale and retail market integration across Member States. At the same time, the Climate and Energy agenda adopted in 2008 reshaped the generation segment with the support of renewables in the electricity generation mix. Hence the liberalisation agenda coincided with increased state intervention in the upstream segment of the electricity market.

2.3.1. Generation segment: renewable developments

The development of renewables has accelerated since 2007 after the adoption of a target to reach a 20% share of renewables in gross energy consumption by 2020 ([9]). This target is part of a broader agenda to improve the sustainability of the EU and is combined with two other targets – a 20% greenhouse gas emission reduction by 2020 and a 20% decrease in primary energy use by 2020.

Compared to conventional energy sources, renewables have their own economic characteristics - large fixed costs, low variable costs and intermittency. Hence, there is a need for backup capacity and/or to extend interconnections in order to ensure security of supply. This means that building a renewable power station implies considerable capital costs in the short term, but once in place the station has low operating costs both in the short and long run (zero fuel costs and zero external costs linked to pollution). As renewable fixed costs are obviously influenced by the degree of maturity of available technologies, two issues needed to be addressed by policy makers when deciding to promote renewable development in the 2000s: the cost of their expansion and, linked to it, their deployment at a large scale ([10]).

In 2007, the degree of maturity of renewable technologies was heterogeneous, ranging from mature ones such as hydro and wind to more costly ones, i.e. photovoltaic and geothermal. In 2007, the estimated production cost of electricity ranged from 110 €2005/MWh for wind on-shore farm, 145 €2005/MWh for large hydro, to 195 €2005/MWh for solid biomass and 880 €2005/MWh for photovoltaic. In comparison, fossil fuel based technologies such as coal, and natural gas were cheaper (from 50 €2005/MWh for coal to 75 €2005/MWh for gas) ([11]). Obviously, most of the renewable technologies were not competitive enough to be deployed through market forces alone.

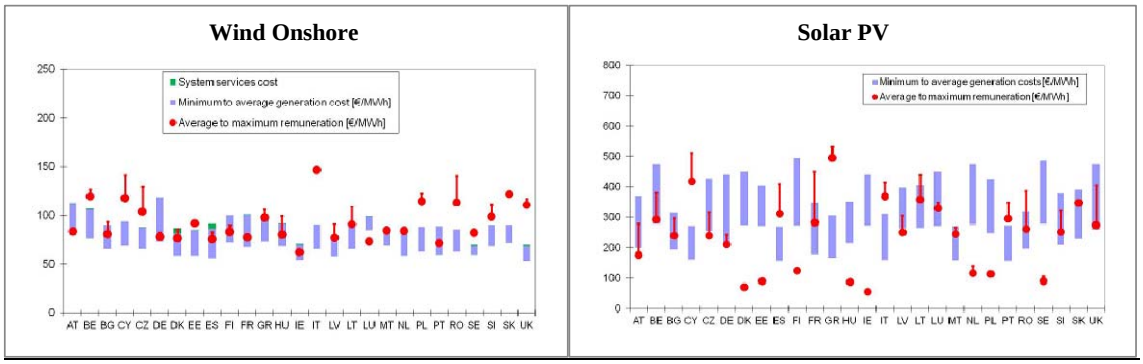
For this reason, Member States have supported the development of these technologies in order to guarantee private investors the same rate of return as for conventional energy sources. Member States combined different types of instruments to promote renewable deployments in the electricity system, i.e. regulation (priority or guaranteed access to network; priority dispatch), price-based mechanisms (feed-in tariffs, feed-in premiums) and/or quantity-based mechanisms (green certificates trading, tendering). These instruments could also be combined with fiscal incentives and public finance support (guarantee, loan) to promote investments in renewable energy ([12]).

However, in some Member States, some technologies are likely to have benefitted from overly generous support systems ([13]). In 2011, average remuneration was above average long-term marginal

([9]) Before these targets, an indicative target had been formulated in the Directive 2001/77/EC on the promotion of renewable electricity. See European Commission (2014a).
([10]) Heal (2009).
([11]) European Commission (2008); European Commission (2010).
([12]) IRENA (2012).
([13]) The cost effectiveness is not easy to check and relies on assumptions made to calculate costs and remunerations. See RE-SHAPING project. http://www.reshaping-res-policy.eu implemented by a consortium led by Fraunhofer Institute. RE-

costs in eleven Member States for wind onshore energy, while it was below average costs for the majority of Member States for solar photovoltaic. For the latter, an exception is the southern countries such as Cyprus, Greece, Spain, Italy and Portugal (see Graph 2.4). These calculations do not take account of the additional costs for the overall energy systems to integrate the massive deployment of renewables. These costs involve, first of all, investment in the electricity grid to transport and balance electricity generated from renewable sources. The variability of electricity generated from renewables also requires investment in back-up power plants (gas turbines), costly hydro storage facilities or interconnectors.

Graph 2.4: **Remuneration ranges (average to maximum remuneration) in the EU-27 MS compared to the long-term marginal generation costs (minimum to average costs) - 2011**



Source: Reshaping (2011)

The development of renewable energy in the EU has been very rapid despite the economic crisis, and its share in gross electricity generation has grown by 50% since 2000 to reach 20.5% in 2011 ([14]). While hydro remains the most important renewable source in electricity generation (11% in 2012), new renewables sources have expanded over the past decade at a high pace. From 2007 onwards, solar photovoltaic (PV) displayed the highest increase (from 0.11% of gross electricity general in 2007 to 1.8% in 2012), followed by wind (3% in 2007 to 6% in 2012). The support mechanisms implemented, in particular since 2007-2008, have certainly contributed to the deployment of more expensive technologies. In Germany, Italy, Spain and Portugal, the high share of wind and solar in the gross electricity generation mix corresponds to high average level of support per unit of electricity produced ([15]).

The pace and scale of the expansion of renewable generation capacity was sometimes unexpected and increased the overall costs and thereby the financing needs. Between 2009 and 2010, renewable electricity support expenditures increased by 33% for thirteen Member States. The expenditure almost tripled for Hungary, France and Czech Republic. Only Spain decreased its support by 10% between 2009 and 2010. Overall, total support from 17 Member States amounted to EUR 25 bn in 2010, 73 % of which came from Germany, Spain and Italy.

In most Member States, support to renewables has been financed by final consumers – by a levy (France, Ireland, Italy, Lithuania, Spain) or a renewable surcharge passed onto consumers and included in

SHAPING assessed cost-effectiveness by comparing the remuneration to renewable generators to electricity and heat generation costs. The remuneration level was calculated as a sum of the net present value of the expected support payments (plus energy price, in case of feed in premiums and green certificates, or if support lasts less than 20 years). The remuneration level was normalised to a common payback period of 20 years and is based on an assumption of the same discount rate. The comparison was carried out per technology category, while the tariffs within one category might differ significantly. The remuneration level was compared to electricity and heat generation costs, distributed over the whole lifetime of the renewable power plant. These costs have been calculated using a complex formula taking into account investment costs, operation and maintenance costs and fuel costs.

([14]) European Commission (2014a).
([15]) European Commission (2014a).

the electricity bill (Austria, Belgium, Czech Republic, Germany, Hungary). In both cases, electricity final consumers have paid for the expansion of renewables. In a few cases (Finland, Luxembourg), support to renewables was financed by citizens through general taxation ([16]).

In a majority of Member States, the State budget has also contributed to stimulate the take-up of these new technologies. In general, these measures have been used in conjunction with feed-in systems or quota obligations. However, the level of this type of support is difficult to quantify in a systematic way. Available information shows that there have been different forms of support – investment support (Finland, Malta, the Netherlands, Poland); tax incentives to encourage specific technologies or to provide income tax deduction to production (Spain, the Netherlands, Finland, Greece, Belgium, Latvia, Poland, Slovakia, Sweden) and low interest loans to reduce investment costs (Bulgaria, Croatia, Czech Republic, Denmark, Germany, Lithuania, the Netherlands, Bulgaria, Estonia, Malta and Poland) ([17]).

2.3.2. Other public interventions and related costs

Support to renewable energies is the most significant, but not the only form of public intervention related to electricity generation. They also include, in particular, support to fossil fuels and nuclear; capacity payments and the pricing of externalities, e.g. carbon (through the ETS).

Some Member States provide support to fossil fuel-based and nuclear electricity generation. They include direct subsidies to electricity production, exemptions of coal-based electricity from energy tax and excise duties, support to nuclear decommissioning and other subsidies. These subsidies are aimed at improving the security of the energy supply and energy independence, but also at improving profitability and maintaining employment of domestic coal producers. Some of the subsidies are also aimed at modernisation and improving efficiency of old fossil-fuel based power plants.

The impacts of these subsidies on electricity costs and prices differ from one case to another. Subsidies to fossil fuel-based electricity may be financed from public finance, for instance in the form of direct coal subsidies or tax exemptions; or by electricity consumers, as a levy included in the final electricity price. Government subsidies may lower electricity generation costs if they reduce the fuel input price, but may also have no impact on generation costs if the subsidies only result in replacing imported coal with domestic coal. In either case, the costs of these subsidies are paid by the taxpayers. If the support to conventional power is financed by electricity consumers, it may also lead to lower electricity generation costs and wholesale prices, but will increase the final electricity prices paid by the consumers. The overall amounts of subsidies to fossil fuel-based electricity generation in the EU are generally lower than subsidies to renewable energy**.** ([18])

Support for electricity generation capacity (capacity remuneration mechanisms) is another type of public intervention in some Member States. They have been introduced, or are planned, as a response to growing concerns that at present the investments in balancing capacity is too low in relation to the increasing shares of intermittent renewable electricity generation. Thus, there is a concern that the market will not be able to deliver sufficient reserve capacity to meet electricity demand at all times in the future in the absences of support to these types of investments. According to ACER (2013c) report, in 2013 capacity payments were applied in Spain, Italy, Greece, Ireland and the Northern Ireland, and a

([16]) CEER (2010; 2013).
([17]) Ecofys (2014).
([18]) An inventory of fossil fuel subsidies including to electricity production is provided in OECD (2013) and in a complementary study (Oosterhuis 2013). Two ongoing studies for the European Commission foreseen for the autumn of 2014 will give a more complete picture of the existing support to electricity and heat production in the EU.

mechanism of strategic reserve existed in Sweden and Finland ([19]). Several other countries, including Germany, France and UK, are currently considering to introduce capacity payments in the near future.

Capacity remuneration mechanisms aim at providing market participants with a more certain stream of revenues than what is delivered by "energy-only" markets. However, they impose additional costs on energy consumers, and may, depending on the design, create substantial distortions in the internal electricity market. Although the costs of capacity payments are currently not very high (for instance, EUR 810 million in Spain in 2013), these costs may increase if they are applied on a larger scale in the future. Thus, capacity remuneration mechanisms should not go beyond what is strictly necessary to balance the market and should be applied in a cost-effective way, in particular by using tendering procedures (European Commission 2013b).

Public Service Obligation (PSO) is an additional type of state intervention. It relates to the need of ensuring a minimum of standards for all consumers that would not be reached under competitive conditions. For this reason, authorities impose requirements on suppliers or system operators to guarantee that such services are provided. The cost of these services is covered through PSOs charges imposed on final customers. According to EU legislation, such services in the field of electricity may relate to security of supply, universal services (for instance providing electricity to vulnerable consumers or in remote areas) and environmental protection. As most PSOs are not profitable and the risk that the market does not to provide them sufficiently, public authorities remunerate selected companies for providing these services (Nowak 2006).

The EU Emissions Trading Scheme (ETS) is another public policy instrument based on regulation that affects electricity generation. In contrast to the previous cases, the ETS is a market-based instrument which aims to internalise CO2 external costs through a price determined in a cap and trade system. The costs related to the EU ETS are incorporated in the energy component of the electricity price. However, the actual impact of the ETS on electricity prices has been very modest so far, due to very low CO2 prices and free allocations of CO2 allowances granted to the installations in the first two phases of ETS, i.e. until the end of 2012. So far no significant impact of ETS carbon prices on electricity retail prices can be found, neither for industry, nor for households ([20]).

2.4. RETAIL PRICE REGULATION

Despite the development towards a liberalised energy market, some Member States are still maintaining retail electricity price regulation. While price regulation for natural monopolies such as transmission and distribution segments is justified, the same does not apply to prices on competitive segments ([21]). Retail price regulation means that final consumer prices are established by a governmental authority as opposed to prices set exclusively by supply and demand ([22]). Price regulation can take various forms: approval by the government, definition of a price cap, definition of a calculation

([19]) In a strategic reserve scheme, some generation capacity is set aside to ensure security of supply in exceptional circumstances. An independent body, for example the Transmission System Operator, determines the amount of capacity to be set aside to achieve the desired degree of adequacy and dispatches it whenever needed. The capacity to be set-aside is procured and the payments for this capacity is determined through a (typically year-ahead) tender and the costs are borne by the network users (ACER 2013c).
([20]) European Commission (2014a).
([21]) The Second Energy Package adopted in 2003 foresaw the abolishment of end-user price regulation by July 2004 for non-household customers and July 2007 for all customers. The Third Energy Package adopted in 2009 authorises price regulation for vulnerable customers.
([22]) ERGEG (2010). This has to be distinguished from the price regulation of natural monopolies where the objective of price regulation is to prevent excessive pricing, discrimination and cross subsidies (Merino, 2013). At the same time, it has to provide incentive to invest and to ensure cost recovery.

methodology by the regulator, link of the retail price to the wholesale price by setting an upper limit on the supplier's profit margin, etc. ([23])

Price regulation is most common in the residential sector although five Member States (Cyprus, Estonia, France, Malta and Romania) still regulated electricity end-user prices for industry in 2012 ([24]). Regulated electricity retail prices for households existed in 18 Member States in 2012. This list includes the regulated prices for vulnerable consumers existing in many countries (social tariff), which is authorised by the EU legislation. The percentage of households with regulated prices is very often larger than the percentage of households with social tariffs. For example, in Spain, households with special needs represented 9.5% of customers supplied under regulated prices. For SMEs, regulated prices were still applied in eleven countries (see Table 2.1).

Table 2.1: **An overview of regulated electricity prices in the Member States, 2012**

	Households	% households with regulated price	% of households with social tariffs***	SMEs
AT	No	-	-	No
BE	Yes*	8.4%	8.4%	No
BG	Yes	100.0%	0.0%	No
CR			-	
CZ	No	-	-	No
CY	Yes	100.0%	3.4%	Yes
DK	Yes	80.0%	0.0%	No
EE	Yes	100.0%	0.0%	Yes
FI	No	-	-	No
FR	Yes	93.0%	3.9%	Yes
DE	No	-	-	No
UK	Yes**	89.8%**	0.0%**	Yes**
EL	Yes	99.9%	4.4%	Yes
HU	Yes	98.3%	0.0%	Yes
IE	No	-	-	No
IT	Yes	80.0%	3.3%	Yes
LT	Yes	100.0%	0.0%	No
LV	Yes	97.3%	9.7%	No
LU	No	-	-	No
MT	Yes	100.0%	12.4%	Yes
NL	No	-	-	No
PL	Yes	99.5%	0.0%	No
PT	Yes	90.2%	1.4%	No
RO	Yes	100.0%	13.3%	Yes
SK	Yes	100.0%	0.0%	Yes
SI	No	-	-	No
ES	Yes	59.4%	9.5%	Yes
SE	No	-	-	No

* BE: household with special needs only have regulated prices; ** UK: prices are regulated for households (90%) and SMEs in the Northern Ireland only; *** Households with social tariffs are part of the regulated segment. The definition of households with special needs varies across Member States.
Source: ACER/CEER (2013); European Commission services

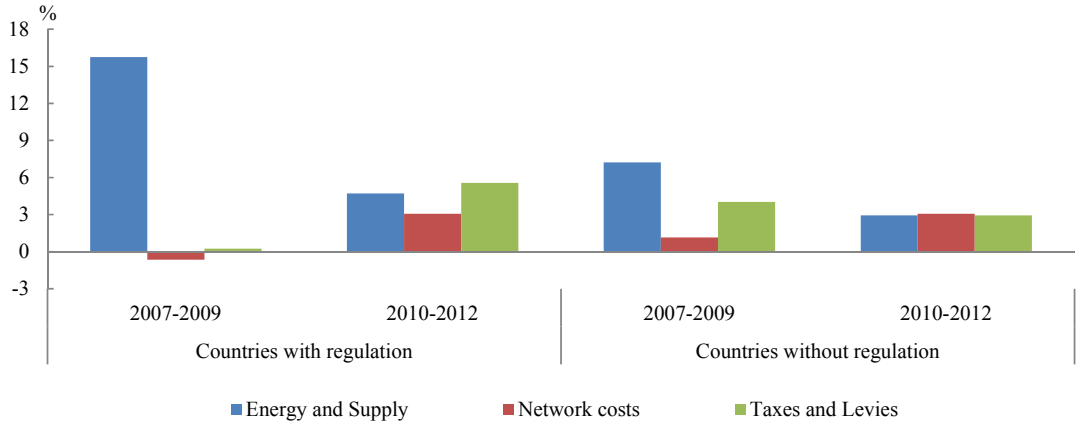
The process and method of setting the regulated prices matters and can be motivated by various objectives. Very often, the objective of price regulation is to respond to social or industrial policy concerns, and as a result some industrial sectors or households segments receive implicit subsidies

([23]) De Suzzoni (2009).
([24]) ACER/CEER (2013).

through lower energy prices ([25]). These segments are sheltered from market price evolutions and prices are maintained artificially low to ensure affordability to all customers (see Box 3.1 in Section 3).

The level of regulated prices will matter if it is set too low, as this has several consequences. First, the price fails to provide the right signal to energy consumers about costs and scarcity, which risk resulting in over-consumption of a cheap service. Second, the low level might hamper the process of market opening by discouraging new companies from entering the market. Third, they will determine the ability of different suppliers to make competitive offers on the wholesale market. For this reason, if end-user prices are set too low, suppliers might not be able to recover their costs and could face potential losses. By contrast, if set to high, they might not reflect the production costs of the incumbent and increase their rents, while at the same time reducing the surplus of final consumers. The result is inefficiencies in the overall energy system. Determining the proper level of regulated prices require full information on the cost structure of the industry, which is becoming increasingly difficult as the electricity markets evolve.

Graph 2.5: **Average compounded annual growth rate for Households between countries with and without price regulation, 2007-2012**



Note: The Consumption bands used were DC for Households (2500 kWh < Consumption < 5000 kWh).
Source: Eurostat.

The electricity price evolution has been different in countries applying retail price regulation (Graph 2.5). During 2007-2009, two components – network costs and taxes & levies – decreased while the energy component increased dramatically, reflecting the oil price hike. During the second period 2010-2012, the increase in all components was higher in the group of countries with regulated prices. This period corresponds to the substantial penetration of renewables in the electricity system, which had to be financed by end-consumers (section 2.3.1).

([25]) European Commission (2013a).

3. TARIFF DEFICIT: IDENTIFICATION AND ASSESSMENT

The tension between increased costs in the generation segment and retail price regulation has certainly contributed to put pressure on the overall electricity system. In many cases, distribution companies or transmission companies were not able to cope with the costs and had to face some losses. In other cases, the gap emerged as a deficit in the overall system. In 2013, Spain and Portugal faced a cumulated tariff deficit reaching 3% of their GDP. The economic recession certainly contributed to aggravating the deficit, The sharp fall in electricity demand due to the crisis would have required an increase of electricity prices, which would have been politically difficult to implement in this situation.

3.1. ELECTRICITY TARIFF DEFICIT: DEFINITION AND SCOPE

An electricity tariff deficit can be defined as follows: a shortfall of revenues in the electricity system, which emerges when the tariffs for the regulated components of the retail electricity price are set below the corresponding costs borne by the energy companies.

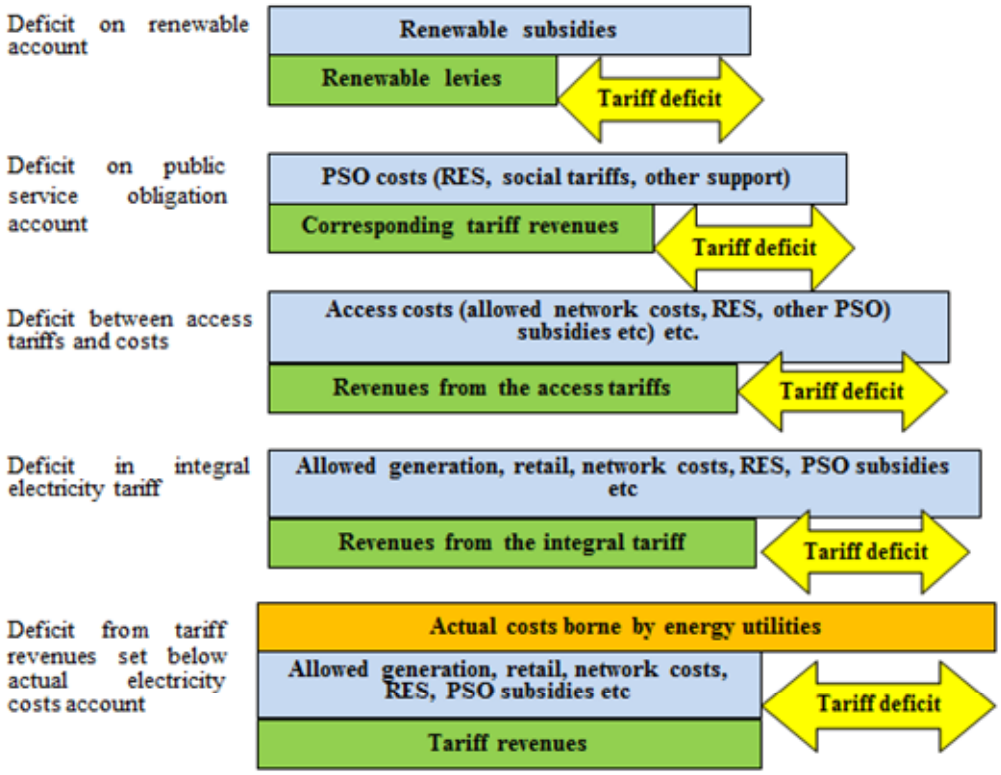
Tariff deficits relate to the regulated components of the electricity price. These tariff components concern primarily network costs (transmission and distribution) and levies related to subsidies to renewable energy or to public service obligations. However, in some Member States, where the end-user price regulation still is applied, the regulated components might also cover the cost of competitive activities, including wholesale cost and retail margins (see Section 2.4). The tariffs should be set in line with the principle of tariff sufficiency so that they cover the allowed remuneration of the electricity companies. However, if for some reasons (see Box 3.1) tariff revenues in a given year differ from the allowed remuneration, a tariff deficit can emerge.

The scope of electricity tariff deficits differs widely from one country to another (see Graph 3.1). Some Member States have the deficit on the renewable energy account, when the tariff revenues are not sufficient to cover the costs – for instance, when the aggregated costs for subsidies to renewable energy are rising so fast that the tariffs do not match them. In other countries, tariff deficit may cover public service obligations, the network costs or the "access costs" which include network costs plus the costs of electricity subsidies (to renewables, to capacity payments, to the provision of electricity to remote or isolated areas etc.).

The scope of tariff deficits may even be broader in countries which have regulated retail electricity prices. In some of these countries, integral electricity tariffs may not be sufficient to cover the energy prices, taxes, levies and the allowed remuneration of network operators. In this situation, the tariff deficit will be the difference between the integral tariff and the sum of these costs, as recognized by the authorities.

Yet another situation exists in some Member States, where the tariffs do not cover the corresponding costs, but when the authorities or regulators do not recognize this fact and do not remunerate the utilities fully. The result is accumulated losses in the electricity companies, usually electricity generators or distributors. This situation usually concerns state-controlled energy incumbents, but also foreign utilities which have invested in energy networks. This is an important imbalance of the energy system and should also be considered as an example of tariff deficits in a broad sense. (see e.g. World Bank, 2013) These cases are therefore included in our quantitative analysis (Section 4.2).

Graph 3.1: **Examples of the scope of electricity tariff deficits**



Source: Commission Services

It is important to distinguish temporary tariff deficits from more permanent ones. Temporary tariff deficits may emerge in case of discrepancies between the electricity system costs implied in the forecasts (for instance the costs of support to renewables or network costs) and the actual costs. Discrepancies may also emerge on the revenue side, for instance when revenues are lower than expected due to lower electricity demand. Determining ex-ante the tariff levels which would ensure cost recovery is not an easy task. Energy system costs are affected by wholesale electricity prices, the variability of renewables production, price levels in the neighbouring countries, demand factors etc. It is difficult to predict these costs when setting tariffs for the year ahead, and some temporary tariff deficits is a normal issue. However, these deficits should be taken into account when the tariffs are set for the following year.

However, in some cases such temporary discrepancies were so big that the authorities decided not to reflect them in the tariffs in the following years. This has led to a build-up of tariff deficits; the cumulated tariff deficits are frequently called tariff debts.

Box 3.1: **Why are not tariffs sufficiently adjusted, with tariff deficits as a result?**

Normally, electricity prices should be set in line with the principle of tariff sufficiency: they should be set at a level that sufficiently covers the relevant costs borne by electricity utilities.

However, in some countries, the authorities considered it not possible to increase the regulated tariffs to a level that fully corresponded to quickly rising electricity costs. The recourse by Member States to tariff deficits reflects their fears about potential damages from rising electricity prices, both for households and for the industry.

Electricity is considered as an important item of households' spending. However, according to the recent Eurostat's Households Budget Survey, carried out in 2012, electricity represented only 2.8% of consumption expenditure of an average EU household. The share of electricity in households' budgets ranged from 1.2% in Greece to 5.6% in Slovakia, also exceeding 4% in Sweden, the Czech Republic, Croatia and Portugal. The share of electricity bills is much higher among the people with the lowest income.

The importance of rising electricity bills and their political sensitivity seems to be larger than its share of households' budgets suggests. This may be due to the fact that demand for energy is inelastic in comparison to the other goods: consumers have little choice but to endure higher electricity prices for lighting, household appliances and in some cases heating of their homes.

For industry, rising electricity prices affect production costs and thus their external competitiveness. The competitive impact of electricity prices is especially high for sectors and countries with higher share of energy intensive industry. The EU manufacturing sector has so far largely responded to energy price increases through sustained energy intensity improvements, thereby maintaining its relatively favourable position in terms of energy efficiency. In addition to price regulation, some Member States apply exemptions and rebates from taxes and renewable charges for energy intensive industries, and/or provide them with free carbon allowances. The issue of rising energy prices and its impact on competitiveness needs to be monitored further in view of future market and policy developments.

For all these reasons, some Member States have tried to prevent electricity prices from rising by keeping the regulated components of electricity prices below the corresponding cost level, which has led to the emergence of tariff deficits. Some temporary mismatches obviously also played a role.

The reluctance to allow the tariffs to fully reflect the production costs of electricity also have other drawbacks apart from creating deficits in the electricity sector, which ultimately will fall on public finances or final consumers. As the tariffs are set below costs, the end user will meet a too low price. As a result, the price will not provide the correct incentives for the consumer to adjust his demand and undertake investment in energy efficiency measures. Hence, it will result in higher consumption of electricity than what would have been the case with a cost-reflective price. Moreover, tariffs are often not increased in order to protect vulnerable households from price rises. As the too low tariffs are applied across all (or a broad set) of consumers, directly targeted income support through the welfare system would be a more cost-efficient way for the government to protect and support the most vulnerable consumers of electricity.

3.2. TRACKING THE EXISTENCE OF A TARIFF DEFICIT IN MEMBER STATES: DATA SCOPING

Identifying where an electricity tariff deficit exists in EU Member States is highly complex and has proven difficult. There is a lack of published information on primary (databases) or secondary (press) sources, and this could be one reason why research-based evidence on this topic is limited. In addition, it requires knowledge of tariff setting mechanisms, as well as of the functioning of electricity markets in order to be able to identify tariff related problems.

For this reason, the quantification of tariff deficits in EU Member States from primary sources was not possible. **To overcome these data challenges, a sequential process has been followed**. It comprises a preliminary phase of scanning the existing literature (criterion 1), along with the analysis of companies' financial data (criterion 2). Following the definition of the problem in section 3.1, the required data were collected from national reports published by the Council of European Energy Regulators (CEER), press releases and other publicly available reports, as well as from the ORBIS database. All these data were combined in order to identify cases of tariff deficits over the years 2007-2012. Particular emphasis was put on issues related to the profitability of regulated companies. The criteria for identifying the cases of tariff deficits were the following:

- **Criterion 1:** Evidence based on publicly available reports

National reports from the Council of European Energy Regulators (CEER) are probably the best available source of information regarding the evolution of the regulation of national electricity markets. These reports cover a wide range of thematic areas in the electricity and natural gas markets and present the main developments in regulation and performance of these two markets. Specifically, they focus on retail and wholesale prices of electricity and natural gas, including the access to networks. The availability of electricity produced from renewable energy sources and the compliance with the consumer rights laid down in Directive 2009/72/EC and Directive 2009/73/EC are also covered, as well as analysis of possible barriers to the well-functioning of national electricity and natural gas markets. In addition to this, press releases and other public reports have been taken into account in this process. However, this information was considered as indicative and needed to be confirmed in order to fully assess whether a tariff deficit exists (see tables A.1.1 and A.1.3 in the annex).

- **Criterion 2:** Monitoring regulated companies' financial positions

Three possible areas were found relevant for identifying deficits after a careful reading of the national reports, along with the overall functioning and the tariff setting mechanism in place in each electricity market. These include the renewables levy, the public service obligations and the overall regulated prices. For this reason, it was decided to monitor the financial performance of the regulated electricity companies in the transmission, distribution or trade segments (NACE 3512, 3513, 3514) to the extent possible based on the data available in the ORBIS database for each country and electricity activity. Complementary data were also retrieved from publicly available annual reports. The data collected include information about the profit and losses after taxes of electricity companies and their assets for the period 2007-2012. Based on these data, the criteria indicated the existence of tariff deficit when companies displayed losses or abrupt loss of profitability (-30%) on a yearly basis (see tables A.1.2 and A.1.5 in the annex) in regulated activities, such as transmission and distribution ([26]) but also in trade activities.

The overall assessment process chosen to identify electricity tariff deficits in EU concluded, based on the available information retrieved by national reports and other relative sources, that:

- for six out of the twenty seven Member States (Germany, Greece, Spain, France, Italy, Portugal) ([27]), there is evidence of a tariff deficit ([28]) over a time period which varies significantly across these countries.

([26]) In general, transmission and distribution companies are responsible for managing the accounts related to levies and charges, including renewable, cogeneration, fuel subsidies, PSOs etc.
([27]) Given the difficulty to find information at this stage of the analysis, Croatia was not included.
([28]) Both the German energy regulator (national report, 2010) and transmission system operators (TSOs) claimed that in 2010 and 2012 there were deficits on the EEG account. In Spain (national reports, 2011 and 2013), Greece (national report, 2011 and 2012 and European Commission (2013d)), Portugal (national reports, 2008 and 2013) and Italy (national report, 2013) their energy regulators stated that there is an accumulated deficit on the accounts for compensating renewables producers. Likewise, the French energy regulator supported that there is an accumulated tariff deficit on the account of the Contribution to the Public Electricity Service (CSPE) since 2002.

- for another five Member States (Bulgaria, Latvia, Hungary, Malta, Romania), there are evidence of possible electricity tariff deficits based on the financial performance of the regulated companies. For instance, in Latvia the national operators in the distribution and transmission activity, respectively, reported continued losses, and the same situation was observed in Malta for the national integrated electricity company (ENEMALTA). ([29]) For the other three countries, either losses or relative low returns on assets were recorded. ([30])

3.3. TARIFF DEFICIT IN MEMBER STATES: COMMON PATTERNS

3.3.1. Scope of tariff deficit

Section 3.2 presented the data scoping carried out from secondary sources and describes substantial differences in the size, scope and other features of tariff deficits in Member States. These differences can be summarized in the following table.

Table 3.1: **Electricity tariff deficit– comparison between Member States**

		ES	PT	EL	FR	IT	DE	BG	MT	RO	HU	LV
Cumulated tariff debt, % of GDP, 2013		3	2.2-2.6	0.4	0.2	0.1*	0.01	1-1.5**	N.A.	0.1*	N.A.	N.A.
Cumulated tariff debt, EUR billion, 2013		30	3.7-4.4	0.7	4	1.5*	0.2	0.4-0.6**	N.A.	0.15*	N.A.	N.A.
Scope of the tariff deficit	- on RES account			✔		✔	✔					
	- on PSO account				✔							
	- of access costs	✔										
	- of integral tariff		✔					✔				
	- tariff below costs				✔			✔	✔	✔	✔	✔
Deficit recognized by the authorities or energy regulator?		✔	✔	✔	✔	✔	✔					
Deficit cumulative (i.e. not settled in the following period)?		✔	✔	✔	✔	✔		✔	✔	✔		

Note:
* 2012, ** World Bank forecast

Source: Commission Services

Based on this table and on the more detailed overview of electricity tariff deficits provided below, the cases of tariff deficits in Member States can be divided into four main groups.

Spain and Portugal have the highest tariff deficits, with their cumulative value of 2.2% to 3% of GDP. While the scope of these deficits differs between these two countries, in both of them the authorities have formally recognized the right of the affected utilities to recover the corresponding amount. They have also set up securitisation schemes that turn these credit rights of the utilities into fixed-income securities. Both countries aim at eliminating new tariff deficits as soon as possible, but have so far failed to do so.

([29]) In Bulgaria, the three largest distribution companies owe a combined 347.6 million lev ($247 million) to the state-owned National Electricity Co. (NEK) due to disbursements for subsidies to renewable and combined heat and power generators since 2010. In Romania and Hungary, based on the information from the press, some distribution and retail companies, respectively, displayed either losses or relative low profits compare to their assets.

([30]) Lithuania was not included in the sample. According to the Lithuanian energy regulator, the losses observed in in the AB LESTO company are a result of the methodology (cost plus) used and assumptions made when setting its tariffs. In particular, the regulator did not take into account the book value of the assets after the revaluation process, but the regulatory asset base, as well as the new value of depreciations and other expenses. Hence, the revenues collected by the tariffs were lower than the OPEX and for this reason AB LESTO displayed losses. In 2015, the methodology to calculate the electricity price regulation model is expected to change.

The tariff debts of France and Greece are relatively low (0.2-0.4% of GDP), but in both countries the respective accounts (renewable account in Greece, public services account in France) have remained unbalanced in the recent years despite tariff increases. In both countries, the deficits are recognized by the authorities but there has been no securitisation of the utilities' credit rights.

Italy and Germany have recorded temporary deficits on the renewable account. These deficits have emerged due to differences between the forecasted and actual costs for the renewable electricity production. Due to the large subsidies to renewables in these countries, the size of these temporary deficits is not negligible. These shortfalls should in principle be financed by increased surcharges in the following period, thereby preventing a deficit to be accumulated. In Germany, a deficit of EUR 2.6 billion (0.1% of GDP) was recorded on the renewable account in 2012. This deficit was almost fully recovered through higher tariffs in 2013. In Italy, a report of the national energy regulator ([31]) acknowledged that a deficit on the renewable account (A3 account) has built up in the 2009-2012 period. The cumulated deficit was estimated at over EUR 1.5 billion (0.1% of GDP) at the end of 2012, and was eliminated through higher tariffs in 2013.

Bulgaria and **Malta** have shortfalls of revenues in the electricity system because the regulated integral electricity tariffs for consumers (especially for households) are too low to cover the corresponding costs borne by the utilities. The situation in **Hungary** has become similar due to the recent substantial decreases of the regulated electricity prices for households. The situation in **Romania** concerns mainly the electricity distribution for which the regulated tariffs are not sufficient to cover the corresponding costs. In these countries, the authorities and regulators only partially recognize the existence of these deficits and have no intention to remunerate the utilities at a level that recover their costs. The result is accumulated losses in the electricity companies, usually electricity generators or distributors. This situation normally concerns state-controlled energy incumbents, but in some cases also foreign utilities which have invested in energy networks. The situation is further complicated by lack of accounting standards for regulated utilities, lack of cost benchmarking, poor transparency, as well as by market distortions such as cross subsidies and purchase power agreements. In **Latvia,** the national transmission system operator and the major electricity distribution company reported continued losses until 2010-2011, which might indicate the existence of a tariff deficit in these activities. However, both these companies have returned to profits since 2011-2012.

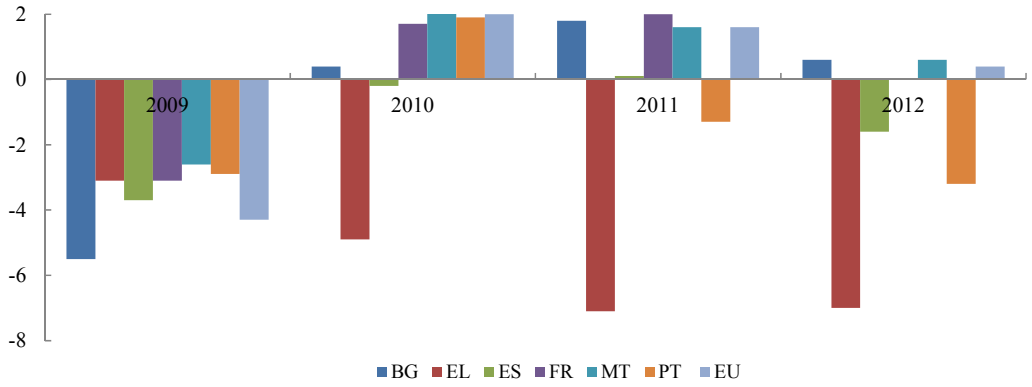
3.3.2. Main features of Member States with tariff deficits

The previous sections of this paper have identified Member States where tariff deficits have emerged, and have described their scope and size. These Member States have some common characteristics, which may indicate possible drivers of tariff deficits. One of the difficulties with this analysis is, however, the fact that the size and the time period when tariff deficits were recorded differ between Member States ([32]).

Some of the countries with tariff deficits were particularly hard hit by the economic crisis, **but not to the same extent and not for the whole period**. In comparison to the EU average, the fall in GDP was particularly severe in Greece in 2010-2012, but also in Portugal in 2011-2012, in Spain in 2010-2012, and in Bulgaria in 2009. In France, GDP growth was above EU average over the same period. On the other hand, some Member States with severe contraction of GDP in this period, such as Estonia or Ireland, did not display electricity tariff deficits.

([31]) (Italian) Regulatory Authority for Electricity and Gas (2013).
([32]) This sub-section covers six countries with the most evident tariff deficit: Spain, Portugal, Greece, France, Bulgaria and Malta.

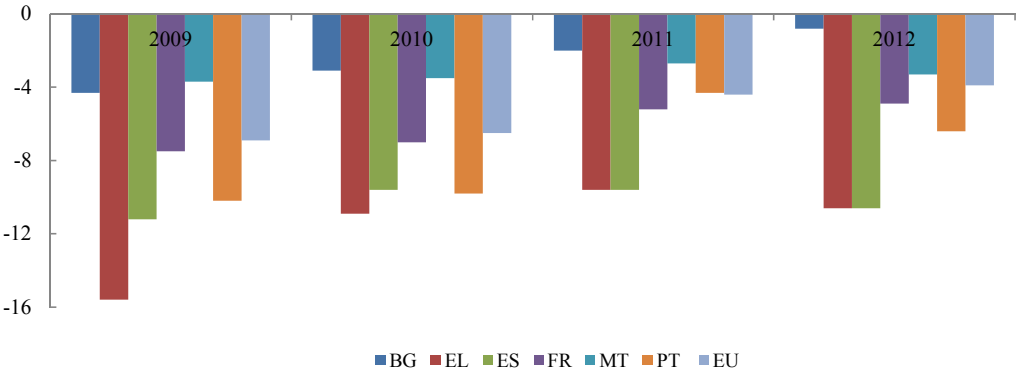
Graph 3.2: **GDP change in the EU and selected Members States (percent change on preceding year, 2009-2012)**



Source: Commission Services based on AMECO database

Public finances have deteriorated more in the countries with tariff deficits than on average in the EU, with the exception of Malta and Bulgaria. General government deficit was extremely high in Greece and Spain in 2009-2012 and in Portugal in 2009-2010, i.e. close to or even exceeding 10% of GDP. This has led to a mounting debt-to-GDP ratio, which reached 157% in Greece, 124% in Portugal, 91% in France and 86% in Spain in 2012, against an EU average of 87%.

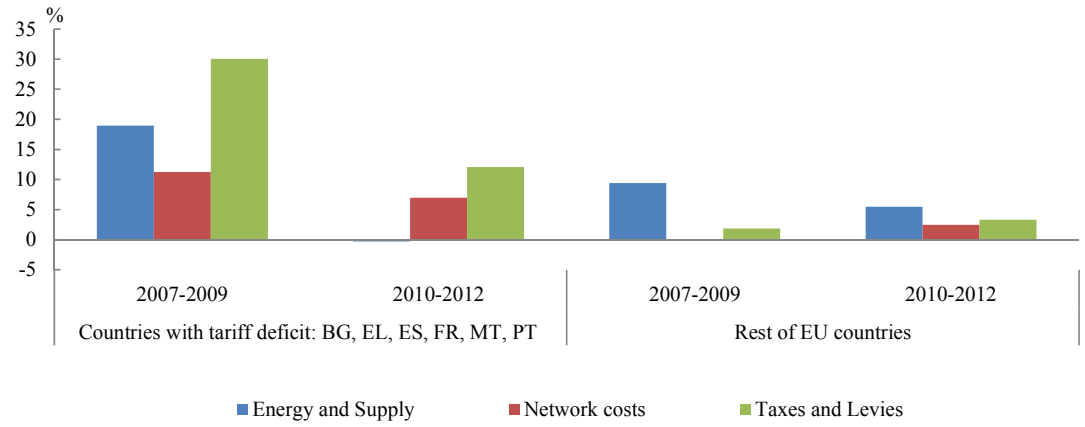
Graph 3.3: **Net lending (+) or borrowing (-) of the general government in the EU and selected Member States (as a percentage of GDP, 2009-2012)**



Source: Commission Services based on AMECO database

As regards the electricity market, one common feature of the six countries with tariff deficits analysed in this section is that they have regulated electricity retail prices. All six Member States regulated electricity end-user prices for households in 2012, with the share of households with regulated price ranging from 59% to 100% (see section 2.4). France and Malta also regulated electricity end-user prices for industry in 2012. The price evolution of these countries follows a different pattern compared to other Member States. In particular, the increase in taxes and levies has been higher than other Member States over the period (Graph 3.4).

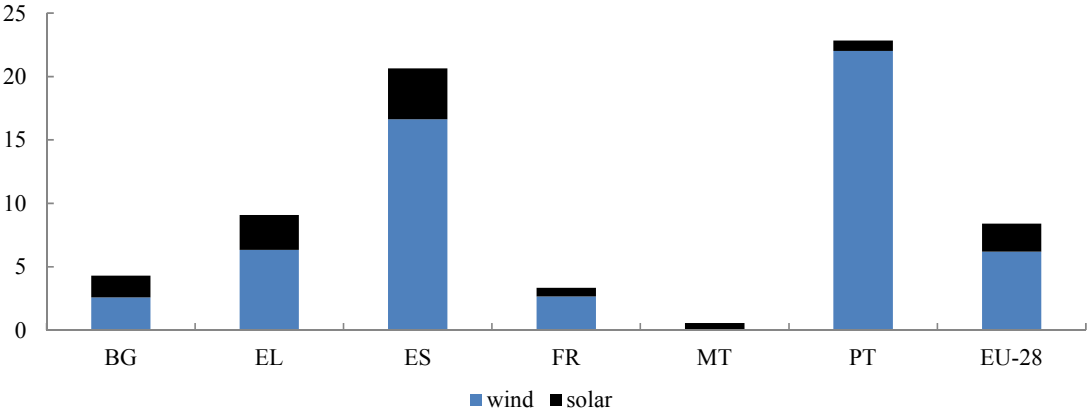
Graph 3.4: **Average compounded annual growth rate for Households in selected Member States and the Europe, 2007-2012**



Source: Eurostat

As regards the development of renewable electricity generation, Spain and Portugal are among the three Member States with the highest share of wind and solar power in their electricity mixes. The share of these technologies may matter for the tariff deficits as their deployment have required subsidies. On the other hand, the share of these technologies in Greece is close to the EU average, while in France, Bulgaria and Malta the share was below EU average.

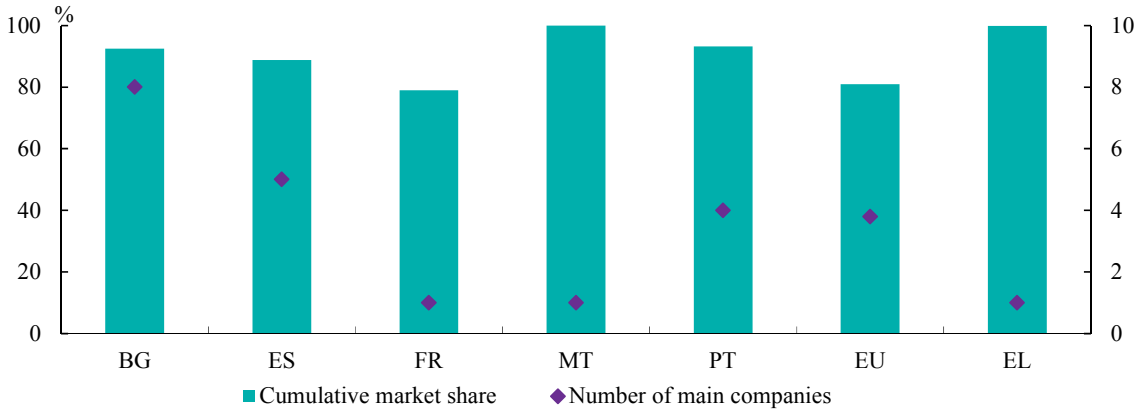
Graph 3.5: **Share of wind and solar energy in electricity generation, 2012**



Source: Commission Services

Finally, the level of competition and concentration of the electricity market varies across the countries with tariff deficits. The market concentration in Spain, Malta, Bulgaria and Portugal (measured, for instance, by the cumulative market share of the main retails) is above EU average. In Greece, 2010 data show that the retail market was concentrated with one main retailer.

Graph 3.6: **Number of main electricity retailers* and their cumulative market share, 2012**



*Retailers are considered as "main" if they sell at least 5% of the total national electricity consumption.
Note: 2012 data for Greece are available from CEER
Source: Eurostat (This data is not yet available in the Eurostat dissemination database), CEER

An econometric analysis aiming at identifying the possible drivers of tariff deficits is presented in section 4.

3.4. COUNTRY PROFILES

This section presents a detailed description of tariff deficit in the eleven Member States.

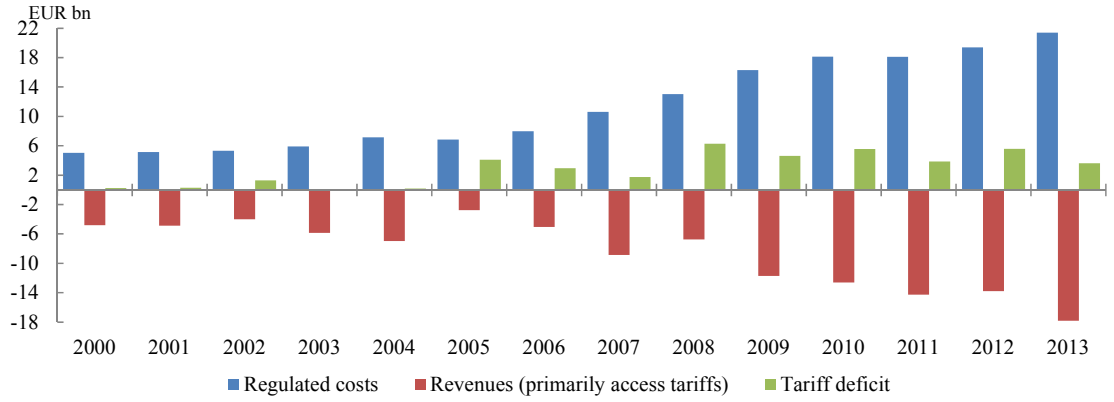
3.4.1. Spain

Spain has the highest electricity tariff deficit among Member States. The amount of the outstanding tariff debt is estimated at some EUR 30 billion (3% of GDP) at the end of 2013. Tariff deficit has also become an issue of economic policy concern in Spain; Spain has a country specific recommendation in 2014 to tackle the electricity tariff deficit as a part of the European Semester ([33]).

The tariff deficit in Spain has gradually built up since 2000 (Graph 3.7).

([33]) 2014 Country Specific Recommendation no. 7 asks Spain to "ensure the effective elimination of deficit in the electricity system as of 2014, including by taking further structural measures if needed". COM(2014) 410

Graph 3.7: **Evolution of electricity tariff deficit in Spain, 2000-2013**



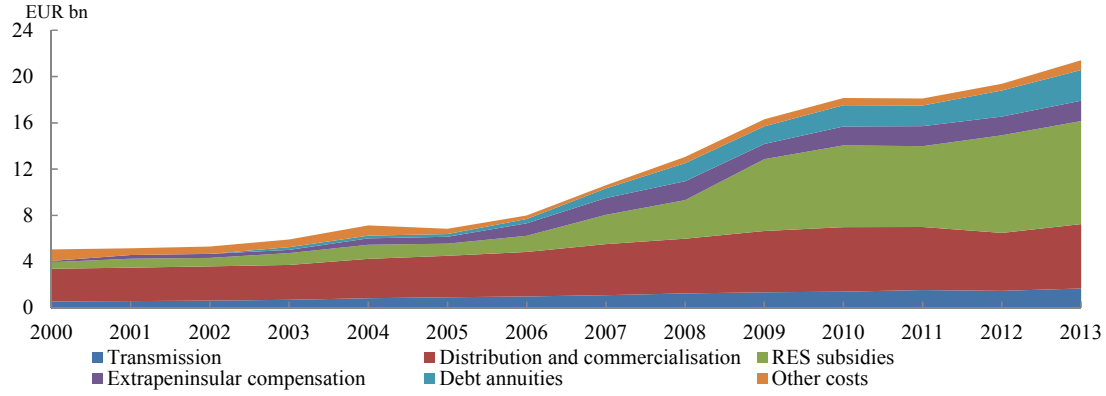
Source: Commission Services based on CNE data

Until 2006, the deficit was generated mainly in the energy component of the electricity price. Since the liberalisation of energy prices in 2007/2008 this component does not contribute to the tariff deficit as it is fully passed on to electricity consumers.

However, the regulated costs, called the "the access costs", has started to grow rapidly over the last years. These costs include: i) transmission and distribution costs, ii) "special regime" of support to renewable and co-generation, iii) "extra-peninsular costs" – compensation for higher electricity costs in Baleares, Canary Islands etc.; iv) annuities to cover the tariff deficit in the previous years and v) other costs.

Graph 3.7 shows that the regulated costs, and especially the "special regime" costs, increased rapidly in the last years. Since mid-2000's, the Spanish government granted generous subsidies to renewables producers, mainly solar and wind. These subsidies led to a massive investment in these sectors on a much wider scale than the government had expected. The costs of support to renewable energy in Spain increased from €1.2 billion in 2005 to €8.4 bn in 2012. The "extra-peninsular costs" and the annuities to cover the tariff deficit in the previous years have also increased considerably, and there was some increase also in the network costs.

Graph 3.8: **Evolution of regulated costs of the electricity system in Spain, 2000-2013**



Source: Commission Services based on CNE data

The authorities considered that the growth in regulated costs was so high that it could not be matched, "for political and social reasons", by the corresponding increase of the fees paid by energy consumers (access tariff revenues). As a consequence, substantial increases of the tariff deficits have been recorded each year since 2008.

The financial burden resulting from the tariff deficit was provisionally borne by the five main vertically integrated energy utilities. However, by a decision of the Supreme Court, these companies were entitled, as creditors, to recover the corresponding amount from the budget, as their financial burden resulted from obligations imposed on them by regulation. Following this decision, the companies have been granted a credit right to receive such amount with interests.

In order to avoid a huge one-off compensation which would represent a burden on the public finance, in 2010 the government set up the Spanish Electricity Deficit Amortisation Fund (FADE) in order to turn the rights of the utilities into fixed-income securities. These securities are backed by payment rights, repaid by energy consumers as a surcharge on electricity costs. FADE bonds are fully irrevocable and unconditionally guaranteed by the Kingdom of Spain. Since January 2011, FADE placed its bonds on the market, with spreads at 50-80 bps above the Spanish government bonds.

In order to reduce the deficit, Spain applied in the recent years a package of measures to split the burden of the corrective action between energy consumers, renewable energy producers and the other actors in the energy sector. The main measures included:

- Suspension of the support to almost all new renewable energy installations since early 2012, apart from some already pre-registered plants. This measure prevented a further increase of the costs of the renewable support, but has had a negative impact on the renewable sector.

- Reduced remuneration of the regulated activities, i.e. the legislator has put pressure on the costs of the distribution and transmission operators, as well as on the regulator's own costs.

- New taxes on electricity generation from the beginning of 2013, which are earmarked to reduce the tariff deficit. They include a tax on electricity production, on nuclear waste, a levy on hydro generation, and a carbon tax on fossil fuels used for electricity generation.

- Limited increases in the access fees (the regulated component of the electricity tariff). The scope of this adjustment was limited due to potentially negative implications of an electricity price rise on the purchasing power of households and on the financial situation of companies, in the context of the economic crisis in Spain.

- Spanish authorities intended to provide a budgetary subsidy to cover the tariff deficit in 2013. This subsidy was, however, finally withdrawn in order to reduce the public finance deficit.

As all these measures to contain the electricity tariff deficit have not been sufficient, the Spanish authorities adopted a further, more radical, "electricity reform" in July 2013. The support mechanism for renewables have been revised: the feed-in tariff has been replaced with a compensation guaranteeing a yearly rate of return for investors (300 basis points over the interest on 10-year government bond). Remuneration of transmission and distribution activities has been revised in a similar way. Further measures include, among others, reduced capacity payments for combined-cycle gas plants.

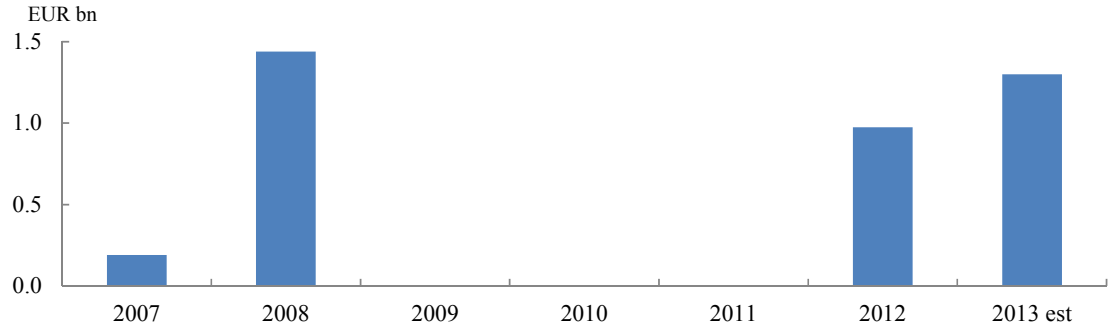
Altogether, the Spanish efforts to reduce its tariff deficit have only been partially successful. The electricity tariff deficit reached EUR 3.6 billion (0.35% of GDP) in 2013, in spite of the government's intention to have zero tariff deficit that year. There are no doubts that the tariff deficit would have been even higher without the reforms. On the other hand, multiple and sometimes chaotic initiatives to

eliminate the tariff deficit created uncertainty in the electricity system. Fitch rating agency assessed that "these measures have failed to bring a credible or predictable end to the problem of tariff deficit in Spain" and downgraded the securitisations of the Spanish electricity tariff deficit in January 2014 ([34]).

3.4.2. Portugal

The tariff debt in Portugal is also substantial. The total accumulated tariff debt was estimated by the regulator at EUR 3.7 billion (2.2% of GDP) at the end of 2013; according to other government estimates, it could be even higher at 2.6% of GDP (EUR 4.4 billion) ([35]). This means a substantial increase in comparison to EUR 2.85 billion (1.7% of GDP) of tariff debt at the end of 2012 (ERSE 2013). The majority of the Portuguese tariff deficit emerged in 2008, 2012 and 2013 (Graph 3.9).

Graph 3.9: **Evolution of electricity tariff deficit in Portugal, 2007-2013**



Source: Commission Services based on data from ERSE, EDP

The tariff deficit in Portugal therefore represents a mismatch between the integral electricity tariff (which should cover energy, network, taxes, levies and other relevant costs) and the sum of the corresponding costs borne by energy utilities.

The regulated tariffs for households are gradually being abolished from January 2013, with a transition period of three years until the end of 2015. The regulated tariff for industrial electricity users was abolished in 2010([36]). Nevertheless, the energy regulator will continue to approve tariffs for access to electricity networks. Moreover, economically vulnerable consumers will continue to pay a social tariff with a discount on the electricity bill directly set by the government (although it represents a small share of the deficit). The tariff deficit may therefore continue to be generated for these components in case the tariff revenues do not match the corresponding costs.

Two different factors were responsible for the emergence of the tariff deficit in Portugal. In 2007 and 2008, the mismatch between the actual wholesale price and the price implied in the tariff was the major factor contributing to the deficit. In 2008, the implied wholesale price was 50 EUR/MWh and the actual average purchase price of electricity on the wholesale market was 73 EUR/MWh (Manso Neto 2012). High wholesale market prices were caused by increased oil and other fuel prices and volatile hydropower production, which are difficult to predict when setting tariffs for the year ahead. Wholesale electricity prices returned to lower levels from 2009.

([34]) FitchRatings (2014).
([35]) Website of Ministerio do Ambiente, available at http://www.portugal.gov.pt/pt/os-ministerios/ministerio-do-ambiente-ordenamento-do-territorio-e-energia/mantenha-se-atualizado/20140129-maote-ar-energia.aspx.
([36]) DG ENER (2011).

In the recent years, rising subsidies to renewable and conventional electricity led to increasing electricity costs, and in consequence to a tariff deficit. These subsidies included both support under the special regime (to renewables and co-generation) and under the ordinary regime (such as power guarantee incentives and compensation for the early termination of former long term power purchase agreements) ([37]). Surging renewable subsidies were a major factor in rising electricity costs, reflecting an increase in installed capacity. Between 2009 and 2011, support to renewable electricity increased from EUR 528 million to EUR 752 million, i.e. by 42% (ACER/CEER 2013b). The cumulative wind power installed in the country increased from 1 GW in 2005, 3.5 GW in 2009 to 4.1 GW in 2011 (IRENA 2012).

The increasing costs of electricity production due to increased support should be reflected in increased tariffs. However, the authorities considered that, due to the economic crisis, the energy policy costs could not be fully compensated by electricity tariffs. As a result, the tariff deficit has substantially increased in the recent years.

The financial burden resulting from the tariff deficit was provisionally borne by the last resort supplier of energy, the EDP. The legal framework in Portugal recognizes that the utility that bears the tariff deficit burden is entitled to recover the corresponding amount. This electricity debt was securitised by EDP and is backed by payment rights repaid as a surcharge on electricity costs. In 2009, EDP placed on the market some 1.7 MEUR bonds for 2007-2009 tariff deficits, and made subsequent placements in the following years. These bond issues were priced at 100-150 bps over the Portuguese government bonds. Contrary to Spain, these bonds do not have an explicit guarantee of the state budget.

Measures to address the electricity tariff deficit have been included in the economic programme for Portugal (European Commission 2014c). The objective is to eliminate the tariff debt by 2020. The main measures include:

- Moratorium on support to new renewable energy installations and elimination of power guarantee incentives (capacity payments);
- Revised remuneration scheme for co-generation;
- Agreement with EDP on reduced compensation for the early termination of former long term power purchase agreements (known as CMEC); the negotiations with this company about the compensation for the extension of exploitation licences of coal-fired Pego and Sines power plants reached a deadlock;
- Levies paid by wind and small hydro producers until 2020, in exchange for receiving some price guarantees behind the current licencing period;
- Additional levy, since 2014, on energy generators, who achieve some windfall profits thanks to increased electricity prices in the MIBEL market caused by the levy on the Spanish generators;
- Earmarking the revenues from CO2 licences sale to reduce the tariff deficit;
- Limited annual increases in tariffs paid by electricity consumers.

The results of these measures have been mixed so far. The Commission assessed recently that the *rent-reducing measures implemented so far to eliminate the tariff debt by 2020 and ensure the sustainability of*

([37]) European Commission (2013c).

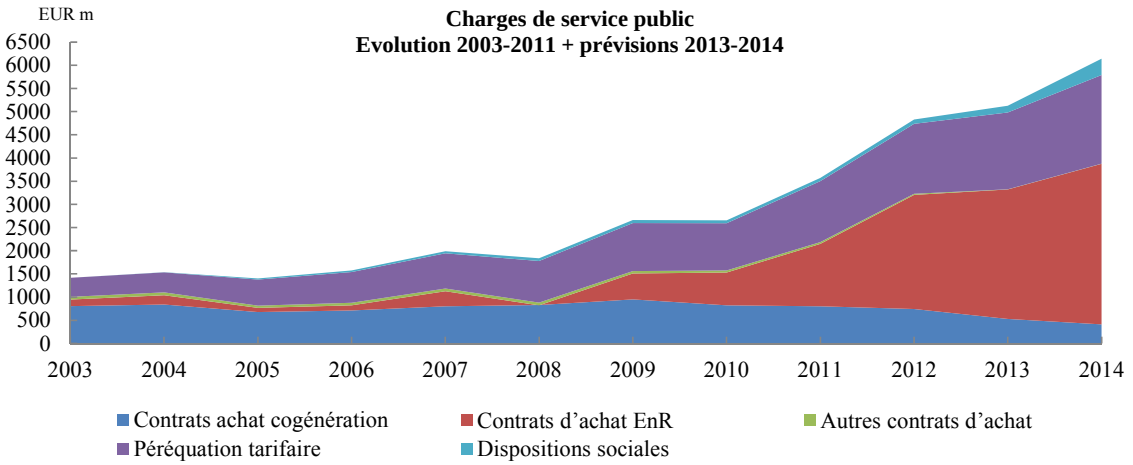
the system appear to be insufficient ([38]). Recent forecasts show a worsening of the debt, which indicate a deteriorating development, which implies that further measures will be needed to phase out the deficit.

3.4.3. France

France displays a tariff deficit on the account of the "Contribution to the Public Electricity Service" (CSPE). This contribution covers the costs of support to renewables (which represent 60% of CSPE costs), support to co-generation, subsidies to electricity costs in Corse and on other islands, as well as the social tariff for vulnerable consumers. The cumulative shortfall at the end of 2012 was estimated by the French energy regulator to EUR 3.5 billion, an equivalent of 0.18% of GDP (CRE 2013b). According to EDF, a French energy utility, in 2013 CSPE had a deficit of EUR 0.45 billion (EDF 2014). This brings the cumulative tariff debt at the end of 2013 to some EUR 4 billion (0.2% of GDP).

The deficit on CSPE account has emerged due to rising CSPE costs in recent years, while the revenues from the regulated CSPE tariff were not sufficient to cover these costs.

Graph 3.10: **Evolution of regulated public service costs of the electricity system in France, 2003-2014**



Source: CRE

The CPSE tariff is set by the Energy Minister upon a proposal of the energy regulator. If the tariffs proposed by the regulator for a given year are not approved, the existing tariffs are automatically applied for the next year with an increase limited to 3 €/MWh. For instance, CSPE contributions amounted to €13.5/MW in 2013 and have been raised by €3/MW to €16.5/MW as of 1 January 2014, although the energy regulator requested a higher tariff increase.

According to the regulator, CRE (2013c), the CSPE deficit started in 2002, but it was insignificant until 2008. Higher deficits, between EUR 0.4 billion and EUR 1.5 billion per year, were recorded from 2009 until 2013. The annual costs and revenues of CSPE should return to equilibrium from 2014 because of the increased tariffs, but without taking into account the costs of reimbursement of the accumulated deficit.

([38]) Ibidem.

Graph 3.11: **Evolution of electricity tariff deficit in France, 2007-2013**

Source: Commission Services based on data from ERSE, EDF

The tariff deficit was provisionally borne mainly by the electricity incumbent, EDF. The French authorities recognized, however, that the shortfall emerged due to public service obligations and agreed to reimburse the tariff debt with interests until the of end 2018.

In addition to the deficit on CSPE account, the French energy regulator CRE has also concluded that the regulated integral electricity tariffs did not cover the actual costs borne by the incumbent electricity company, i.e. the state-controlled EDF. This shortfall was assessed by CRE at EUR 1.47 billion (0.07% of GDP) in 2012 (CRE 2013a). The main reason for this deficit were rising production costs for the electricity produced by EDF, as the costs increased by 4.5% each year on average in 2007-12. These rising costs were not matched by corresponding tariff increases.

3.4.4. Greece

Greece faces a deficit in the special account for renewable energy (RES account). The cumulative tariff debt in RES account was estimated at EUR 700 million (0.4% of GDP) in early 2014. Tariff deficits have been recorded since 2011. The deficit on the RES account reached EUR 195 million (0.1% of GDP) in 2011 and EUR 340 million in 2012 (European Commission 2013d). This reflects large investments in renewable generation capacity. The installed solar photovoltaic (PV) power capacity increased for example from 48 MW in 2009 to 620 MW in 2011 and 2600 MW at the end of 2013 ([39]). In 2014, PV is expected to cover 7% of electricity demand in Greece.

The expansion of solar power generation was pushed by very generous incentives, in the form of feed-in tariffs for PV. Such incentives were not promptly adjusted to take into account the decrease in the cost of technologies, thus creating windfall profit opportunities. The ensuing surge of the cost of supporting renewable energy should have been covered through a substantial increase in renewable levies, which was however difficult to implement as users were hit by the economic crisis. This has led to an emergence of tariff deficit, and therefore of cumulated debt on the RES special account managed by LAGIE, the market operator, since 2011.

In order to eliminate the deficit and the debt, the authorities allocated several additional sources of revenues to the RES account. In addition to the levy paid by electricity consumers and the revenues from RES production sold in the wholesale market, the revenues of the RES account include a levy from the production of electricity from lignite, revenues from the sale of unused CO2 allowances and a part of the revenues from the television license fee. An additional source, from 2012 to 2014, is a solidarity contribution, with rates between 25% and 30% of the revenues received, paid by producers of electricity

([39]) Data of the Hellenic Association of Photovoltaic Companies (HELAPCO).

from photovoltaic plants, and of 10% paid by the producers from other RES sources. In spite of these revenues, however, the RES account remained financially unsustainable, also because the solidarity contribution would expire in July 2014 and a financial gap estimated at €400ml million yearly would have emerged.

In March 2014, following a public consultation, the authorities announced further measures to correct the situation in a structural way and bring the debt in the RES account to zero by the end of 2014, in line with the economic adjustment programme. These measures include retroactive cuts in feed-in tariffs by, on average, 28% for PV plants and 5.4%% for wind and hydro projects, a write-down of arrears owed to RES producers by €310 million (equivalent to a 28.7% write-down for PV producers and 10% for others), and the introduction of a 200 MW annual cap on new PV installations receiving support. The retroactive cuts were differentiated to take into account the size and the vintage of the investment (and thus the extent of overcompensation and windfall profits) and any state aid received. As a compensation for lower tariffs, the authorities extended the agreements with renewable power producers by seven years ([40]). Finally, the energy regulator raised the renewable levy paid by electricity consumers up to 15€/MWh, an increase of 4.8€/MWh or 47%; further adjustments of the levy are possible in the future if needed.

In addition to the RES account deficit, current tariffs for low-voltage consumers (households, SMEs and agriculture) are not sufficient for a full recovery of energy costs. This difference is mainly accumulated by the incumbent company PPC and largely due to the level of tariffs and to cross subsidies from higher electricity prices paid by commercial users and residential users with a large consumption, in favour of residential users with a low consumption level and agriculture users. The amount of these cross subsidies was gradually reduced in the last years and consumer prices progressively increased, but a sizeable gap remained. In line with the economic adjustment programme, a full liberalisation of electricity prices for households and SMEs, except for vulnerable consumers, was introduced on July 1st, 2013. This failed, however, to ensure full recovery of the electricity cost. Therefore, following a commitment taken by the Greek government under the adjustment programme, PPC announced, at the end of July 2014, a new framework for low-voltage tariffs, which significantly reduced cross-subsidies, simplified the structure and increased tariffs for low-voltage users not included in the social tariff for vulnerable customers (i.e. the increase mainly affected secondary houses). Action is still needed to ensure a correct identification of agriculture users, whose tariffs are also reportedly much below cost-recovery.

Finally, the Greek electricity system faces another very significant financial shortfall related to a strong rise in unpaid electricity bills, which was reported at EUR 1.3 billion ([41]) (0.7% of GDP) in 2014. The gap between bills issued and payments collected was reported to amount to €4 million per day ([42]). While this was due mainly to the deepening recession, the high amount of unpaid bills may also be caused by the inclusion in the bill of house property taxes, high taxes and charges on electricity (including RES levy) and a levy for state television. As agreed under the second economic adjustment programme, the government cleared by end-July all arrears to PPC due by the general government and committed to clear all arrears to PPC by the public sector by end 2014.

3.4.5. Bulgaria

A World Bank report of May 2013 addressed the issue of electricity tariff deficit in Bulgaria. This deficit is however different as compared to the situation in Spain, Portugal and Greece, described above.

Electricity prices for household consumers in Bulgaria are regulated. The country has an integral electricity tariff covering all electricity costs including energy generation, transmission, distribution, supply, and support to renewables etc.

([40]) European Commission (2014d)
([41]) http://www.eletaen.gr/drupal/sites/default/files/deltiatypoy/Note_for_the_cash_deficit_04052012.pdf
([42]) http://www.ekathimerini.com/4dcgi/_w_articles_wsite2_1_19/01/2014_536462

Retail prices for households are in nominal terms by far the lowest in the EU and hardly changed between 2008 and 2012. On the other hand, over the past five years there was an upward trend in generation costs due to the recent expansion of renewables stimulated by generous subsidies for solar power and co-generation. Other factors like the long term purchase power agreements and delays in market liberalisation also played a role. Investment in wind and solar power installations over the last year in Bulgaria is estimated at more than 4 billion euros ([43]), which needs to be repaid by surcharges on electricity prices over the next years. According to the World Bank and the utilities, the integral tariff is not sufficient to match the corresponding costs borne by electricity utilities.

However, in contrast to Spain and Portugal, the existence of this deficit tariff deficit is not recognized by the authorities as a public liability. Thus, the Bulgarian government has not given the utilities credit rights to recover the corresponding amount. The situation is further complicated by lack of accounting standards for regulated utilities, lack of cost benchmarking, as well as by market distortions such as cross subsidies and purchase power agreements ([44]).

The deficit has accumulated in the energy system, especially in the foreign-owned distribution companies ([45]) (which also collect the revenues from energy consumers) and in the incumbent state-owned electricity supplier NEK. The financial situation of the latter is deteriorating quickly; at the end of 2013, NEK is considered to have a debt of BGN 2.3 billion (3% of GDP) ([46]) and one third of this amount were liabilities to energy producers. Foreign-owned energy distribution firms have announced their intentions to sue Bulgaria over non-compensated obligations for purchasing electricity from renewable energy sources, and claim to have accumulated substantial losses due to these obligations ([47]). NEK and the distribution companies are also in dispute over the amounts of renewable subsidies, which are collected by the distribution companies and should be paid to NEK ([48]). While there is no official estimate of the electricity tariff deficit, the annual deficit in 2013 has been estimated by the World Bank to be between BGN 800-1200 million (1 - 1.5% of GDP) and is expected to increase further in the coming years ([49]) if no measures are taken.

The Bulgarian energy regulator tried to increase electricity prices for households by 14% as of January 2013 to match the rising electricity system costs. This decision, however, triggered dramatic street protests and finally led to the resignation of the government of PM Borisov in February ([50]). Following these events, the energy prices for households were cut in several steps by an average of 13 per cent in 2013 ([51]).

Other measures to reduce the energy system costs include the introduction of grid access tariffs for renewable energy producers and the prohibition of access to the energy system for a part of the grid-connected renewable capacity. These measures were contested by the renewable investors and some International Financial Institutions, who claimed they were breaching the law. The first of these measures was indeed revoked by the constitutional courts as discriminatory ([52]). In addition, in December 2013 the parliament imposed a 20 percent charge on income from wind and solar power installations in 2014. This measure was also sent to the constitutional court by the President, who considered the fee on wind and solar power producers as a form of discrimination against other electricity generators.

([43]) http://uk.reuters.com/article/2013/12/05/bulgaria-renewables-idUKL5N0JK1BF20131205.
([44]) World Bank (2013).
([45]) CEZ, EVN and Energo Pro.
([46]) http://www.novinite.com/articles/157403/Bulgaria%27s+National+Electric+Company+Entangled+in+Debt. The NEK financial statement for 2013 has not been available before the closure of this publication.
([47]) http://www.novinite.com/view_news.php?id=149146.
([48]) http://www.bloomberg.com/news/2014-03-19/bulgaria-moves-to-revoke-power-selling-licenses-of-cez-evn.html.
([49]) Ibidem.
([50]) http://www.ebrdblog.com/wordpress/2013/03/bulgaria-energy-sector-economics-behind-the-political-turmoil/.
([51]) http://www.reuters.com/article/2013/12/05/bulgaria-renewables-idUSL5N0JK1BF20131205.
([52]) http://www.reuters.com/article/2013/03/15/bulgaria-energy-renewable-idUSL6N0C6EEP20130315.

In order to eliminate the financial difficulties of the power sector, the World Bank's (2013) report recommends a comprehensive set of measures involving electricity producers, consumers and the public sector. In addition to limited tariff adjustments, they should include a reduction of preferential pricing for cogeneration, "equitably addressing" financial liabilities arising from preferential tariffs for renewable energy, long-term agreements and failed investments; reducing costs through the whole energy chain etc. As Bulgaria has an excess generation capacity, one of the recommendations is to facilitate exports which would require better interconnections. The World Bank addresses also the energy poverty aspect and suggests increasing the heating allowance and other social benefits for the poorest, as they decreased dramatically over the recent years.

3.4.6. Other countries

In **Germany**, renewable electricity is supported by the surcharge for renewable electricity (EEG surcharge) financed by the consumers. The EEG account had temporary deficits in recent years due to differences between the forecasted and actual renewable costs. In 2012 this difference amounted to EUR 2.7 billion (0.1% of GDP) and resulted from higher than foreseen renewable production, and from lower wholesale price (which increased the amount of subsidies in feed-in tariffs) ([53]). However, contrary to Spain, Portugal and Greece, the German renewable account deficits have not been cumulated, but have each time been repaid in the following year as one of the components of the renewable surcharge. For instance, in 2013, out of 52.4 EUR/MWh of the renewable levy paid by consumers, 6.3 EUR/MWh was charged due to "equalization of the negative balance from the previous year" ([54]). As a result, the surplus of the EEG account in 2013 was almost equal to the 2012 deficit (EUR 2.5 billion), and the balance of the EEG account was fully restored in early 2014 ([55]).

Due to increasing amounts of supported electricity, the renewable levy per MWh of consumed electricity increased very fast in the recent years (by 47% in 2013 and by additional 18% in 2014). This leads to a serious burden on households and the part of the industry that pays the charge (energy-intensive industries are exempted from this levy). In 2013, the authorities considered to introduce a cap of 2.5% on the annual increase in the renewable levy paid by consumers, which would have increased the risk of having a tariff deficit. These plans were, however, abandoned. In 2014 the government has adopted a proposal for a revision of the Renewable Energy Act aimed to slow down overall renewable cost increases, distribute the costs more evenly across consumers, control the expansion of renewables and promote their integration into the market.

In **Italy**, another major renewable energy producer, initially provided support through a quota obligation with green certificates. This support is passed on to energy consumers through the increased energy wholesale price, which includes additional costs borne by producers to comply with the RES quota. Since 2005, solar PV is supported through feed-in tariffs; since 2012, feed-in tariffs and premiums are also available to RES other than solar.

Like in Germany, financial incentives for renewable electricity generation are paid for by electricity consumers through an added charge to their power bills (Brown 2013). The differences between the forecasted and actual costs of support should be financed by the consumers in the following period, so the deficit should not be cumulated ([56]). However, a report of the national energy regulator ([57]) acknowledged

([53]) International Energy Agency (2013).
([54]) http://theenergycollective.com/schalk-cloete/326791/dissecting-germanys-eeg-surcharge.
([55]) Information about the state of the EEG account is published regularly on website http://www.netztransparenz.de.
([56]) According to the information provided by the Italian Ministry of Economy and Finance, the current legal framework in Italy prohibits the emergence of electricity tariff deficits because any arising imbalances must be reflected in electricity tariff adjustments paid by the electricity consumers. Furthermore, the Italian law clearly excludes the possibility of transferring such costs to taxpayers. The tariff revenues are collected by the CCSE (Cassa Conguaglio per il Settore Elettrico) and are allocated to several accounts having different functions. Temporary imbalances can result from mismatches between actual revenues generated from each tariff component and the account-specific expenditures. In this case, the Cassa Conguaglio can use residual stocks in its accounts to face temporary imbalances, provided that such funds are progressively restored in order to guarantee

a cumulated deficit of the RES account (A3 account) of EUR 1.5 billion at the end of 2012. This deficit was generated between 2009 and 2012. According to the Italian authorities, this shortfall was eliminated as of 2014 through higher tariffs implemented in 2013 ([58]).

In **Malta**, the state-owned electricity utility Enemalta has accumulated some EUR 0.87 billion of debts, an equivalent of 12% of GDP (European Commission 2014e) and showed negative profits and cash flows in the recent years. As Enemalta is the only supplier of electricity to final customers and the electricity prices are fully regulated, the company's losses may be considered as a sort of tariff deficit: the revenues from the regulated tariffs are not sufficient to cover its costs.

However, Enemalta's situation is specific and results from several factors. The company has very high costs due to its oil-based generation facilities, which makes it difficult to fully pass on the costs to consumers. The company incurs high costs related to its ongoing investment in an interconnector with Sicily, but also has operational inefficiencies and suffers from a huge amount of unpaid electricity bills. The government's plan to restructure Enemalta aims to reduce the high cost of electricity generation by converting its existing plants to run on cheaper natural gas instead of heavy fuel oil. The plan also includes an equity injection (from a Chinese investor) in return for a minority stake in Enemalta. However, the authorities' decision to reduce energy tariffs by 25% from March 2014, while simultaneously cutting energy production costs at Enemalta risk to negatively impact Enemalta's profitability ([59]) and increase its debts. Nonetheless the improvement in operational efficiency of the planned generation plant, the closing down of the old Marsa Power Station, the switch to gas, and the possibility to access the European Electricity Market via the interconnector (thus allowing Enemalta to benefit from economies of scale not possible in the local context,) should ensure the long-term sustainability of Enemalta.

Romania has a shortfall of revenue in electricity distribution. This deficit concerns the deferred revenues of two foreign-owned energy distributors, ENEL and CEZ, estimated at some EUR 150 million (0.1% of GDP) in 2012. The energy regulator, ANRE, applied price caps in distribution for each voltage level, which has been unchanged since 2007. On the other hand, these distribution companies made investment in their distribution networks as required by their privatisation contracts. The regulator recognizes that these investments must be recovered by higher tariffs at some point in the future, but has so far not agreed to raise tariffs. ANRE and the distributors have agreed to recover the amount over the next five years, but at the same time ENEL and CEZ have created provisions for these amounts, on the assumption that the recovery of these costs might prove to be difficult (Expert Forum 2012).

Another issue concerns the substantial debts accumulated by state-owned enterprises in the Romanian energy generation sector. Electricity prices for households continue to be regulated and will be gradually liberalised by the end of 2017, in line with the conditions of the agreement with the IMF ([60]). These prices are still very low, the second lowest in the EU, and are considered to be at a level that does not fully cover costs ([61]). Low electricity prices for households are partially cross-subsidized by higher energy prices for industrial consumers, which have been liberalised from 2014. The state-owned enterprises in the energy

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full liquidity of the Cassa. Hence only temporary imbalances can occur, with movements within accounts managed by the CCSE guaranteeing that electricity enterprises receive the accrued payments in full. As a consequence, according to CSSE's balance sheets, tariff deficits have never been recorded by the CSSE.

([57]) (Italian) Regulatory Authority for Electricity and Gas (2013).

([58]) In the second half of 2013, the electricity tariff was adjusted to rebalance various accounts managed by the CCSE, taking into account the estimated costs and revenues for 2014. In particular, the A3 component tariff rate was raised by 16% in comparison to the same period of the preceding year. Given the improvement achieved in 2013 due to the progressive increase in the A3 component and the preliminary results for 2014, the Italian authorities consider that,as of 2014, Italy has eliminated the tariff imbalance reported in previous years.

([59]) Reuters, Fitch Affirms Malta at 'A'; Outlook Stable, 14 March 2014.

([60]) International Monetary Fund (2013).,

([61]) SAR (2011).

generation have accumulated substantial debts over the recent years, leading in one case (Hidroelectrica) to an insolvency procedure. These debts result partially from too low regulated prices, but also from many other factors, such as bilateral contracts with large energy-intensive companies at very low prices, obsolete technologies leading to poor fuel efficiency, overinflated maintenance costs, and poor governance.

In **Hungary**, electricity, gas and district heating tariffs were reduced by 20% in 2013 for residential consumers. Further tariff cuts are foreseen in 2014. To a certain extent, the reduction in the utilities' revenues in the household segment of the market was compensated by cross financing from the industrial consumers, whose tariffs were increased (KPMG Hungary 2014). Lower electricity prices for end-users reflected also lower wholesale market prices in that year. It seems, however, that the reduced electricity prices may be below the corresponding costs which leads to losses in the energy system, in particular for the mainly foreign-owned distribution companies and for the state-owned incumbent MVM. Universal services generated HUF 20 bn (EUR 71 million) losses for the electricity companies already in 2011 and HUF 13.5 bn (EUR 45 million) losses in 2012.

In Latvia, the national transmission system operator Augstsprieguma Tīkls reported losses until 2010 which might indicate that the tariffs in transmission activity were too low in comparison to the costs borne by the operator. However, the company has returned to profits since 2011. Similarly, the main electricity distribution company Sadales Tikls had negative profits in 2009-2011, which might indicate an existence of the tariff deficit in distribution activity in these years. The distribution company returned to profits in 2012-2013([62]). A part of the losses in transmission and distribution activities could be attributed to delays in the approval of regulated tariffs by the public utilities regulator. In spite of the losses of the transmission system operator and distribution company, the vertically integrated state-owned Latvenergo Group (Sadales Tikls is a part of this group, and Augstsprieguma Tīkls was a part of until the end of 2011) was profitable in all years since 2009([63]). Therefore the deficit in these segments did not cumulate and there was no need in external financing. The inability of Latvenergo to pass electricity costs onto customers via regulated costs was seen as a negative factor for the overall company ([64]).

([62]) Data from Annual Reports of Augstsprieguma Tīkls and Sadales Tikls.
([63]) Data from the website of Latvenergo Group.
([64]) Moody, 20 March 2014. Website of Latvenergo Group.

4. DETERMINANTS OF ELECTRICITY TARIFF DEFICIT

4.1. METHODOLOGY AND DATA DESCRIPTION

In this section an empirical analysis is presented, aiming at identifying the possible drivers of tariff deficits. Although there is literature on the occurrence and persistence of electricity tariff deficit in some Member States (mainly Spain) ([65]), the determinants of the electricity tariff deficits have so far received relatively little attention by researchers and policy makers. Given the theoretical considerations and findings presented in Sections 2 and 3, this chapter analyses the role played by a number of relevant explanatory variables such as the macroeconomic conditions, existing energy policies, as well as institutional and external factors. In particular, the following variables ([66]) were chosen to be included in the empirical analysis:

- **GDP growth:** Economic growth is considered a major driver of electricity demand, which in turn constitutes an important factor in the tariff setting mechanism itself. Regardless of the preferred cost allocation methodology, demand is used to determine the costs per unit transmitted or distributed electricity. During the economic crisis, the projections regarding future demand have turned out to be too optimistic when the consumption of electricity declined due to fall in economic activity. As a result, the predetermined tariffs have turned out to be insufficient to recover the system's cost, which to a large part consist of fixed or regulated costs. This has in turn resulted in a need to increase the tariffs in subsequent years. Thus, in some Member States this have led to temporary deficits, while in others it has resulted in more permanent deficits, as authorities have been reluctant to raise tariffs sufficiently to keep pace with falling demand ([67]).

- **Government debt or deficit (as a share of GDP):** To address increasing public deficits and debts in Europe and elsewhere, governments have focused on fiscal consolidation. This has a potential impact on the likelihood of a tariff deficit as the Member States have less fiscal space to cope with a potential deficit in the electricity sector, while with a better fiscal position the deficit can possibly be addressed through the public budget. The latter has happened in some Member States. For example, in 2012, distribution charges in Czech Republic increased due to extra costs induced by renewable support. Due to a subsidy of CZK 11.7 bn from the national budget, the increase in the electricity price required to match the increase in cost was reduced.

- **Consumption under regulated prices ([68]):** This variable is a proxy for price regulation. It signals the effects that preferential regulated tariffs can have on the market functioning. In this regard, a higher share of consumption under regulated prices that do not reflect the underlying costs will contribute to the likelihood of a tariff deficit occurring and its persistence, especially in the retail segment of the market. This is particularly true when governments have turned to price regulation decisions that set electricity prices below the corresponding costs. In order to capture political intervention in the energy regulatory decision-making process, especially in the price setting, two additional variables ([69]) were included in the analysis. The first one reflects the effectiveness of the government and the second one the quality of regulation. It is expected that lower values of these variables will be associated with a higher propensity of an electricity tariff deficit, as a political influence in the tariff setting will tend to hold prices at a level below the corresponding costs.

- **Renewables penetration:** The actual production of renewable electricity is one of the key elements for calculating the total cost of the subsidies to renewables. Thus, the share of renewable electricity is

([65]) Maranon and Morata, 2011; Mendoza, 2013; Robinson, 2013.
([66]) See table A1.5 in annex for data description.
([67]) Robinson, 2013.
([68]) This variable is calculated as the product of the consumption of household customers in the country supplied under regulated end-user prices and the share of household consumption in the total consumption in the country.
([69]) World Bank Indicators on governance. See table A1.5 in annex. .

used as a proxy to capture the effect of the increasing costs for the subsidisation of renewable electricity in the system.

- **Retail Competition:** This variable indicates whether retail prices reflect the cost of production and distribution. In other words, it is used to assess whether price regulation, where it is applied, is distortive or not. Artificially low prices are generally considered as barriers to entry because they prevent new companies to compete in liberalised market segments and thus prevent them from entering the market on equal terms. Consequently, the higher the competition in the market, the lower is the expected probability of having a tariff deficit.

- **Crude oil prices:** This variable influences one key component of the electricity tariffs through the evolution of wholesale cost: the energy and supply component. As the prices of gas, and to some extent coal, used as inputs to generate electricity are linked to crude oil price, the wholesale cost will closely follow the development of the crude oil price. As the wholesale cost represents in many cases more than 90% of the total electricity supply cost (which in turn accounts for around 50% of the total retail price), it is expected to increase retail electricity prices ([70]).

Taking into account the data scoping of section 3.2, Table 4.1 displays the number of countries facing a problem, and the corresponding share of Member States in EU electricity consumption. The figures indicate that the number of countries facing a tariff deficit problem increased considerably after 2009 reaching eleven in 2012. These countries represent more than 60% of EU-28 electricity consumption in 2012.

Table 4.1: **Share of countries facing an electricity tariff deficit over the period 2007-2012**

Year	2007	2008	2009	2010	2011	2012
# of countries having an electricitity tariff deficit	4	4	7	10	10	11
Share of electricity consumption in the EU-28 (%)	26%	26%	43%	60%	41%	61%

Source: Commission Services

Table 4.2 reveals the differences in the explanatory variables across countries with an electricity tariff deficit and the rest of the countries. The macroeconomic variables differ substantially across the two groups implying that the economic crisis had a larger impact on countries with electricity tariff deficits. Another striking difference is the fact that in countries with an electricity tariff deficit, the number of main retailers is around half of the number in countries without this problem. This might explain the differences in the cost reflectiveness of their tariffs. Similarly, the penetration of renewables between the two groups varies significantly, as well as the variables that represent the share of consumption under regulated tariffs, the effectiveness of the government and the quality of regulation. The crude oil price, in contrast, presents the lowest gap.

Table 4.2: **Descriptive statistics between countries with and without an electricity tariff deficit**

	Countries without an electricity tariff deficit				Countries with an electricity tariff deficit			
variable	**mean**	**sd**	**min**	**max**	**mean**	**sd**	**min**	**max**
Government Deficit to GDP (%)	3.22	4.52	-5.30	30.60	5.28	3.57	-2.00	15.70
Government Debt to GDP (%)	50.51	27.38	3.70	117.40	73.26	38.56	9.00	170.30
GDP (%)	9.89	7.53	-2.60	34.10	5.66	7.35	-13.30	22.10
Share of RES (%)	20.90	18.12	0.06	75.91	25.48	18.16	0.00	66.63
Retail Competition (# retailers)	4.08	1.97	1.00	9.00	2.60	1.95	1.00	8.00
Crude Oil Price	64.55	14.38	44.65	86.85	68.23	15.30	44.65	86.85
Consumption under regulated tariffs (%)	21.45	11.62	0.00	37.96	26.80	9.86	0.00	38.92
Governement Effectiveness	1.27	0.61	-0.36	2.36	0.83	0.50	-0.31	1.58
Quality of Regulation	1.35	0.39	0.52	1.92	0.99	0.29	0.50	1.58

Source: Commission Services

([70]) European Economy (2013e)

Box 4.1: **Methodology**

In order to estimate the likelihood of having an electricity tariff deficit, a binary panel model was employed based on the theoretical considerations and findings presented in the previous sections. The probability of having a tariff deficit is explained by a set of covariates, x_{it}, that consider the effects of macroeconomic country-level factors, energy policy related characteristics and other external factors. Having studied and estimated several models (probit, logit and extreme value alternatives), the chosen logit panel model is shown in Eq. (1).

$$y_{it}^{*} = X_{it} b + e_{it}, \quad i=1,\ldots 27,\ t=2007,\ldots 2012 \qquad (1)$$

Where y is a binary variable that takes the value 1 if there is a tariff deficit in country (i) and year (t) and zero otherwise. This is based on the data scoping presented in section 3.2. The vector x_{it} includes a set of observed regressors ([1]) which might be driving the occurrence of an electricity tariff deficit. The error term e_{it} is assumed to be normally distributed with zero mean and a constant variance. The model was estimated using annual data for EU-27 and for the period 2007-2012, based on a random effect specification, ([2]) in order to account for unobserved time invariant heterogeneity across countries. In this case the error term is given by:

$$e_{it} = a_i + u_{it}, e_{it} \sim iidN, a_i \sim iidN(0, \sigma_a^2)$$

According to theory, a logit estimation hypothesize that the probability P of the occurrence of an event is determined by the following function:

$$P_i = f(Y_i) = \frac{1}{1 + e^{-Y_i}}$$

The marginal effect of Y on the probability, which will be denoted f(Y), is given by the derivative of this function with respect to Y:

$$f(Y_i) = \frac{dP}{dY} = \frac{e^{-Y}}{(1 + e^{-Y_i})^2}$$

As in all binary models, the marginal effect of any variable is not constant. It depends on the value of the function f(Y), which in turn depends on the values of each of the explanatory variables. To obtain a summary statistic for the marginal effect, the same procedure is used as in a simple logit analysis, i.e. the marginal effect is calculated based on the mean values of the explanatory variables.

([1]) See table A1.4 in annex for data description.
([2]) Random effects Panel Logit Model (REM) is appropriate when there are cross sectional differences or heterogeneity and this hetereogeneity is assumed to be not correlated with the regressors of the model.

4.2. MAIN RESULTS

Table 4.3 presents the parameter estimates for the probability of an electricity tariff deficit. The first column includes the macroeconomic country-level factors, institutional factors, energy sector characteristics, and other external factors defined previously, and the rest of the columns display their estimated coefficients ([71]). Specifications (1) to (3) include the government deficit and the GDP growth,

([71]) The combination of variables included in each specification was based on the correlation index between different pairs of variables. The correlation indexes indicate budgetary imbalance variables should not be included in the same specification. Similarly, only one variable of the institutional factors can be included in the specification.

while specification (4) only takes into account the deficit in order to test if there is a multicolinearity between these variables. In (5) and (6) the government debt replaces the government deficit. Along the same lines, specifications (7) to (9) only includes the GDP growth. Moreover, all specifications only include one variable from the institutional dataset. All the independent variables obtain the expected sign and almost all are statistically significant.

The probability to have a tariff deficit is driven by economic and energy market related factors. The economic determinants and the energy sector related variables, as well as the crude oil price remain in most of the specifications highly significant independently of changes made in the institutional variables. In addition the likelihood ratio test (LR) implies that the joint hypothesis of all the independent variables coefficients equal to zero is rejected and that random effects should be included in the analysis in all specifications.

Table 4.3: **Probability of an electricity tariff deficit (1)**

	SPECIFICATIONS								
VARIABLES	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**
Macroeconomic factors									
Government Deficit to GDP (%)	1.63***	.581**	.698***	1.34***					
Government Debt to GDP (%)					.189***	.129*			
GDP (%)	-.819***	-.726***	-.925***			-.761**	-0.613	-.523**	-.818***
Energy Sector Related Factors									
Share of RES (%)	.323***	.398***	.399***	.395***	.338***	.352***	.267*	.286***	.281***
Retail Competition (# retailers)	-2.15***	-2.7**	-2.13***	-1.96***	-1.28**	-1.53**	-1.23	-2.25***	-1.92***
External Factors									
Crude Oil Price	.31***	.254***	.292***	.189**	0.073	.189**	0.147	.155**	.192**
Institutional Factors									
Consumption under regulated tariffs (%)	.244*			0.171	0.151		0.0913		
Governement Effectiveness			-14.4***			-12.2***			-13.2***
Quality of Regulation		-25.9***						-21.4***	
Constant	-24.6***	6.82	-11.1**	-27.1***	-26.3***	-14.1**	-13.4**	12.2	-8.12
Random effect specification	5.44***	5.18***	5.23***	5.16***	4.93***	5.06***	4.62***	4.41***	4.5***
AIC	71.6	75.5	78.4	76.8	77.8	81.3	79.7	77.3	82.6
BIC	94.5	99.8	103	96.8	97.7	106	99.7	98.6	104
#Obs.	128	154	154	128	128	154	128	154	154

Note: *, **, *** Indicates significance at 10%, 5% and 1% confidence level
(1) Based on logit regression model
Source: Commission Services

As expected, the effect of the economic environment represented by the growth of GDP decreases the likelihood of an electricity tariff deficit. A good economic environment with growth is a major driver of electricity demand and hence makes it easier to ensure tariff sufficiency. It also indicates that the economic crisis has certainly contributed to aggravating the existing electricity tariff deficits.

The coefficients of the budgetary imbalances indicate that the higher and the more persistent the deficit or debt is, the more difficult it will be for a country to avoid having an electricity tariff deficit.

An increasing share of renewable electricity in power production contributes to the probability of having a tariff deficit. The coefficient of the renewable share over total electricity production confirms the stylised facts of section 3.2, where it was described that electricity tariff deficit in many countries (Spain, Greece, Italy etc.) is closely linked to a high penetration of renewables and the associated costs of support schemes. This fact has been acknowledged by many EU Member States, which are taking actions to reduce remuneration levels in line with falling technology costs, while moving to more market oriented instruments. The cut back of the subsidies to renewable electricity also reflect the need to consolidate public finances.

Box 4.2: **Model Accuracy**

Several tests have been developed in order to evaluate the performance of binary models and to compare the accuracy of various models' specifications. The most common tests include error type I and II, cumulative accuracy profiles (CAPs), accuracy ratios, receiver operating characteristics (ROC) and Brier score. To verify the estimated results, the error type I and II methodology has been employed. Binary models can lead to false results in two ways (see table 1 below):

a) When the model predicts that an assumed effect or relationship does not exist, when in fact it holds true. In this case, when there is an electricity tariff deficit for a specific Member State and year, the model would not confirm it.

b) When the model provides signals for an electricity tariff deficit, while in reality there is no deficit.

Table 1: **Error types**

		Model	
		YES	NO
Actual	YES	Correct prediction	Type I error
	NO	Type II error	Correct prediction

Source: Commission Services

A critical point of this methodology when evaluating the predictive performance of the preferred binary model is the selection of the threshold that determines an electricity tariff deficit occurring. Table 2 summarises the behaviour of type I and II errors, as well as the overall degree of accuracy for different thresholds. ([1])

Table 2: **Model accuracy**

		Model																		
		Specification									Specification									
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Threshold	YES*									NO*									
Actual YES	50%	77%	79%	76%	71%	66%	74%	75%	81%	82%	16%	16%	16%	19%	20%	18%	19%	16%	17%
	25%	76%	72%	75%	69%	67%	69%	67%	76%	72%	16%	16%	15%	19%	19%	18%	19%	17%	16%
	5%	66%	69%	72%	70%	66%	63%	62%	71%	69%	17%	14%	15%	18%	18%	17%	19%	14%	16%
Actual NO	50%	23%	21%	24%	29%	34%	26%	25%	19%	18%	84%	84%	84%	81%	80%	82%	81%	84%	83%
	25%	24%	28%	25%	31%	33%	31%	33%	24%	28%	84%	84%	85%	81%	81%	82%	81%	83%	84%
	5%	34%	31%	28%	30%	34%	37%	38%	29%	31%	83%	86%	85%	82%	82%	83%	81%	86%	84%

Note: *YES: stands for an electricity tariff deficit occurring - NO: stands for no electricity tariff deficit
Source: Commission Services

The results indicate that the preferred specifications outperform in terms of accuracy, regardless of the selected probability threshold for defining the electricity tariff deficit. Specifications (1), (2), (3) and (8) perform slightly better than the other specifications based on the degree of accuracy. The probability of both error types is considered relatively low. Most of the specifications, especially (3), (8) and (9) provide little evidence of missing signals, as in the worst case the error is close to 19%. This percentage concerns the missing signals of some specifications for electricity tariff deficit in Bulgaria, France, Malta and Romania. Similarly, the probability of a false alarms is slightly higher (around 30% on average), but this can still be considered as satisfying. These error types (II) concerned mainly Lithuania, Cyprus and Austria.

([1]) Note that missing values of explanatory variables for specific Member States and years did not allow the estimation of the expected probability of an electricity tariff deficit based on the selected specifications.

As regards regulation of retail electricity prices, the results indicate that the higher the consumption under regulated prices, the higher the probability of having an electricity deficit in a country. Under price regulation, prices are likely to be regulated at a level below real costs. As a result,

countries are more prone to generate deficits and thereby jeopardising both the economic viability of regulated companies and the energy system's security of supply.

Additionally, the variables on government effectiveness and quality of regulation suggest that governments are likely to influence the tariff setting process, which can generate a higher propensity for electricity tariff deficits. This indicates that although regulators are formally independent, they are subject to political influence due to political or funding reasons. Thus, they are not fully independent and tend to underestimate the energy system's cost in order to keep tariffs at levels perceived as acceptable for consumers at large.

Retail competition also matters for the probability of a tariff deficit. The results also imply that when there is a larger or increasing number of retailers in the electricity market, the likelihood of an electricity tariff deficit occurring would be lower. Hence, a large or increasing number of suppliers can be considered as an indication of a well-functioning market, where existing tariffs are cost-reflective and provide incentives to new entrants to enter the market.

Finally, the coefficient of the crude oil price indicates that the impact of oil price on the supply component has a positive impact on the likelihood of a tariff deficit. Higher cost of producing electricity due to increasing oil prices are not fully passed through to the consumers due to the price regulation. This is a situation observed in many Member States that have an electricity tariff deficit, such as Spain and Portugal.

4.3. MARGINAL EFFECTS

Due to the nonlinear assumptions of the logit model, the impact on the probability depends on the initial levels of the explanatory variables and their coefficients. Table 4.4 presents the marginal effect ([72]) of each variable, measured in terms of elasticities.

Crude oil prices and institutional factors have the largest impact on the probability of having an electricity tariff deficit. Taking into account specification (1), the results indicate that 1% increase in the crude oil price will increase the probability of having a deficit by at most 14.7%, which is also one of the highest marginal effects. Similarly, a 1% increase in the public deficit increase the probability by 3.4% and the same increase in the renewable share increase the probability by 4%. By contrast, a similar increase in retail competition and GDP growth would reduce the probability of an electricity tariff deficit by 6.8% and 6.5%, respectively.

([72]) In regression models, the marginal effect of an explanatory variable X is the partial derivative of the prediction with respect to X and measures the expected change in the response variable as a function of the change in X with the other explanatory variables held constant. In the interpretation of a regression model, presenting marginal effects often brings more information than just looking at coefficients.

Table 4.4: **Marginal effects (percentage changes)**

VARIABLES	SPECIFICATIONS [1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Macroeconomic factors									
Government Deficit to GDP (%)	3.401***	1.495***	1.659***	3.041***					
Government Debt to GDP (%)					7.134***	5.055**			
GDP (%)	-6.875***	-5.881***	-7.553***			-6.392***	-5.232	-4.302**	-6.812***
Energy Sector Related Factors									
Share of RES (%)	4.042***	5.653***	5.681***	4.608***	3.931***	5.235***	3.081***	4.271***	4.261***
Retail Competition (# retailers)	-6.506***	-8.196**	-6.391**	-5.932***	-3.888**	-4.715**	-3.711	-7.007***	-5.989***
External Factors									
Crude Oil Price	14.746***	12.688***	14.686***	9.175***	3.567	9.681***	7.261	7.922**	9.975***
Institutional Factors									
Consumption under regulated tariffs (%)	3.843**			2.729	2.437		1.526		
Governement Effectiveness			-13.855***			-11.747***			-13.039***
Quality of Regulation		-26.660***						-22.410***	

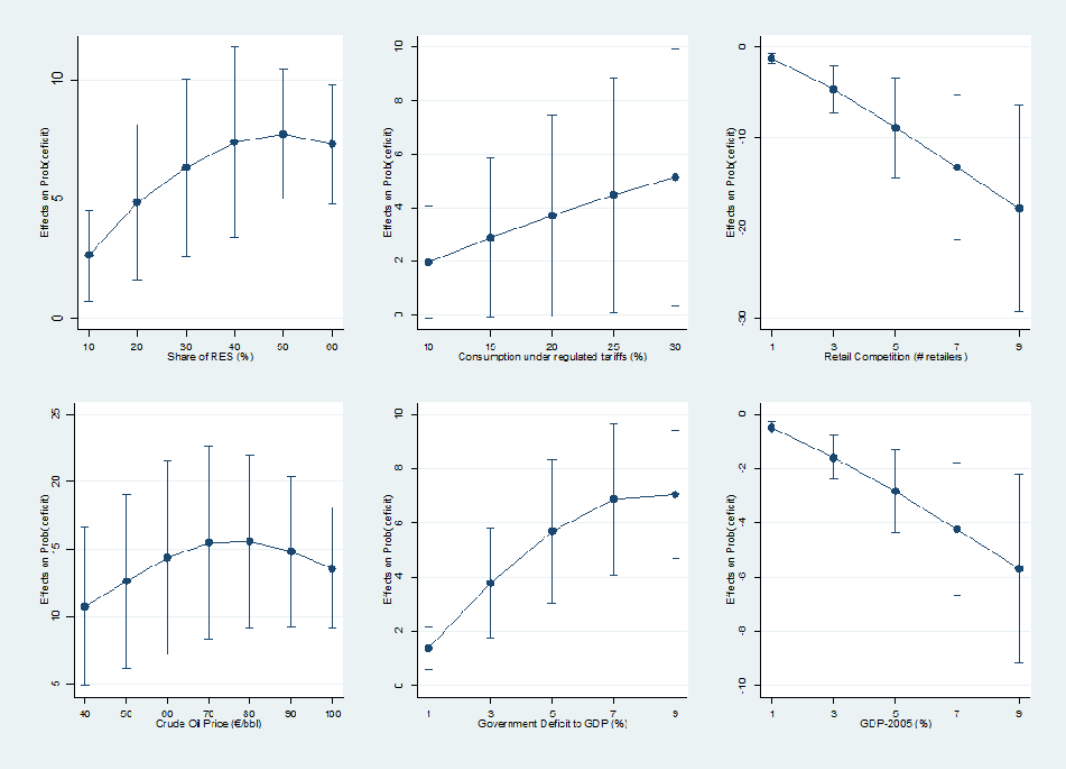
Note: *, **, *** Indicates significance at 10%, 5% and 1% confidence level
Source: commission Services

In addition, Graph 4.1 presents a sensitivity analysis of the estimated marginal effects, which takes into account the relevant range of the explanatory variables levels. In this context, the marginal effect will depend on the coefficient of the variable, but also on the initial level as we do not expect the impact to be constant. Specifically, the following scenarios have been tested: renewables shares ranging between 10% and 60% of electricity production; consumption under regulated prices ranging between 10% and 30% of total consumption; government deficit between 1 and 9% of GDP, annual GDP growth between 1% and 9%; crude oil price from 40€/bbl to 100€/bbl; number of main retailers operating in a country between 1 and 9. The estimated marginal effects per explanatory variable in Graphs 4.1 are based on specification (1).

The results reveal that the estimated marginal effects, i.e. one percentage change in the explanatory variables on the probability of having a tariff deficit, are significantly affected by the variables' initial levels. This is likely to explain the different dimensions and magnitude of electricity tariff deficit across Member States as their situation differ in terms of economic growth, public finance and energy developments. The impact is higher when the initial level of the explanatory variables is higher. It means for instance that the higher the share of renewables in Member States, the higher the probability of having a tariff deficit. Similarly, the lower GDP growth, the higher the probability of a tariff deficit.

In addition, two interesting conclusions can be drawn based on the comparison of each variable's marginal effects pattern. First, for some variables such as the consumption under regulated prices, the GDP growth and the retail competition, the marginal effect is a linear function of the variable's initial level. For other variables such as the share of renewables and the crude oil price, it follows almost an inverted u-shaped function. For the latter, this means that, after a certain level, the impact of these variables declines marginally. Second, the marginal effect of the crude oil price is less influenced by its initial value compared to the other variables. This implies that over the period of the analysis the other explanatory variables might have played a crucial role in the probability of having a tariff deficit, as their variation is greater than that of the crude oil price.

Graph 4.1: **Sensitivity analysis of the estimated marginal effects**



Note: average Marginal Effects of explanatory variables of specification [1] with 95% confidence intervals
Source: Commission Services

5. POTENTIAL IMPACT OF ELECTRICITY TARIFF DEFICIT

As mentioned in Section 3.1, the identification of tariff deficit has proven to be difficult. For this reason, the assessment of its potential impact remains qualitative and needs to be conducted in a cautious way. However, anecdotal evidence shows that the financial situation of utilities as well as of the government is potentially impacted by the presence or not of a tariff deficit.

5.1. IMPACT ON THE FINANCIAL SITUATION OF UTILITIES

Tariff deficits and the measures aimed at addressing them have an impact on the financial performance of energy companies, regardless of which electricity business segment that they operate in. However, this impact is complex and differs between companies and countries.

The burden of the tariff deficit has been initially borne by the energy utilities. The companies concerned are mainly former vertically integrated incumbent energy utilities, for instance EDP in Portugal, EDF in France, and five energy utilities in Spain. In some countries, the distribution companies are also affected by the tariff deficit. Table 5.1 shows that on average the five largest companies in the distribution and trade segment tends to display lower return on asset.

Table 5.1: **Descriptive statistics between countries with and without an electricity tariff deficit based on the return on assets (ROA)* - 2007-2012**

		Countries without an electricity tariff deficit				Countries with an electricity tariff deficit			
Variable	**NACE Code**	**mean**	**sd**	**min**	**max**	**mean**	**sd**	**min**	**max**
Generation	**3511**	0.04	0.04	-0.11	0.12	0.03	0.03	-0.01	0.15
Transmission	**3512**	0.04	0.08	-0.44	0.47	0.05	0.10	-0.04	0.49
Distribution	**3513**	0.14	0.14	-0.55	0.47	0.00	0.21	-0.94	0.27
Trade	**3514**	0.17	0.24	-0.44	0.95	-0.15	0.53	-1.71	0.86

Note: The ratio ROA was calculated based on the accumulated data of the five biggest companies in terms of assets in each country and activity
Source: ORBIS

In Spain, Portugal, France and some other Member States, the authorities or the legal systems recognised the liabilities of the energy companies resulting from the tariff deficit ([73]). The energy utilities affected by the tariff deficit were entitled, as creditors, to recover the corresponding amounts with interests. The utilities' rights are gradually repaid from electricity consumers' levies; in some cases, their rights were also securitised and placed on the market.

In the countries which recognise the credit rights resulting from the tariff deficits, the direct impact of the deficits on companies' profits is rather limited. The affected companies assume for accounting purposes that they will receive their due revenues, although with a delay in comparison to a situation without the tariff deficit, and possibly with lower interests, below market rates. In these cases, the tariff deficits have a limited direct impact on their operating profits. The tariff deficits have more affected the liquidity of the utilities both in terms of the further uncertainty regarding cash flows and the need for companies to build a strong liquidity profile.

The impact on energy utilities is much more severe when the authorities have no intention to reimburse the amount of the tariff deficit to the utilities concerned. This is the case, for instance, in Bulgaria, where the deficit is accumulated in the energy system, in particular in the foreign-owned distribution companies and in the incumbent electricity supplier NEK. The financial situation of these companies has deteriorated substantially in the recent period, as data from ORBIS database show (see table A1.4 in the annex).

([73]) In Spain, this recognition resulted from a Supreme Court decision.

The energy utilities' credit ratings are negatively affected by tariff deficits. The lower ratings result from higher regulatory risk both in relation to the deficit and to measures aimed at solving it. For instance, Fitch announced in September 2013 a "Rating Watch Negative" on all ratings of utilities with a large exposure to the Spanish electricity sector. This was due to a critical assessment by the rating agency of the new regulatory measures aimed at the elimination of tariff deficit in Spain (Fitch Ratings 2013). Credit rating is an important factor for determining the companies' cost of capital and their access at a reasonable rate to the debt markets.

The adjustment measures aimed at eliminating the tariff deficit have also a very important direct impact on the financial situation of the energy utilities. The costs of the necessary adjustment are usually divided between the energy consumers, conventional and renewable electricity producers and network operators. The renewable sector is usually the most affected by these measures through reduced support or additional levies imposed on them. Conventional energy utilities operating on the markets are also affected by for example additional taxes or reduced remuneration of electricity transmission and distribution. These measures may have a more tangible impact on the profits of energy companies than the direct impact of the tariff deficit.

The impact of tariff deficit is mitigated by international exposure of the utilities. International activity can compensate losses related to the tariff deficit or to the adjustment measures through operations on other markets. As a result, the impact may be more severe on local companies.

5.2. IMPACT ON PUBLIC FINANCE

The electricity tariff debt is considered as a contingent liability for public finance. This liability is due to the fact that tariff deficits result from the decisions of public bodies (public administration or energy regulators), which set tariffs at insufficient levels to cover the corresponding costs. As mentioned above, in the majority of Member States with tariff deficits, the authorities have recognized that the utilities bearing the tariff deficit burden are entitled, as creditors, to recover the corresponding amount.

Credit rights of the energy companies are, however, normally not repaid from the state budget, but from the levies paid by the electricity consumers. In none of the Member States, has the budget been used directly to allocate part of its expenditures to the tariff deficit account ([74]). On the other hand, some of the revenues, which otherwise would have been allocated to the general budget, have been earmarked to reduce the tariff deficit. For instance, the revenues from CO2 allowances were earmarked in Portugal and Greece to reduce the tariff deficit.

In Spain and Portugal, the credit rights of energy companies related to tariff deficit were securitised and placed on the market. In Spain, these securities are fully irrevocable and unconditionally guaranteed by the state. In Portugal, these bonds do not have the formal guarantee of the state budget, but the tariff debt is nevertheless considered as a having a state guarantee. Tariff debt securities are therefore among off-budget liabilities accumulated by these countries, which altogether aggravate and add uncertainty to their public debts. Moreover, the tariff deficit bonds compete on financial markets with sovereign debts of these countries.

Nevertheless, the contingent risk for public finance related to tariff deficit is rather limited. First, the scale of tariff deficits is limited. The cumulated tariff debt (1 to 3% of GDP in three Member States and below 0.5% of GDP in the others) is not high in comparison to the size of public debt in the EU (89% of GDP). Second, the risk that the tariff debt will need to be repaid by public finance is rather low, as it

([74]) In 2013, Spain planned to provide a subsidy from the central budget to cover a part of the tariff deficit, but this subsidy was finally withdrawn to reduce the public finance deficit.

has a revenue base in the levies paid by the consumers. If, however, new tariff deficits continue to emerge and the cumulated tariff debt keep growing, its repayment would become more problematic.

6. CONCLUSIONS

The issue of tariff deficits has first emerged in the countries hit hardest by the economic crisis, with Spain, Portugal and Greece exhibiting the largest deficits. In some cases such as Spain, the tariff deficit had been there for many years. However, the economic crisis accelerated the growth of the tariff deficit and public finances could not cope with the magnitude of the cumulated tariff deficit.

The analysis in this paper shows that this problem is not only relevant for these vulnerable countries, as a deficit is also found in several other Member States, including France, Bulgaria, Malta, and Romania. Moreover, the mapping of the tariff deficits also shows that Germany, Latvia, Hungary and Italy have experience temporary deficits. Hence, the drivers or causes to the deficits are broader than just a bad economic situation. Several factors related to the design of the electricity markets are found to have a positive influence on the prevalence of a tariff deficit.

First of all the determination of prices on the electricity market plays a major role. Regulated retail prices, for example through integrated tariffs or through price caps, limit the possibility of the electricity companies to cover their full productions cost. The result is the emergence of losses, and hence a risk to accumulate a deficit in these firms.

A high share of renewable energy has also proved to have a positive influence on the likelihood of a tariff deficit. This reflects the existence of support systems for renewable electricity, which in many cases have proven very costly. As the deployment of renewables has been more rapid than expected (in some cases, due to overcompensation), the costs related to these systems have also increased fast to large sums. As a result, it has proved difficult for the regulatory authorities to raise tariffs and prices to ensure that the support costs are duly covered in the energy system. Again, the result is losses and deficits of some of the operators in the system.

Yet another issue is the regulatory set up with independent regulators, which should determine the tariffs so that the cost sufficiency criterion is met. In view of the economic crisis, rising fuel costs and rising renewable support costs, regulators appear not to have proven sufficiently independent from political considerations to ensure cost recovery of the electricity system.

Analysing these different dimensions, it appears as the emergence of the tariff deficits can be traced back to the combination of the on-going liberalisation process with state intervention in the market. The liberalisation process has aimed at separating the various steps of the supply chain, e.g. supply, transmission, distribution and retail. Each of these steps should carry their own costs, with regulated tariffs set for the monopolistic network activities. This has, however, been combined with other forms of state intervention, which look different across Member States. In some cases, it relates to a large share of renewable electricity, where regulators have been tasked to allocate the cost of the support through regulated price components for some customers. In other cases, price regulation extends beyond the regulated activities to the competitive activities due e.g. to service obligations. As prices are set below costs for broad categories of customers losses are generated in energy companies and/or network operators.

Going forward, the analysis points at the following implications for the future policy:

- The independence of the energy regulators needs to be ensured both in theory and practice. This is important in order for the regulator to focus on the recovery of the full costs of the regulated activities in the electricity system, including e.g. network operation, support system to renewables and other PSO activities.

- Retail price regulation, very often implemented to protect vulnerable customers, tends to prevent electricity producers and operators to cover their costs, and risk generating deficits in the electricity

system. Thus, it is important to primarily address vulnerable consumers through the welfare system and/or limit the price regulation to very selective segments of the households sector.

- The cost of the support to various energy sources, e.g. renewable energy, and/or customers, e.g. for social reasons, need to be made explicit in the system and transparently allocated across consumers. If not, the risk is that costs will not be fully covered and losses generated.

- Support systems, e.g. to renewable electricity, needs to be designed carefully to avoid both overcompensation and exploding costs, and should be compatible with a proper functioning of the electricity market.

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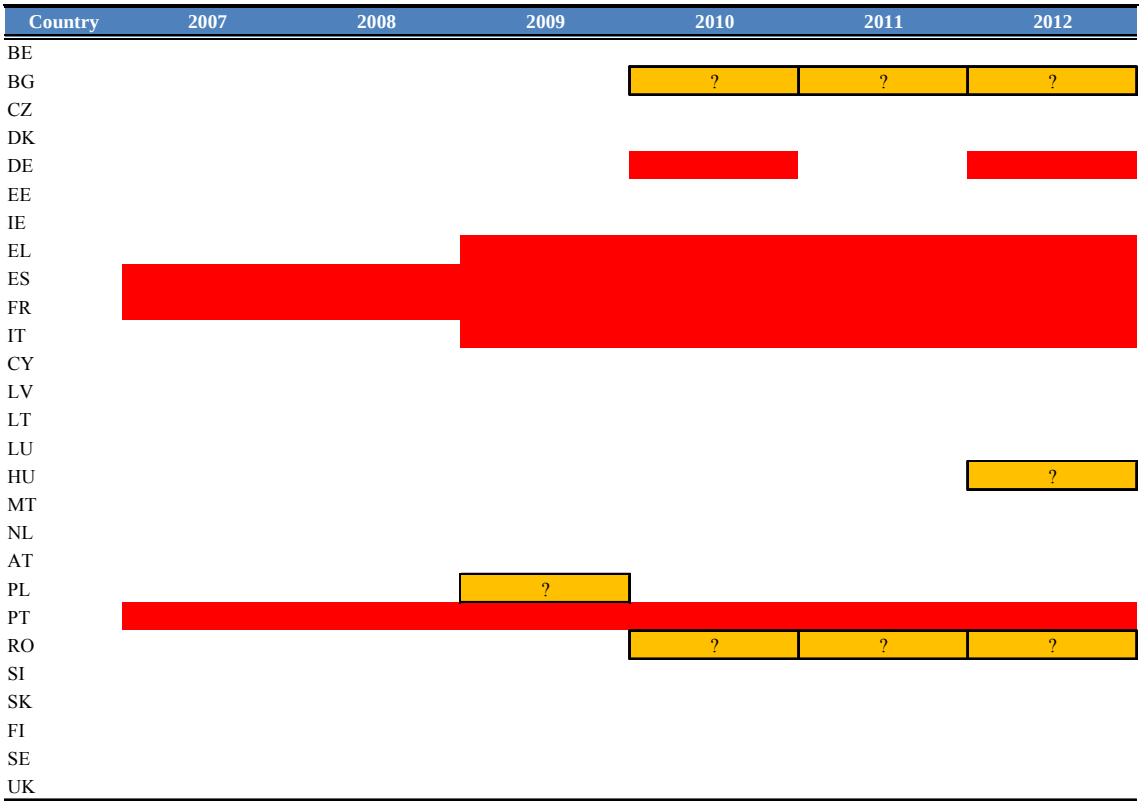
ANNEX 1

Table A1.1: **Mapping Electricity Tariff Deficits in EU based on National Reports from CEER**



Source: Commission Services

Table A1.2: **Mapping Electricity Tariff Deficits in EU based on Financial Statements**

Country	2007	2008	2009	2010	2011	2012
BE						
BG				**Losses**	**Losses**	**Losses**
CZ						
DK						
DE						
EE						
IE						
EL						
ES						
FR						
IT						
CY						
LV	**Losses**	**Losses**	**Losses**	**Losses**	**Losses**	**Losses**
LT						
LU						
HU						**Losses**
MT	**Losses**	**Losses**	**Losses**	**Low profits**	**Losses**	**Losses**
NL						
AT						
PL						
PT						
RO				**Low profits**	**Low profits**	**Low profits**
SI						
SK						
FI						
SE						
UK						

Losses (Orbis&Annual Reports)
Tariff Deficit (National Reports, CEER)
No indication

Source: Commission Services

Table A1.3: **Evidence Based Information for table A.1.1**

Country	Evidence Based Information
BG	The three largest distribution companies owe a combined 347.6 million lev ($247 million) to state-owned National Electricity Co., also known as NEC, in disbursements for subsidies to renewable and combined heat and power generators, http://www.bloomberg.com/news/2014-03-19/bulgaria-moves-to-revoke-power-selling-licenses-of-cez-evn.html (National report (CEER), 2011-2013, p.7)
DE	Deficit in the EEG account (€8.5B)-(National report (CEER), 2010, P.33-34), data available on TSOs website http://www.netztransparenz.de/de/EEG-Konten-Übersicht.htm show that there were deficits in EEG account in 2010 and 2012 (but matched by similar surpluses in 2011 and 2013)
EL	1) Deficit in the RES account, managed by the market operator: LAGHE (2011, p.54-55), 2) Deficit in the RES account, managed by the market operator: LAGHE (National report (CEER), 2012, p.29-30), 3) European Commission, DG Economic and Financial Affairs, The Second Economic Adjustment Programme for Greece – Second Review May 2013, European Economy. Occasional Papers. 148, page 43-45, http://ec.europa.eu/economy_finance/publications/occasional_paper/2013/pdf/ocp148_en.pdf
ES	1) Electricity tariff deficit (National report (CEER), 2011, p. 3), 2) Electricity tariff deficit (National report (CEER), 2012, p. 7), 3) Section of the report 2013 on electricity tariff deficit p. 58-63
FR	Accumulated tariff deficit on the account of the Contribution to the Public Electricity Service (CSPE) since 2002. Cumulative shortfall at the end of 2012: EUR 3.5 billion. Source: CRE http://www.cre.fr/documents/deliberations/proposition/cspe-2014 Gap between revenues collected by the tariffs and EDF's costs, estimated at 1.47B €. Source: CRE. Analyse de couts de production et de commercialisation d'EDF, 2013, http://www.cre.fr/documents/publications/rapports-thematiques/analyse-des-couts-de-production-et-de-commercialisation-d-edf
HU	http://www.budapesttelegraph.com/news/367/reduction_of_utility_prices_might_escalate_into_nationalization, http://www.eurofound.europa.eu/eiro/studies/tn1305028s/hu1305021q.htm. The economic crisis led to the government increasing taxes for electricity providers. They were first increased in 2011, to 8% of pre-tax profit for the 'rich' suppliers of energy and other strategic services, and in 2013 this rate was increased to 16%. This led to reduced profit for the main (multinational) suppliers. They wrote an open letter of protest in December 2011 to José Manuel Barroso, President of the EU Commission. In December 2012 the government introduced a so-called 'overhead reduction' of 10% for public utility costs of housing, which affects again the profit expectations of energy sector and might lead to job losses and wage developments.
IT	Deficit of the RES account (known as account A3) managed by the DSO. The deficit is estimated in 2012 at 1.5b € and it was generated between 2009-2012 (National report (CEER), 2013,p.24-25).
LV	The main electrcity distribution company Salades Tikls presented continued losses for the period 2007-2012.
MT	Enelmalta, the incumbent company has accumulated some 0.87 billion € (European Commission 2014e).
PT	Section on tariff deficit p. 49-50 of 2013 National report (CEER). 2012 deficit: 0.97 billion. Cumulated debt in 2012: 2.8 bn €
RO	Regulatory shortfall in electricity distribution tariff in 2012. Source: Expert Forum, The Romanian Energy Regulator ANRE Second Assessment, 2012, http://expertforum.ro/en/files/2012/10/ANRE-third-report-EN.pdf

Source: Commission Services

Table A1.4: **Profit & losses after taxes (Th.€) per electricity segment 2004-2012**

Country	Companies	Segment	2012	2011	2010	2009	2008	2007	2006	2005	2004
BE											
BG	Energo pro	3514	-172	6,243	-112	950	-2,810	-11,088	9,975	129,896	118,308
BG	EVN	3514	-39,900	5,738	4,112	-716	38	3,122	6,006	2,931	143,518
BG	NEK	3514	-48,060	35,060	52,086	4,342	20,757	17,331	16,445	29,283	9,616
CZ											
DK											
DE	AMPRION GMBH	3512	197,800	82,100	119,200	66,100		5,100	36,900		
DE	TENNET TSO GMBH	3512	99,747	-32,671		206,467					
DE	50HERTZ TRANSMISSION GMBH	3512	226,400	51,600	126,600	6,400	-92,900	-127,900	47,000	9,600	53,500
DE	50HERTZ OFFSHORE GMBH	3512	16,892	8,304	3,616	1,128	84	20			
DE	STADTWERKE FLENSBURG GMBH	3512	-518	-3,565	8,095	-2,655	4,970	13,091	16,392	9,699	4,217
EE											
IE											
EL	ENERGY MARKET OPERATOR "LAGIE" S.A		-165,116	-109,803	-46,470	-65,215	14,030	12,226	-18,978	233	173
ES	E ON ESPANA SL	3513	-35,310	-1,098,497	-588,454	-36,146	-10,888				
ES	ENDESA DISTRIBUCION ELECTRICA SL	3513	787,536	870,972	1,537,968	264,380	477,921	530,592	157,969	293,029	295,016
ES	EON DISTRIBUCION SL	3513	37,078	65,464	34,700	21,020	5,685	16,314	6,052	4,575	9,794
ES	IBERDROLA ENERGIA SA	3513	249,041	376,143	392,103	243,746	179,194	10,999	14,235	-73,237	40,358
ES	UNION FENOSA DISTRIBUCION SOCIEDAD ANONIMA	3513	249,870	314,141		-176	-297	-410	-322	-242	-126
FR	ELECTRICITE RESEAU DISTRIBUTION FRANCE	3513	672,800	253,700	114,000	-18,000	209,000	363,461	-3	-3	-6
FR	EDF PRODUCTION ELECTRIQUE INSULAIRE SAS	3511		-14,500	-11,142	-135	634	-832	-4		
IT	A2A RETI ELETTRICHE SPA	3513	6,681	38,499	39,739	-912	25,689	3,683	14,516	7,845	6,162
CY											
LV	SADALES TIKLS AS	3513	-5,975	-21,491	-7,182	-16,336	-2,983	-13,440	-7		
LT	AB LESTO	3512	-13,258	-17,771	-17,876						
LU											
HU	EDF DEMASZ ZRT.	3514	30,803	6,512	31,996	15,794	45,621	-7,095	-4,073	4,002	
HU	MVM PARTNER ENERGY TRADING LTD.	3514	44,007	1,669	1,890	23,135	16,773	8,232	5,298	1,688	6,289
HU	E. ON ENERGY SUPPLIER LTD.	3514	-52,672	6,930	16,011	-23,899	28,238	13,640			
MT	ENEMALTA			-8,830	21,640	-45,213	-46,601	-7,096	2,536	-6,528	-7,471
NL											
AT											
PL											
PT	EDP SERVICO UNIVERSAL, S.A	3514	24,815	5,975	931	15,365	-54,561	-47,017			
	EDP COMERCIAL - COMERCIALIZACAO DE ENERGIA, S.A	3514	-7,945	-31,564	-8,246		-30,083	-46,793	-116,514	-80,394	-7,364
RO	ENEL DISTRIBUTIE MUNTENIA SA	3513	46,566	11,681	24,525	66,210	55,938	12,052			
RO	E.ON MOLDOVA DISTRIBUTIE SA	3513	16,321	1,850	38,961	13,398	8,882				
RO	SOCIETATEA COMERCIALA ENEL DISTRIBUTIE BANAT SA	3513	37,750	51,023	34,708	35,775	29,125	43,825			
RO	ENEL DISTRIBUTIE DOBROGEA SA	3513	19,673	15,603	6,226	5,828	19,357	7,929	13,492	28,750	3,605
SI											
SK											
FI											
SE											
UK											

Source: ORBIS

Table A1.5: **Description of the variables included in the electricity tariff model**

Variable	Description	Unit	Source
GDP growth	Gross domestic product at market prices - Index (2005)	%	Eurostat
Government debt	The government debt is defined as the total consolidated gross debt at nominal value in the following categories of government liabilities (defined in ESA95): currency and deposits, securities other than shares excluding financial derivatives, and loans.	%	Eurostat
Government deficit	The government deficit is the net lending / net borrowing of general government as defined in the European system of accounts (ESA95), adjusted for the treatment of interest relating to swaps.	%	Eurostat
Consumption under regulated prices	This variable is calculated as the product of the consumption of household customers in the country supplied under regulated end-user prices and the share of household consumption in the total country's consumption.	%	Eurostat, CEER/ACER
Effectiveness of the government	This variable reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.		World Bank
Quality of regulation	This variable reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.		World Bank
Renewables penetration	Share of gross electricity generated from Solar Thermal, Solar Photovoltaic and Wind in Total Gross Electricity Production	%	Eurostat
Electricity Retail Competition	Number of companies with more than 5% share of the retail market by volume	Number of companies	Eurostat
Crude oil prices	Annualised Crude Oil Brent prices (EURO)		EIA

Source: Commission Services

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