Description of European policies and issues related to electricity pricing

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Abstract. This paper is focused on the description of institutional, technical, economic, legal and other relevant issues of electricity pricing in the European Union connected with the increasing use of renewable energy sources in electricity production and consumption. It provides background information related to the types of energy sources along with the summary of their advantages and disadvantages regarding both the environmental impact and financial costs. Furthermore, it involves fundamental global and European electricity production statistics and a summary of the European Union approach to the support of environment-friendly energy production methods.

Key words: electricity price, energy sources, renewable energy sources, energy policy, European Union

JEL classification: Q20, Q40, Q47, Q48, Q54

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1 Introduction

Renewable energy replaces conventional fuels (mostly coal, oil and natural gas) in four distinct areas, namely electricity generation, heating, motor fuels and rural energy services. Within the scope of this paper, we focus on the electricity sector as it plays a decisive role in reaching the EU renewable energy targets. The main objective of this paper is to provide a descriptive analysis of the effects caused by the shift of the EU energy consumption and production to the alternative sources of energy.

This paper is structured as follows. First, a brief overview regarding the types of energy sources and their characterisation along with a summary of both global and EU electricity production by source is given in section 2 as the essential background for the topic of electricity produced from renewable energy sources. Next, section 3 includes a description of the EU electricity pricing system including the components comprising the electricity prices for final consumers. In section 4, the reader can find fundamental information concerning the EU renewable energy and climate policy containing the targets to achieve a sustainable energy sector in the long run with considerably lower greenhouse gas emissions produced by the energy production. To reach its energy sector goals, the EU makes use of specific support schemes for the promotion of renewable energy production which are described in this section as well.

2 Sources of Energy

2.1 Classification

There is a controversial debate about the effects of the electricity sector reforms (concerning the promotion of renewable energy) on electricity prices. The deployment of renewable energy technologies provides several positive effects, mainly with reference to an expected increase in energy self-sufficiency and cleaner environment, but it also leads to some additional costs related to the adjustments in production, prices and transportation systems. Hence, we aim to provide an overview regarding the costs and benefits connected to each energy source.

According to the World Energy Resources (WER) Survey 2013, the value of the global primary energy supply is forecasted to rise to 17,208 Mtoe by 2020, an increase by more than 22% compared to the 2010 level (see Table 2.1). Renewable energy has become a widely discussed topic since its share in the world primary energy supply is expected to increase as well, from 13% to approximately 18% over the 10-year period.

Table 2.1: Total Primary Energy Supply by Resource (1993, 2010, 2020)

	Nuclear (%)	**Fossil (%)**	**Renewables * (%)**	**Hydro ** (%)**	**Total *** (Mtoe)**
1993	6	82	10	2	9,908
2010	5	82	11	2	14,092
2020	6	76	16	2	17,208

* other than large hydropower (> 10 MW)

** amount larger than 10 MW

*** Mtoe (million tons of oil equivalent) = 1.163 x 10^{10} kWh

Source: World Energy Resources 2013 and WEC World Energy Scenarios to 2050

Thus, the amount of renewable energy generated on a global basis is estimated to rise by almost 69%, from 1832 Mtoe in 2010 to 3097 Mtoe in 2020. On the contrary, the level of energy generated by using natural fossil sources is predicted to decrease by at least 6 percentage points over the time period. The following three parts of this section are focused on a basic characterization of fossil, nuclear and renewable energy sources to offer a reader the fundamental background for the further analysis provided in the next sections of the paper.

2.1.1 Fossil Energy

Fossil energy is generated from the remains of decomposition of plants and animals in the nature. The main three types of fossil fuels for energy generation consist of coal, petroleum, and natural gas. These fuels are burnt in fossil-fuel power stations and the heat produced during the burning process is used either directly for heating or converted to mechanical energy or electrical power. As shown in Table 2.1, fossil fuels account for more than 80% of the world primary energy supply but the number is expected to decrease.

The fact that the technology and infrastructure needed for the extraction of fossil fuels already exists and has improved over the last tens of decades, makes such sources less costly in the short run than the renewable ones associated with relatively newly developed modern technologies. On the contrary, the intensive extraction and consumption of fossil fuels results in an environmental degradation and high amount of greenhouse gas emissions contributing to concerns about the global warming. Regarding the data present in Table 2.1, the world energy supply figures indicate the global efforts to decrease the level of countries' dependence on fossil fuels. The reason for such decrease is the fact that the fossil-based resources are non-renewable; their production is un-sustainable; and they create high level of environmental pollution and energy security risks for dependent countries.

2.1.2 Nuclear Energy

The main source of fuel for nuclear reactors is uranium. The present survey shows that the total identified uranium reserves are abundant based on the current energy requirements (WER Survey 2013). A growing trend has been seen in the total nuclear electricity generation during the last two decades albeit the proportion of nuclear-based electricity supply in the total global electrical power production decreased. Public arguments against the use of uranium in energy generation process are comprised mostly of concerns about the reactors' operation and final waste disposal, since the radioactive waste as a by-product of nuclear power production is dangerous to most forms of life and hence the whole environment. Moreover, the safety, emergency, containment and storage systems connected to handling of radioactive waste bring about high costs. By contrast, the defenders of nuclear energy base their arguments on the fact that this type of energy production is environment-friendly regarding the CO_2 and other greenhouse gas emissions; the nuclear energy transformation into electricity is almost ten times more efficient than in the case of coal or oil; and the cost of the generated electricity is moderate and relatively predictable over the nuclear reactors' service life.

2.1.3 Renewable Sources of Energy

Renewable energy (RE) can be produced from a variety of sources including mainly sun, wind, water, and biomass. The advantage of using such resources for energy generation is the fact that they exist over wide geographical areas, in contrast to fossil and nuclear-based fuels which are concentrated in a limited number of territories. Moreover, the modern deployment of renewable energy is assumed to lead to a significant energy security, moderation of climate changes, environmental pollution reduction and economic benefits.

Biomass and biofuels are energy sources derived from living or recently living organisms (referring mainly to plants and plant-based materials). Generally, biomass can either be used directly to produce heat by combustion, or indirectly after conversion to some type of gaseous or liquid biofuels. Probably the most important attribute of the modern biofuels is the fact that they can be used in diesel engines and are considered to be an alternative to fossil-based fuels used in transport. The other advantages of this energy source are its worldwide abundance and relatively simple combustion technologies connected with the energy production. Although using biofuels causes less CO_2 emissions than fossil fuels, it produces some air pollutants such as nitrogen oxide or sulphur dioxide and emits some gas or liquid waste.

Hydro power is power obtained by using the energy of flowing and falling water which is harnessed for further purposes. Currently, the main use of water power is the modern development of hydroelectric power stations which in 2013 accounted for around 16% of the world electricity production and 10% of the electricity generation in the EU. The fundamental advantages of using water power in the energy production contain zero waste and CO_2 emissions generated during the process, low operation costs, reliability in conjunction with generating large amounts of power and capability to meet a specific energy demand by possible regulation of the output. By contrast, the opponents of hydro power argue that the construction of hydroelectric dams is very expensive and has negative environmental impacts on the dam areas being absolutely adapted to functioning of the dam. Moreover, the energy generation using water power can be affected by drought or other climate and weather changes.

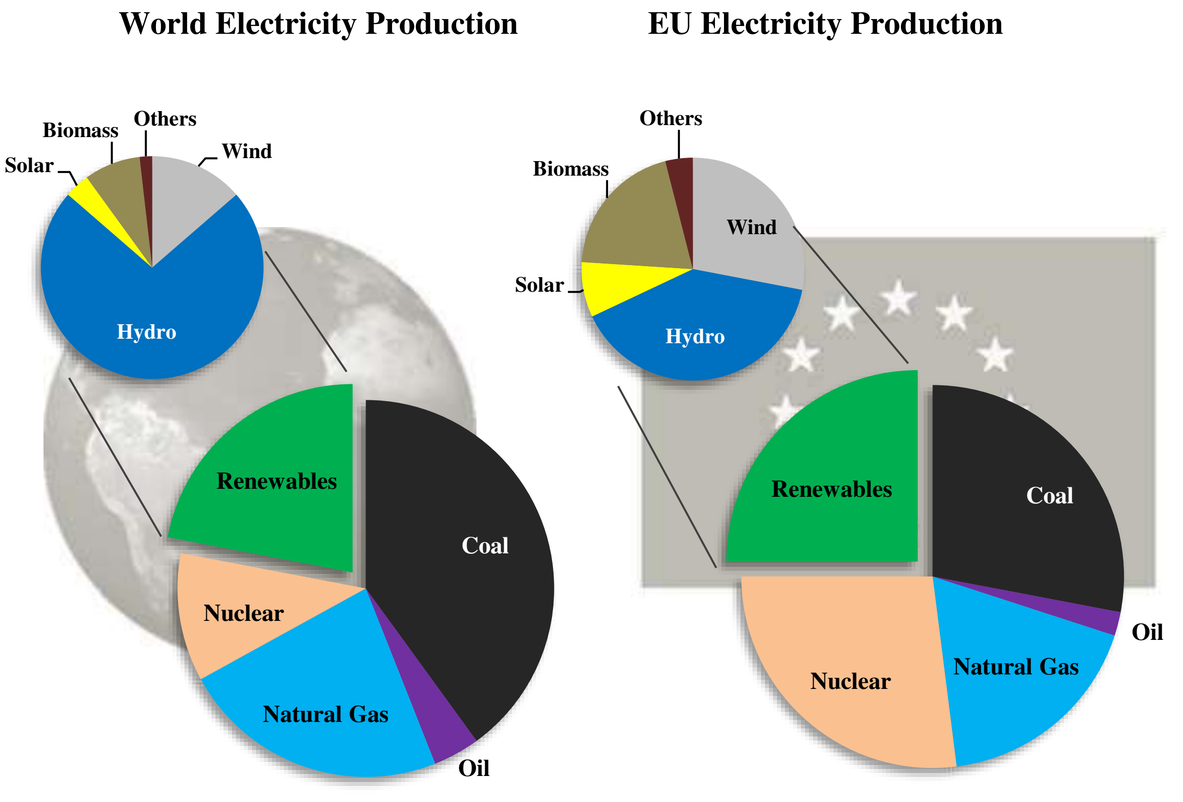
Wind energy can be also used to generate mechanical power or electricity having a relatively high energy output. In 2013, wind accounted only for 3% of the world electricity production. The figure for the EU was noticeably higher, 7%, since there is substantial support for wind energy generation in a lot of European countries (e.g. Germany, Spain, the United Kingdom, Denmark, France, Italy, Sweden, Portugal, Romania, and the Netherlands). The supporters of wind energy see the advantages from both the environmental point of view (the reduction of greenhouse gas emissions, and little disruption of ecosystem caused by wind turbine installation) and the economic efficiency (no fuel or waste costs during the turbine life cycle, simple technology, and relatively fast installation). Nevertheless, the wind turbine is not feasible for all geographic locations and territories and even at a suitable place, the output is proportional to unpredictable changes in wind speed. In addition, the modern wind power generation requires a high initial investment and subsequent ongoing maintenance costs, usually resulting in dependence on government subsidies.

Solar energy can be harnessed using a variety of technologies. The most frequently used technology is called *solar photovoltaics* (solar PV) denoting a non-polluting method of electrical power generation by converting solar radiation into direct electricity current using PV solar panels. Recently, solar PV has become one of the most important renewable sources regarding newly installed capacity. This is caused mainly by the facts that the installation and dismantling of solar panels is relatively uncomplicated and fast, the energy generation process is reliable and the installed solar panel systems last from 15 to 30 years without almost any maintenance costs. However, the need for high initial investment, limited availability of materials for solar PV panels, and the dependence on sunny weather cause the unsuitability of this electricity production method in some areas.

2.2 Renewables in the EU/World Electricity Production

Since the core of this paper is to analyse the relationship between an increase in the use of RE sources and the electricity prices in the EU, we provide a short summary regarding the current importance of RE in the electricity production sector. Figure 2.1 concerns the total electricity production by source in 2013, both globally and in the EU. While comparing the two graphs, it is noticeable that unlike the world average figure (67%), the EU share of fossil fuels in the total electricity production was lower than 50%—albeit oil, coal and natural gas have been the mostly used sources of energy throughout the world, accounting for more than 80% of the global energy production (WER Survey 2013). The share (25%) of RE in the EU electrical power generation was above the global average proportion (22%) in the same year.

The most significant RE resource used for the production of electricity was hydro power (both globally and in the EU). On the global scale, the energy for almost 73% of the electricity from renewable energy sources (RES-E) was drawn from hydro power stations. In the EU, the hydroelectricity participation in the RES-E production was around 40%. Concerning the other increasingly used RE sources, wind accounted for almost 14% of the global electrical power generation from renewables, and biomass served as a source for about 8% of the production. The figures for the EU were 28% and 20%, respectively. In addition, solar power comprised 3.6% share of the RES-E generated worldwide. In the EU, the proportion was more than twice higher, approximately 8%. According to the above mentioned figures, about 76% of the RES-E production in the EU came from hydro, wind and solar power—energy sources connected with considerably high initial costs of electricity generation and strongly supported by the EU energy, climate and environmental programmes regarding the following decade (see section 4).



					Renewable Sources				
	Coal	Oil	Natural Gas	Nuclear	Hydro	Wind	Solar	Biomass	Others
World	40%	4%	23%	11%	16%	3%	0.8%	1.8%	0.4%
EU	28%	2%	18%	27%	10%	7%	2%	5%	1%

Figure 2.1: Total World and EU Electricity Production by Source in 2013

Source: REN21 Report 2014, WER Survey 2013

3 Electricity Pricing in the EU

3.1 Electricity Supply and Demand

This section provides an insight into how electricity prices and costs are evolving and which factors are driving their changes. Since the energy markets were deregulated in 1998, market prices of electricity have been the result of supply and demand. Due to the fact that electrical power cannot be stored, it is produced at the exact moment of demand. Hence all the factors influencing the supply and demand have an immediate impact on the price on the spot market (commodities or securities market in which goods are sold for cash and delivered immediately). The summary of these factors is given by Figure 3.1.

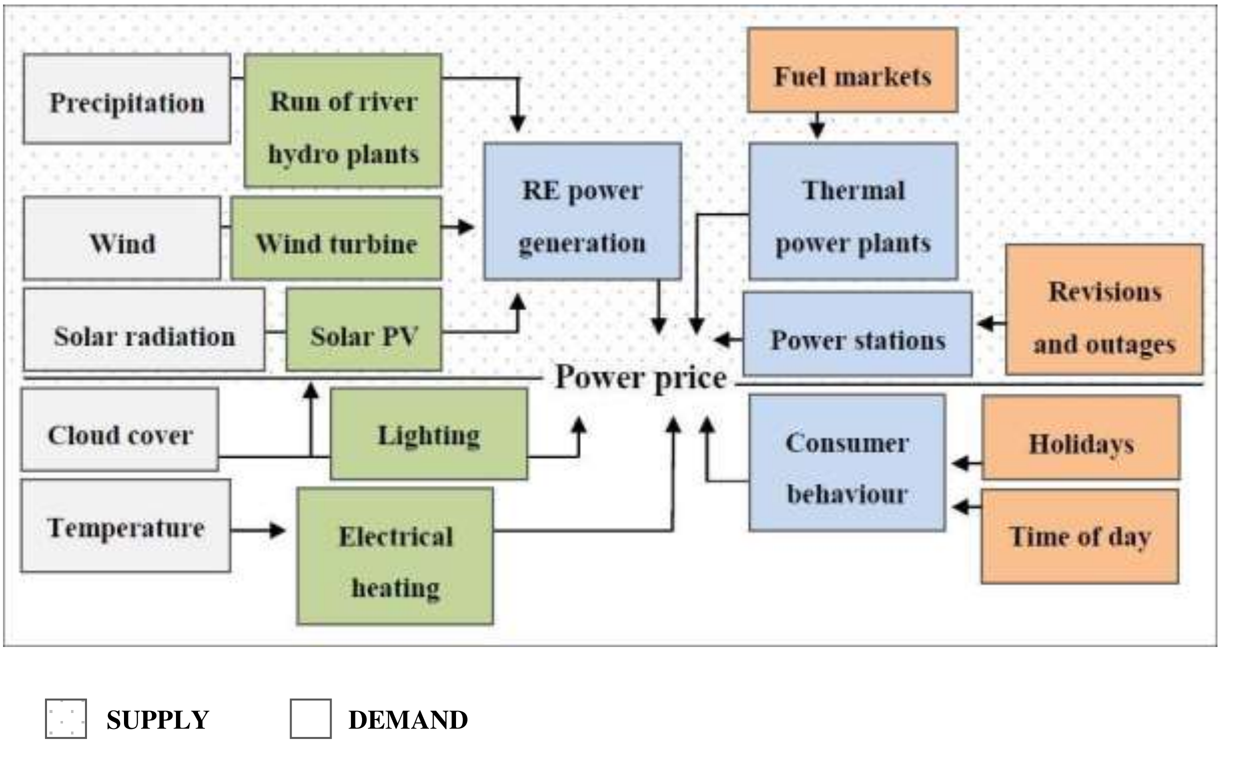


Figure 3.1: Factors Affecting the Electricity Supply and Demand

Source: RWE AG

On the supply side, the electricity price is mostly influenced by fuel prices (for fossil fuels) and the prices for CO_2 allowances. To determine how much electricity is generated by renewable power stations, the weather and climate are crucial. Moreover, the supply depends on the capacities of power plants, their current technical conditions and planned overhauls or unplanned outages.

On the demand side, the weather (temperature and cloud cover influencing consumer behaviour directly) plays an important role as well as the state of the general economy. Other factors that might influence consumer behaviour and therefore the demand for electricity are for instance holidays (public, school or bank) and fluctuations in the global economy (the reduction in the demand due to economic crisis in 2008 can serve as an example).

3.2 Electricity Price Components

To understand how the price of electricity is finally determined, we have to consider all the elements affecting it, influenced by both market forces and government policies. In Figure 3.2, you can see a summary of such elements.

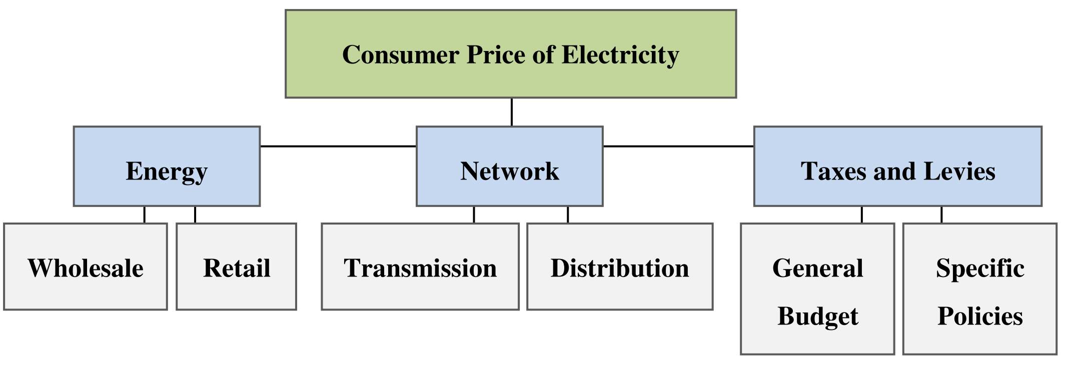


Figure 3.2: Elements of Consumer Prices

Source: European Commission

The *energy* component consists of two parts. First, the *wholesale* element of the price reflects the costs incurred by companies in delivering energy to the grid, including fuel purchase (or production), shipping and processing as well as the costs of construction, operation and decommissioning of power stations. Second, the *retail* element covers costs related to the sale of energy to final consumers on the retail markets. Next, the *network* element reflects transmission and distribution infrastructure costs related to the maintenance and expansion of grids, system services and network losses. Charges are often added to network tariffs to cover other costs such as those related to public service obligations and technology support. Finally, *taxes* and *levies* are applied, being part of either general taxation (VAT, excise duties) or specific levies to support targeted energy, environment and climate policies.

3.2.1 EU Electricity Prices by Component

Over the last five years, the European consumer prices of electricity have increased noticeably. Albeit the differences between distinct national prices have been large, almost all EU member states have seen a consistent rise in their electricity prices. The energy policies and accompanying environmental targets, both on the national and the European level, have been considered to play an increasing role in determining the final electricity price for consumers. Hence, in order to better understand the relationship between energy policies and electricity prices, it is useful to disaggregate the price into its elements (as in Figure 3.2) and compare them.

The relative share of the *energy* component in the retail price of electricity has diminished over the last five years. If we compare the data from 2010 and 2013 (the 2014 data has not been available yet), we can notice that the energy component has seen the smallest increase while the tax/levy component has increased the most over the time. Since 2010, household electricity network costs went up by 14.2%, taxes and levies rose by more than 20.7% and energy supply costs by approximately 6.5% (see Figure 3.3) for the EU weighted average electricity price.

Albeit the relative share of energy cost element in the European electricity prices is diminishing, it still composes the largest part of the price. On average, the EU household electricity *retail* prices have risen by 5% each year from 2010 to 2013. In contrast to the retail developments, the average *wholesale* electricity prices decreased over the time period. This fact can be linked with the EU energy policies, mainly with the unbundling of electricity generation from system operation, and the growth of power generation capacity with low operating costs, such as wind and solar power along with existing nuclear and hydro power stations. However, due to a weak price competition in a number of retail markets (allowing suppliers to avoid passing on the wholesale price reduction to retail prices), the fall in wholesale prices has not resulted in a reduction in the retail prices.

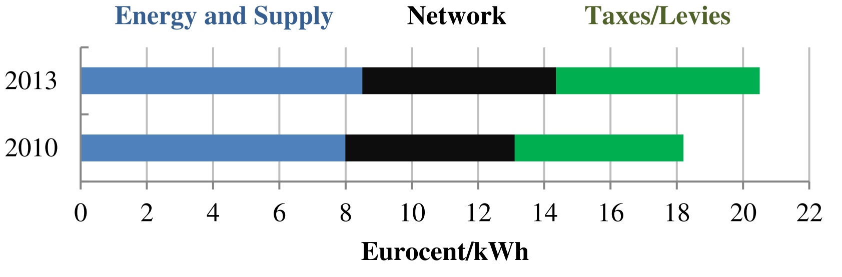


Figure 3.3: Electricity Prices by Component in 2010 and 2013 in the EU

Source: Eurostat

Regarding the *taxes* and *levies* element of electricity prices, it is important to distinguish between general energy tax measures and special energy policy-related costs financed by levies, which have recently increased significantly. In most member states, taxes and levies have financed energy, environment and climate policy measures, including promotion of energy efficiency and renewable energy production. As can be seen in Figure 3.3, in 2013, the mentioned taxes and levies were the second largest component of the EU average prices of electrical power for households.

The change in percentage proportion of the electricity prices formed by taxes and levies over the last few years is showed in table 3.1. In nine of the thirteen EU member states, for which the data have been collected, the share has risen over the last 3 years. The most noticeable increase was seen in Germany, where taxes and levies stood for 52% of the electricity price in 2014 while in 2012, this figure was only around 16%. On the contrary, Belgium, the Netherlands, Poland and Portugal saw a decrease in the participation of taxes and levies. The EU average figure has increased from 29% in 2012 to more than 32% in 2014.

Table 3.1: Percentage Shares of Taxes/Levies in Electricity Prices by Country

	BE	CZ	DE	ES	FR	IT	NL	PO	PT	RO	FI	SE	GB
2012	31.7	17.5	15.7	19.4	29	32	29	22	44.6	24.3	29.7	35.3	4.7
2014	20.2	18.3	52	21.4	33	37	28	21.6	41.7	29.5	31.5	35.7	4.8

Source: Authors computations, Eurostat

In addition, the cost of renewable energy added to retail prices constituted 6% of the average EU household electricity prices in 2012. Generally, there is a wide range of the costs in form of renewable energy taxes and levies, with Spanish and German shares reaching 15.5% and 16% of household electricity prices respectively, in contrast to Poland and Sweden with less than 1% shares. However, the share is increasing in the majority of the EU member states due to the EU policies supporting the use of renewable sources of energy. The net effect of renewable energy on retail electricity prices has not been the same throughout the EU. While in Spain the effect has appeared to be reducing the prices, in Germany it has been the opposite case.

The last important element of the breakdown of electricity prices consists of the already mentioned *network* costs. Albeit the relative shares of transmission and distribution costs (as well as the absolute levels) vary greatly across the EU, in all member states the distribution costs exceeded the transmission costs each year over the last five years. Since 2010, the electricity network costs went up by 14.2% for households. Such an increase has been expected in the context of energy sector transformation but it could be mitigated through better network governance on the national level. The absolute values of electricity network costs, ranging from 2.2 cents/kWh to 9.7 cents/kWh between the EU member states, imply that such costs can have a significant impact on the total electricity prices.

3.3 Conclusions: Future Price and Cost Trends

Over the last five years, the rise in electricity prices has been driven mainly by increases in taxes/ levies and network costs. Hence, the goal of the EU is to ensure that the policies financed by taxes and levies (energy, environment and climate policies) are applied as cost effectively as possible. It is therefore important for member states to review their different national practices and follow the best practices, including the European Commission's guidance regarding government interventions in the energy sector (mainly renewable energy and energy efficiency policies) to minimise negative consequences for energy prices. In addition, the EU aims to benchmark network costs to ensure that European convergence in network practices improves the efficiency of the distribution and retail markets and so reduces the network cost element of the prices.

According to the European Commission's 2030 energy and climate policy framework, the energy costs are expected to be driven by the rising fossil fuel prices as well as by the high initial investments needed for the construction of renewable energy power stations (mostly wind, hydropower and solar PV power stations) and the infrastructure connected with it. Specifically for electricity, the costs are estimated to increase up to 2020 when they are expected to stabilise and subsequently slightly decrease as fossil fuels are going to be already replaced by renewable energy sources with low operation and maintenance costs of the power plants.

4 Renewable Energy in the EU

Energy prices and costs increases have been a significant political concern in the EU for decades. Since they create additional cost burdens on households and majority of industries, they affect European global competitiveness as well. Recently, the European energy sector is in the middle of a shift away from the dependence on imported fossil fuels and hence it needs high levels of investment to develop the power generating system replacing the existing one. Particularly, moves to decarbonise electricity generation have led to strong growth in wind and solar power, which has had a significant impact on energy production costs. Alternative gas supplies, such as shale gas, are also being developed, requiring further investment. At the same time, the European electricity sector moves from public monopolies to liberalised markets composed of competitive private companies, where users, rather than tax-payers, bear the cost of new energy investments.

There are various ways to anticipate the impacts of all the mentioned changes of current energy sector. The liberalisation of the energy market is expected to deliver more competition and hence more efficient and cheap energy. Decarbonisation targets along with some other environmental and climate policy goals are designed to ensure a sustainable energy sector in the long run, with acknowledged higher costs in the short run (mostly comprised of the initial investments needed for construction of the power stations and its infrastructure). European governments expect these changes to deliver both short term benefits for consumers (jobs and quality of life) and long term sustainability objectives. To ensure that the EU can manage all these changes, efforts are needed at the European and national policy levels as well as an action by industries and individual consumers. In this section, we focus on the European energy policy regarding the efforts to decrease the greenhouse gas emissions as well as the dependence of energy generation on the fossil fuel combustion (i.e. promotion of energy from renewable sources).

4.1 Renewable Energy Targets

The EU Renewable Energy Directive 2009 (which is still binding in its original version) has set a target of 20% final energy consumption from renewable sources by 2020. To achieve this goal, EU member states have committed to reaching their own national renewables targets (reflecting their starting point) ranging from 10% (in Malta) to 49% (in Sweden). In Figure 4.1, there are the target levels for the 13 EU countries. For a proper designing and reforming of the renewable energy support schemes in each member state, European Commission provides guidance programmes and requires progress reports published by the countries every two years to show how they actually move towards the EU 2020 target. Moreover, a new framework for climate and energy policies agreed by the European Commission in October 2014 sets a target of at least 27% share of RE in energy consumption in the EU by 2030.

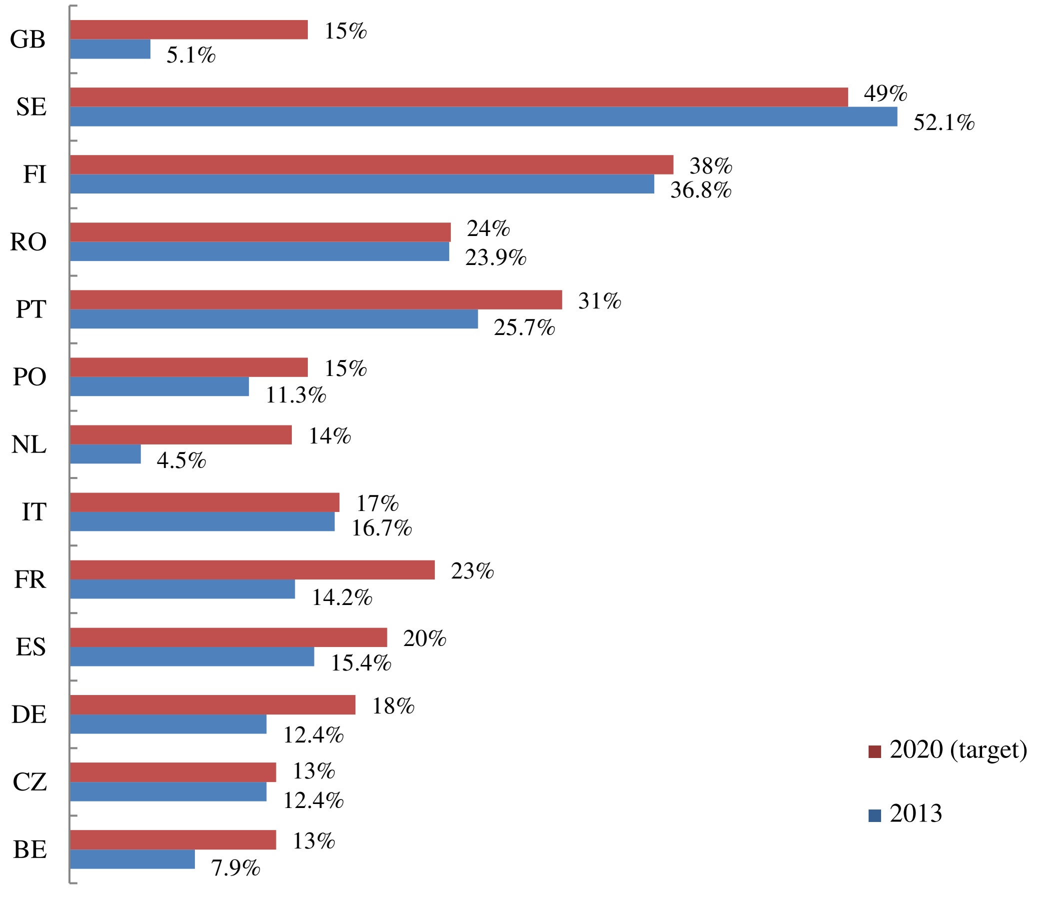


Figure 4.1: Share of RE Sources in the EU Gross Final Energy Consumption

Source: Eurostat

Since individual EU member states have different available resources and unique energy markets, they have adopted distinctive *national renewable energy action plans* showing what actions each of them intends to take to meet the renewable energy targets. These plans include e.g. sectorial targets for electricity, heating and transport; planned energy policy measures and joint projects with other countries; national policies to develop biomass resources; and the different mix of renewables technologies the counties expect to employ.

To make certain renewable energy technologies employed by each country competitive, public interventions such as *support schemes* are necessary. Since energy markets alone cannot deliver the desired level of renewables in the EU, the national support schemes are needed to overcome such market failure and encourage increased investment in renewable energy. To limit distorting energy prices and markets, the schemes has to be time-limited and carefully designed. Otherwise these public interventions can lead to noticeably higher energy costs for European households and businesses. The EU has adopted guidance for EU countries designing and reforming renewable energy support schemes suggesting that:

- financial support for renewables should be limited to what is necessary and should aim to make renewables competitive in the market,
- support schemes should be flexible and respond to falling production costs (as technologies mature, schemes should be gradually removed),
- unannounced changes to support schemes should be avoided as they undermine investor confidence and prevent future investment,
- EU countries should take advantage of the renewable energy potential in other countries via *cooperation mechanisms* set up under the Renewable Energy Directive (2009)

The cooperation mechanisms can have a form of statistical transfers, joint projects or joint support schemes. First, in a *statistical transfer* (an accounting procedure), an amount of renewable energy is deducted from one country's progress towards its target and added to another's. Allowing transfers of this kind provides the

EU countries with an extra incentive to exceed their targets since they can receive a payment for energy transferred to others. Moreover, it allows countries with less cost-effective renewable energy sources to achieve their targets at a lower cost. Second, through the *joint projects*, two or more EU countries can co-fund a renewable energy project regarding electricity generation, and share the resulting renewable energy for the purpose of meeting their targets. A physical transfer of energy from one country to another does not have to be involved in the project. Third, a *joint support scheme* can be co-funded by two or more EU countries to spur renewable energy production in one or all of them. This form of cooperation involves measures as a common quota, common feed-in tariff, or a common feed-in premium.

The feed-in systems as economic policy mechanisms promoting active investment in and production of renewable energy sources are generally the most commonly used RES-E (electricity from renewable energy sources) support schemes in Europe. The *feed-in tariff* is based on offering long-term contracts tied to the costs of electricity generation of a specific infant technology (mostly wind and solar PV power) for the renewable energy producers. By offering guaranteed price per kWh of electricity produced, producers are sheltered from some of the risks in renewable energy generation. The *feed-in premium* mechanism consists in payments in a form of premium offered above the market price for electricity. It implies that RES-E generators receive a feed-in support payment in addition to the revenue from selling electricity in the spot market. Albeit the producers can enjoy high rewards when market prices increase, they also run a corresponding risk when they decrease. Depending on the detailed design of the premium option, the risk for the RES-E producers may be larger and over- or under-compensation may occur. In general, three main types of feed-in premiums exist.

First, *fixed premium* does not depend on the average electricity price in the power market and the renewable generators bear all price risks from the electricity market. The revenue risk is higher as compared with the feed-in tariff. Second, *feed-in premium with cap and floor prices* reduces revenue risks and surpluses as under this model, only a certain income range is allowed for. Third, *sliding premium* is determined as a function of the average electricity price. In 2013, Czech Republic, Denmark, France, Finland, Germany, Italy, Netherlands, Slovakia, Slovenia and Spain used feed-in premiums as the main support tool for renewable electricity.

In contrast to feed-in systems, quota systems are quantity-based and technology-unspecific. While quantity-based support schemes define a certain percentage of RES-E in the electricity mix which needs to be provided by the producers, price-based support sets a fixed price for an energy amount of RES-E (e.g. one MWh). Hence, quota systems typically reach their targets but have an inherent uncertainty about the price. The second typical attribute is that quota systems are types of technology neutral support. It means that compared to feed-in tariff supporting the specific infant technologies in order to create a broader RES-E mix in the future, quotas usually lead to a more cost efficient deployment of RES-E, since every produced MWh of RES-E has the same value and hence producers can choose the cheapest and most cost efficient technology to produce the specific amount of RES-E (leading to a lower diversity in types of RES-E power stations). However, currently there is a strong preference for feed-in systems throughout the EU.

4.2 Greenhouse Gas Emission Targets

Along with the promotion and support of RE production, the EU aims to reduce its greenhouse gas emissions. As CO_2 is the greenhouse gas mostly produced by human activities and is considered to be responsible for about 64% of man-made global warming, we focus on this gas also in addition to our focus on electrical energy.

For 2020 and 2030, the EU has made a unilateral commitment to reduce the overall domestic greenhouse gas emissions compared to 1990 levels by 20% and 40%, respectively. This has been one of the headline targets of the EU 2020 and 2030 strategies. The EU has also offered to increase the emissions reduction target from 20% to 30% by 2020 if other major emitting countries in both developed and developing parts of the world commit to undertake their fair share of a global emissions reduction effort. According to the latest estimates, the total EU greenhouse gas emissions in 2013 already fell by 19% below the 1990 level. The structural climate and energy policies have contributed significantly to the EU emission reduction over the last decade.

The EU initiative to reduce greenhouse gas emissions includes adopting various legislations and setting targets, but the key tool has recently been the EU Emissions Trading System (ETS). It is a cornerstone of the EU policy regarding the climate change concerns and the biggest international system for trading greenhouse gas emission allowances. It operates in the 28 EU member states along with Iceland, Lichtenstein and Norway. The principle which the EU ETS works on is called ‘cap and trade’. A ‘cap’ (limit) is set on the amount of certain greenhouse gases that can be emitted by the factories, power plants and other installations in the system, and this amount is reduced over time. Hence, the total emissions fall. Within the cap, companies receive or purchase a limited number of emission allowances which they can trade with one another. After each year, a company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. By putting a price on carbon and thereby giving a financial value to each tonne of emissions saved, the EU ETS has placed climate change on the agenda of company boards and their financial departments. According to Gerbelová (2014), there is a clear reduction in CO_2 with the increase in CO_2 prices (with 100 EUR/tonne of CO_2, there is a 79% decrease expected in 2050 compared to the 1990 level). A sufficiently high CO_2 price also promotes investment in clean, low-carbon technologies. In 2020, emissions from sectors covered by the EU ETS will be by 21% lower than in 2005. Currently, the EU ETS covers around 45% of the EU greenhouse gas emissions and is considered to be the most cost-effective emission reduction method adopted in the EU.

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