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ELECTRICITY FOR EUROPE

A SECTOR IN TRANSFORMATION:

ELECTRICITY INDUSTRY TRENDS AND FIGURES

A EURELECTRIC report

January 2015

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ELECTRICITY FOR EUROPE

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Our well-defined structure of expertise ensures that input to our policy positions, statements and in-depth reports comes from several hundred active experts working for power generators, supply companies or distribution system operators (DSOs).

We have a permanent secretariat based in Brussels, which is responsible for the overall organisation and coordination of EURELECTRIC's activities.

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Economic Development

- growth, added-value, efficiency

Environmental Leadership

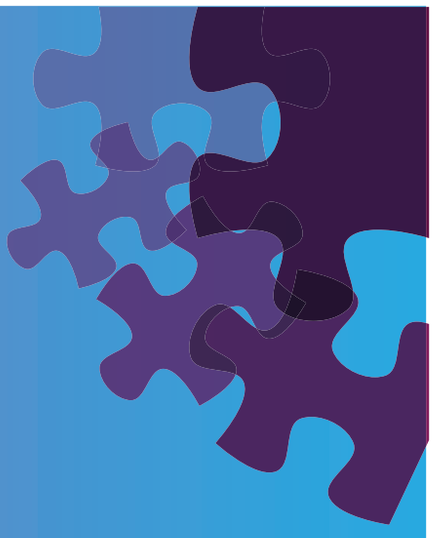
- commitment, innovation, pro-activeness

Social Responsibility

- transparency, ethics, accountability

January 2015

Contents



Intro

The present report aims to introduce the readers to the new dynamics of the 'energy transition' and how it impacts both energy policy/regulation and businesses. The report outlines the efforts carried out by the power industry in adapting to these changes with the objective of delivering continuous safe, affordable and cost efficient electricity supply to its customers.

The report is based on the latest available industry figures (2013) gathered from the EURELECTRIC statistical experts and complemented by publicly available information. The data contained in this report covers 34 countries, namely the 28 EU Member States as well as Norway, Switzerland, Iceland, Turkey, Serbia and Ukraine, and addresses respectively demand, generation, capacity and investment.

In outlining the new trends and data, the report examines the policy context, the evolution of fundamentals such as production and demand, and provides a brief outlook of market developments, prices and environmental performances.

We would like to express our sincere gratitude to all contributing experts in particular country data experts.

KEY MESSAGES

Energy Policy Context

EMPOWERING COMPANIES TO COST-EFFICIENTLY MEET THE DECARBONISATION AGENDA

The energy transition requires prompt and necessary policy and market adaptations to allow power companies to bridge the investment gap and offer a continued safe and affordable electricity supply to its customers. It is thus vital to reinforce the EU Emission Trading System and achieve a well-connected and integrated power market where both flexibility and capacity are properly valued.

1

Demand

STAGNATING WITH DIFFERENCES ACROSS COUNTRIES/CUSTOMERS

Demand in the Nordic area and Germany was roughly the same in 2013 as ten years ago while it continued to increase in Eastern Europe. Consumption by households and services has steadily increased since 2004 in contrast to industry consumption.

2

Electricity generation

Going green

In 2013, for the second consecutive year, more than half of the electricity generated in Europe came from low-carbon sources. Renewables generation continued to increase, nuclear production remained stable and fossil fuel fired generation fell sharply.

3

Capacity and investment

THE INVESTMENT GLOOM

Renewable energy plants continued to be added to the system but at a more moderate pace, suggesting a decline in the volume of subsidies. Power companies are facing a major investment dilemma as current levels of wholesale electricity prices are too low to incentivise investment in most existing technologies and in particular back-up plants that are needed for the security of the system.

4

Markets

CUSTOMERS NOT REAPING THE FULL BENEFITS

Whilst markets continue to integrate and become more liquid, the expected benefits have been more moderate, with limited or even declining price convergence. Declining wholesale prices combined with a sharp rise in policy costs/levies and an increasingly complex energy policy environment are preventing customers from feeling the full benefits of market integration.

5

Environment

AS CAPACITY GETS GREENER, CO_2 GOES DOWN

With increased generation from Renewables sources, new RES capacity being commissioned and further improvements in energy efficiency, 2013 saw a marked decline in CO2 emissions. However, the ongoing surplus of more than 2 billion allowances continues to depress the CO2 price. Reinforcing the ETS through a more flexible design, so that it delivers a robust carbon price that supports continued investment in low carbon technologies, remains an urgent and vital policy objective.

6

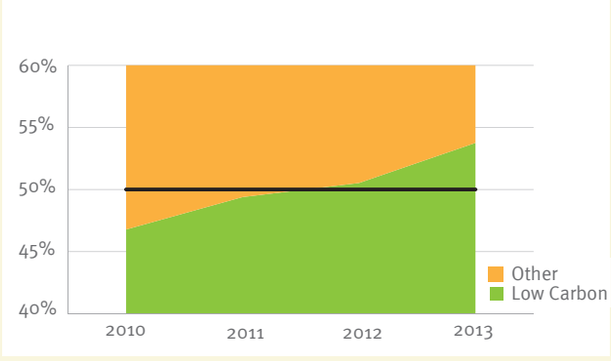
1 Energy Policy Context

Redirecting energy policies towards greater competitiveness and affordability

The adoption of the EU's 20-20-20 energy and climate policy framework back in 2009 was the first step in Europe's global policy approach aimed at decarbonising its economy and combating global warming. This set a strong signal in favour of investment in renewable energy sources (RES): As the 20-20-20 package was being implemented, investment in variable RES peaked at levels of over € 130 billion per annum. Altogether € 470 billion went into these technologies from 2010 to 2013, showing the tremendous efforts made in meeting the RES target and initiating profound transformative changes in the power sector.

In 2013, for the second year in a row, more than half of the electricity generated in Europe came from low-carbon facilities. Of the 3101 TWh of electricity produced in 2013 in EU 28, 27% came from renewables and another 27% from nuclear. The structure of the power industry is changing rapidly, with a growing diversification of its portfolio towards variable generation sources and a stronger focus on developing smart meters and empowering customers. Of the newly installed renewables capacity in 2013, 80% were added by large utilities, making the European utility business a world sustainability leader[1]. These results are a direct consequence of the commitments made by power companies since the inception of the EU's climate policies to actively contribute to the decarbonisation process.

Figure 1: Share of Low Carbon technologies versus other in total electricity production in EU28



Source: EURELECTRIC

Going down the decarbonisation path, the economic crisis that hit Europe in 2009 and the prolonged effects of recession have put strains on the European climate ambition, somewhat blurring some of the results and placing increased emphasis on policy costs. The evolution of power demand has been closely correlated with the GDP curve in that Europe saw an overall stagnation of electricity demand during the crisis with a decline in 2009 and 2011. It is not entirely clear what proportion of this stabilising demand was attributable to the underperforming European economy and what was attributable to the implementation of energy efficiency measures. In 2013 however, demand barely reached 2005 levels. The RES boom that coincided with the economic crisis exacerbated the disconnect between (lower) electricity demand and (increasing) capacity, thereby making the conditions for the implementation of the decarbonisation agenda more complex.

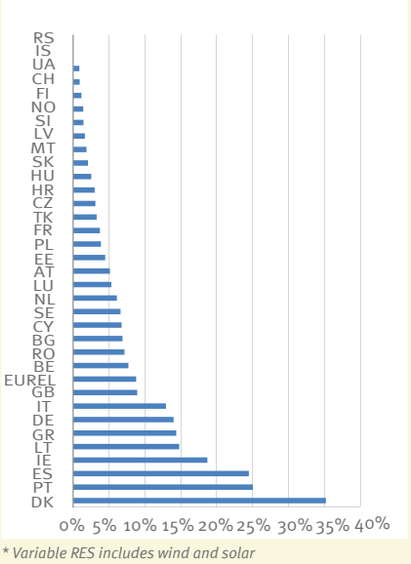
In 2013, the share of variable renewables generation represented at least a quarter of the total electricity produced in three EU countries (Denmark, Portugal and Spain) whilst in five other EU countries (Ireland, Latvia, Greece, Germany and Italy), it totalled 10 to 20% of their overall production. Whilst not being the only contributor to a CO_2-free electricity production, the deployment of variable RES has played an instrumental role in Europe's efforts to decarbonise the broader economy.

However, the generation pattern of this new technology (being variable, non-firm with high upfront investment costs and close to zero marginal costs) is leading to considerable changes and a major overhaul of the energy system. This is one of the lessons of these early years of massive RES deployment: the policy shift requires a holistic approach and well-suited adaptation measures to ensure a continued secure and affordable supply. Furthermore, keeping costs under control and as to make the energy transition affordable for customers remains an important objective[2].

[1] *The global utility ranking published in EI New Energy global in 2014 showed that, of the 100 Green Utilities selected on the basis of the volume of their renewable energy portfolio and their greenhouse gas emissions, 6 out of the top 10 companies are European.*

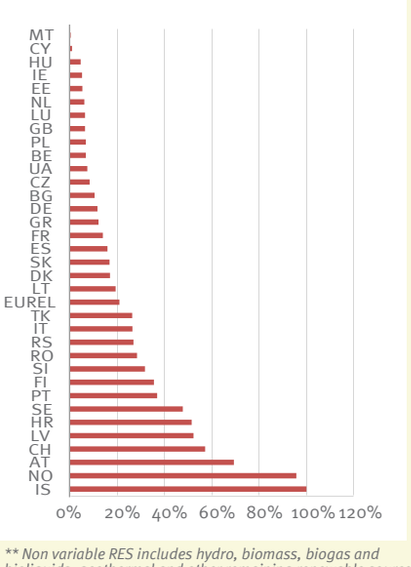
[2] *Between 2008 and 2012, customers saw their taxes and levies increase by as much as 31% for residential customers and 109% for industrial customers. In 2012, European households spent an average of 39 €/MWh on taxes and 25 €/MWh on policy support costs.*

Figure 2: Share of variable RES * in the 2013 power mix



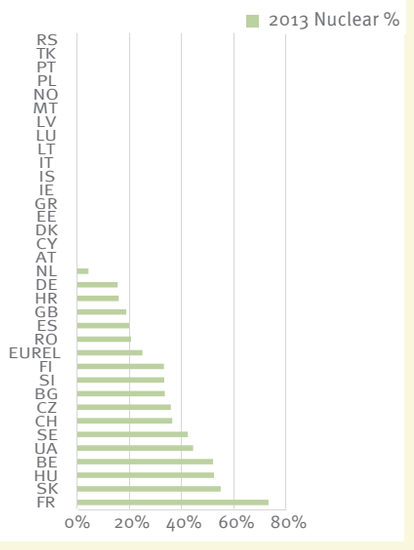
** Variable RES includes wind and solar*

Figure 3: Share of non variable RES** in the 2013 power mix



*** Non variable RES includes hydro, biomass, biogas and bioliquids, geothermal and other remaining renewable sources*

Figure 4: Share of nuclear in the 2013 power mix



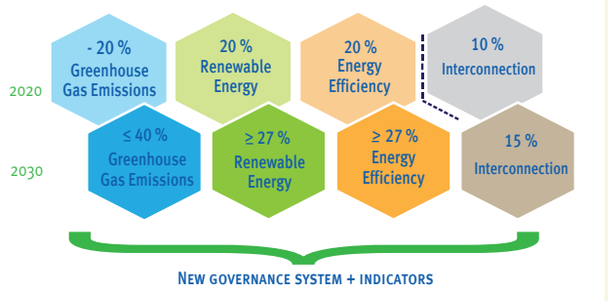
Source: EURELECTRIC

Adapting the power sector to its transformative changes has been on the agenda of the EU institutions and continues to be an essential topic for the new European Commission and Parliament. In 2014, some important steps were made with the adoption of the State Aid Guidelines for Environmental Protection and Energy on 9 April and the conclusions of the European Energy Council in relation to the 2030 climate and energy framework on 23-24 October.

Running from the 1 July 2014 up to the end of 2020, the state aid guidelines issued by the European Commission aim to drive RES schemes towards cost-efficiency and reduce market distortions. In doing so, they introduce a gradual shift from rigid feed-in tariffs to flexible premiums as a result of competitive processes. They also make it obligatory for renewable generators to sell their electricity in the market and take on grid balancing responsibility. However, this does not apply to small installations which can continue to benefit from generous exemptions and not act in the market. This exemption is far from marginal: in most countries more than half of the installed PV capacity does not have to comply with these rules.

The second main policy achievement in 2014 aimed to make decarbonisation policies more consistent with competitiveness. On 23-24 October, the Heads of State and Government backed the Commission proposal for an overarching energy and climate framework for 2030 with, at its heart, a binding reduction of domestic greenhouse gases of at least 40% below 1990 levels. This target is accompanied by two important policy objectives, namely the further deployment of RES through a European binding target of at least 27% of EU energy consumption and improvements in energy efficiency of at least 27% (non-binding). Close consideration was given to the overarching GHG reduction target in developing and calibrating these two additional targets. In addition, the European Council meeting paid due attention to expanding the grid, requesting the Commission to monitor interconnection development with a view to achieve a Commission's target of 15% by 2030 . These conclusions also include a new governance process whereby governments will contribute through national plans for competitive, secure and sustainable energy with a set of indicators to assess progress and objectives over time.

Figure 5: Agreed headline targets – 2030 Framework for Climate and Energy



Source: European Commission 2030 Framework for Climate & Energy, outcome of the October 2014 European Council

Working towards a RES target that is solely binding on a European level is a new way of achieving this policy goal that will require further clarification in the course of 2015. In addition to being the main focus of the energy and climate framework, the 40% GHG reduction target will be part of the EU negotiating position at the United Nations Climate Change conference (COP 21), which will take place in Paris in the first half of December 2015. The announcement made on 12 November 2014 by the US and China – two economies that account for more than a third of global greenhouse gas emissions – in favour of controlling their carbon emissions is a promising signal demonstrating that major international partners may be ready to take on commitments in combatting climate change. However greater efforts will be necessary to deliver an international agreement at the COP 21 which may also in turn open the door for possible review and adjustment in the current EU energy and climate package endorsed in October 2014.

Even if some elements still have to be clarified further, the conclusions of the European Council in October 2014 undoubtedly marked an important step in European policy-making, showing a political will to redirect energy policies towards greater competitiveness and affordability through more consistent targets in the 2030 horizons.

As RES technologies become mature and are increasingly being integrated into the market, the conclusions of the European Council can be seen as the start of a new era where the ambition of moving towards a low-carbon economy is pursued in an increasingly holistic, technology-neutral and market-based approach. Under this new framework, RES and conventional generation need to build on their complementarity and strengths. Achieving synergy between variable and back-up generation together with setting incentives to reach such an adequate balance is a cornerstone of the 2030 climate and energy framework.

Over the last five years, the changes occurring in the power markets have been profound and significant, showing the early signs of the sector's transformative efforts to achieve a low-carbon economy. Whilst markets continue to integrate and greater liquidity is being pursued with the coupling of spot markets across Europe, the pattern of production has become more versatile, leading to more volatile and declining wholesale prices, increased congestion and reduced load factors of back-up plants. The full potential arising from robust and integrated wholesale markets remains however untapped as the benefits of more integrated intra-day markets and balancing arrangements have not yet been realised whilst they are instrumental to enhance flexibility and accommodate short-term system variations.

Another fundamental aspect of this quickly changing sector is the displacement of generation units that are essential to safeguard the system. Whilst variable RES generation contributes to a low-carbon generation mix and to reducing Europe's energy dependency, this form of generation is heavily dependent on weather conditions and can only be planned and scheduled to a limited extent. It thus requires complementing it with a form of firm generation that will act as a back-up. However today many of the power markets face a paradox: they need back-up plants to ensure a reliable electricity supply to customers but they do not provide the right market incentives to ensure that a sufficient level of back-up capacity is guaranteed.

Moving forward, and building on this, a growing and major concern lies in the investment gap that the European decarbonisation agenda is faced with. From 2000 to 2012, € 1.1 trillion were spent in new power generation, of which three quarters went to the renewables sector. This considerable amount of new capacity played an instrumental role in engaging Europe on a decarbonisation path.

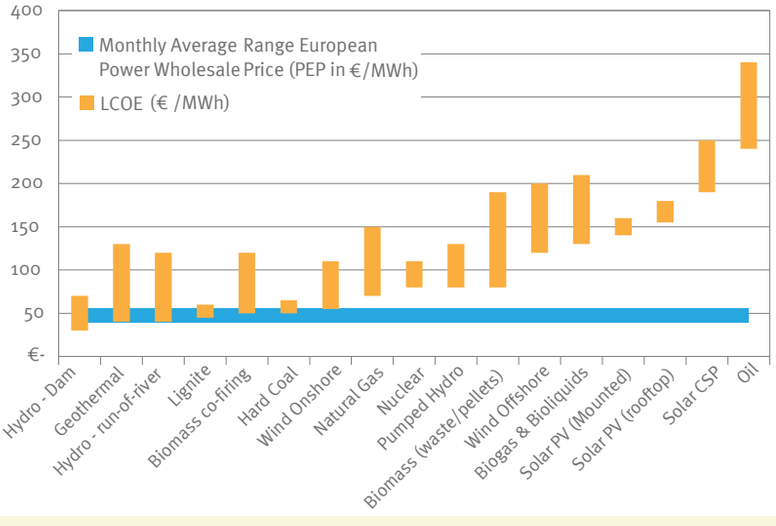
However, the process is far from being completed as Europe would need an additional 740 GW of generation capacity by 2035, making the EU the second largest economy after China to upgrade and refurbish its generation fleet in such order of magnitude[3]. With the lowering of wholesale electricity prices over the last years, - and taking into account the current running hours of each technology-, the graph below shows that current price levels do not allow investing in most of these technologies (Figure 6). This illustrates the investment dilemma currently faced by power companies and the difficulties of meeting the decarbonisation ambition with today's power prices in the context of current energy policies and market framework. However, the strengthening of the ETS mechanism and a stronger carbon price could change this outcome significantly.

Europe will only be able to manage a successful decarbonisation of the economy if the electricity industry becomes investable again. And indeed, the challenge is immense: according to the IEA, no less than €1.3 trillion of investment is needed by 2025 for generation, transmission and distribution. At a time where variable RES are seeing a sharp decline in their technology costs, are made more cost-effective and are being integrated into the market, this raises the issue as to how to pursue investment in a way that is market-based and technology-neutral.

Making renewable electricity affordable plays an important role in the successful evolution of the European energy system. A robust carbon price is the most cost-effective way to ensure the optimum investment levels in low carbon technologies, including RES are achieved. Other national and European policies should be designed in a way that support the effectiveness of the EU ETS.

Furthermore, it will be essential to properly value flexibility and capacity so that plants are adequately remunerated to accommodate both the short-term variations in the system and the need for system back-up that delivers long-term adequacy.

Figure 6: Levelised Cost of Electricity (€/MWh) at realised full load hours in 2013 compared with Average Range of European Electricity Wholesale Price in 2013[4 5]



Source:
- *Alberici, S. et al. (2014). Subsidies and Costs of EU energy: An Interim Report. (DESNL14583). Utrecht, The Netherlands: Ecofys.*
- *Kost, C. et al. (2013). Levelized Cost of Electricity Renewable Energy Technologies - Study - Edition: November 2013. Freiburg, Germany: Fraunhofer Institute for Solar Energy Systems ISE.*
- *World Energy Council, & Bloomberg New Energy Finance. (2013). World Energy Perspective: Cost of Energy Technologies. London, UK: World Energy Council.*
- *Department of Energy & Climate Change. (2013). Electricity Generation Costs (December 2013). London, UK: Department of Energy & Climate Change.*
- *International Energy Agency. (2014). World Energy Outlook 2014. Paris, France: International Energy Agency.*

3 *IEA Investment Outlook, 2014*

4 *As these LCOE numbers are based on public studies (which take different realised full load hours (FLH) for all technologies in the different EU countries), we assume 'average European' FLH.*

5 *We acknowledge the drawbacks of LCOE comparisons. While they can provide a reflection of total costs, given high-quality assumptions, the broad set of technologies play such different roles in the power system that they provide equally wide-ranging benefits or value to the energy system and investors.*

2 Demand

Stagnating demand despite long-term increases in power consumption from households and services

Total EU-28 electricity consumption has roughly stayed on the same level during the last two years, after ups and downs experienced due to the economic crisis since 2008. Final consumption decreased by 1% from 2012 to 2013, from 2,903 to 2,867 TWh. Power consumption is today on the same level as in 2005, and lower than in the years right before the economic crisis: in general power consumption by industry has been decreasing while consumption by households and services has increased steadily.

Most EU countries experienced a slight decrease in their power consumption from 2012 to 2013. Electricity consumption in the EU's three biggest economies – Germany, France, and the United Kingdom – remained almost constant, with year-on-year changes in the range of +/-1%. Spain and Italy saw a moderate decrease of power consumption by around 3%. Altogether final consumption evened out across Europe, which witnessed a converging development trend across countries – in contrast to previous year-on-year changes between EU member states, which had ranged from -9% to +9%. Notable exceptions are Croatia, where final consumption increased by 8%, and Cyprus, where it decreased by 10%. Changes in final consumption of EFTA (Iceland, Norway, Switzerland) and Energy Community (Serbia, Ukraine and observer Turkey) countries were similar to those of EU countries, ranging between -3% (Iceland) and +3% (Ukraine), and total final power consumption across all reporting countries decreased from 3,485 to 3,450 TWh (1%).

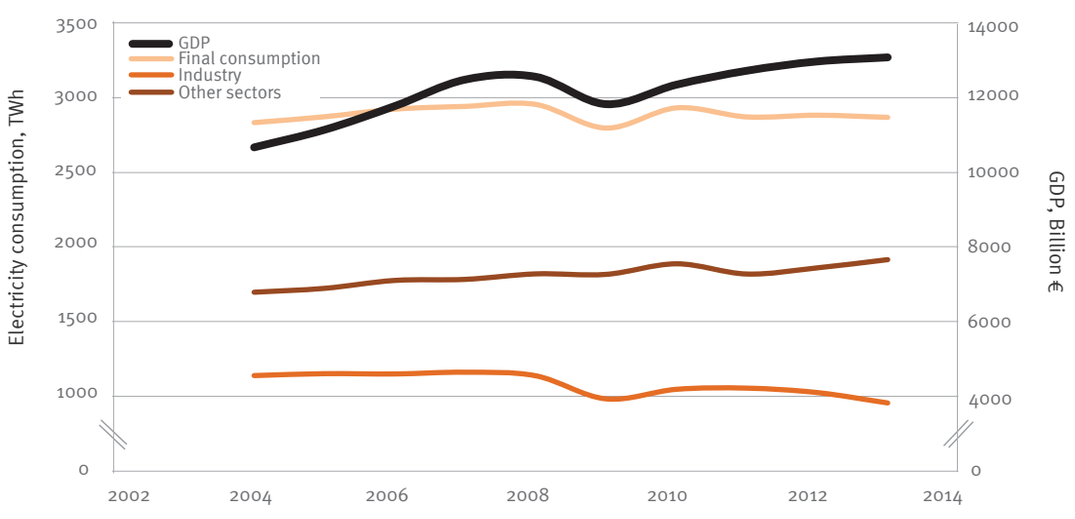
Table 1: Final Consumption of electricity (TWh)

	2012	2013
Austria	65	65
Belgium	84	82
Bulgaria	29	29
Cyprus	4	4
Czech Republic	59	59
Germany	534	528
Denmark	31	31
Estonia	7	7
Spain	246	239
Finland	82	82
France	453	457
United Kingdom	325	325
Greece	54	52
Hungary	36	36
Croatia	16	17
Ireland	26	24
Italy	307	297
Lithuania	10	10
Luxembourg	7	6
Latvia	7	7
Malta	2	2
Netherlands	109	107
Poland	137	134
Portugal	47	47
Romania	51	49
Sweden	132	130
Slovenia	13	13
Slovakia	29	29
Total (EU28)	**2.903**	**2.867**
Iceland	17	18
Switzerland	59	59
Norway	118	118
Turkey	195	199
Serbia	28	28
Ukraine	166	161
Total (all reporting countries)	**3.485**	**3.450**

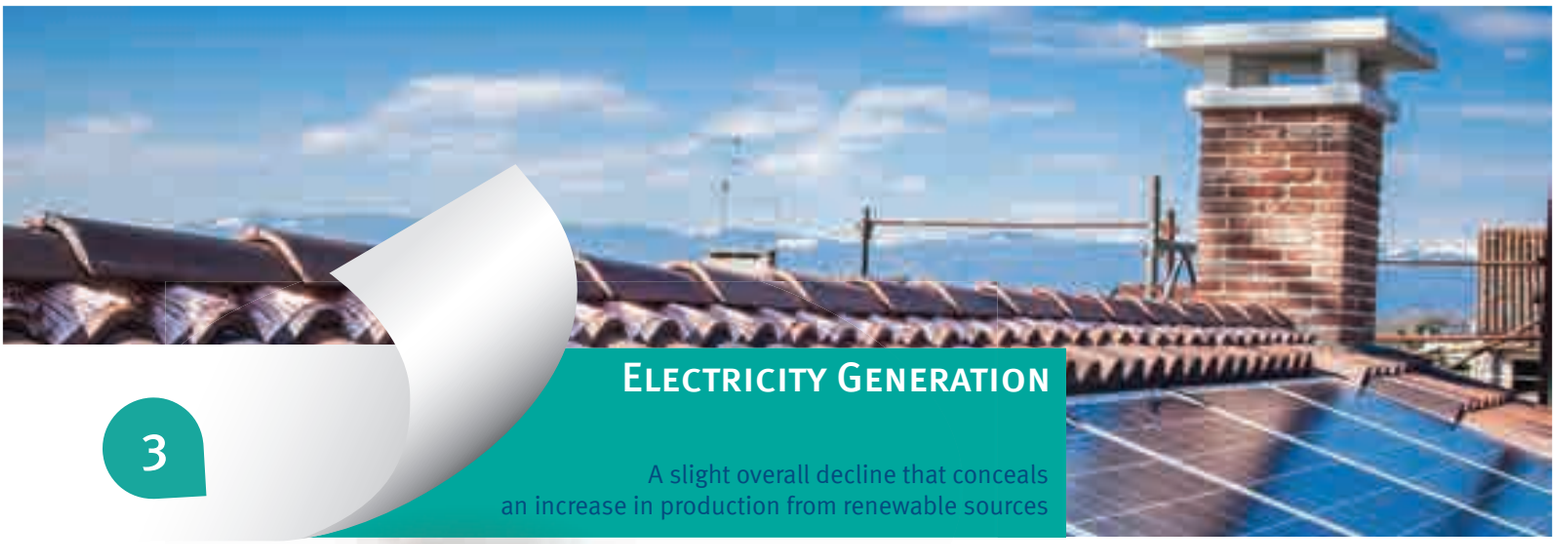
From a longer term perspective, however, major differences between European regions emerge: consumption in the Nordic area and Germany in 2012-2013 was largely at the same level as ten years ago, while Eastern Europe has seen a significant increase in electricity consumption and the consumption in the United Kingdom has decreased by 6% since 2004. Over time, GDP is closely correlated with power demand: during the economic crisis, for instance, power demand mirrored GDP trends. However whilst GDP in the EU-28 has picked up slightly, power consumption no longer clearly follows such a trend, suggesting possible less converging paths for GDP and power consumption in the future. Possible explanations for these diverging paths are the impact of energy efficiency measures, the structural changes in European economies towards less energy-intensive production processes and the growth of the services sector.

Looking at different sectors, power consumption by industry is lower today than it was ten years ago, while consumption by households and services clearly increased between 2004 and 2012. In 2012, the three largest power consuming sectors in the EU-28 were industry (36%), households (30%), and services (30%). The rest was consumed by transport (2%) and by agriculture, forestry and fishing (2%).

Figure 7: Share of Low Carbon technologies versus other in total electricity production in EU28



Source: EURELECTRIC



3 Electricity Generation

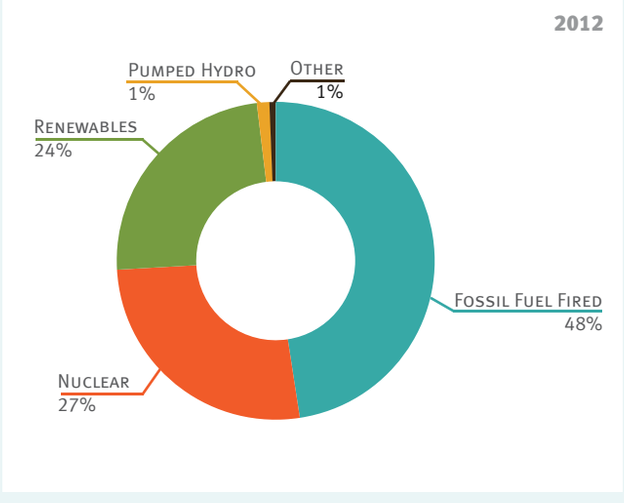
A slight overall decline that conceals an increase in production from renewable sources

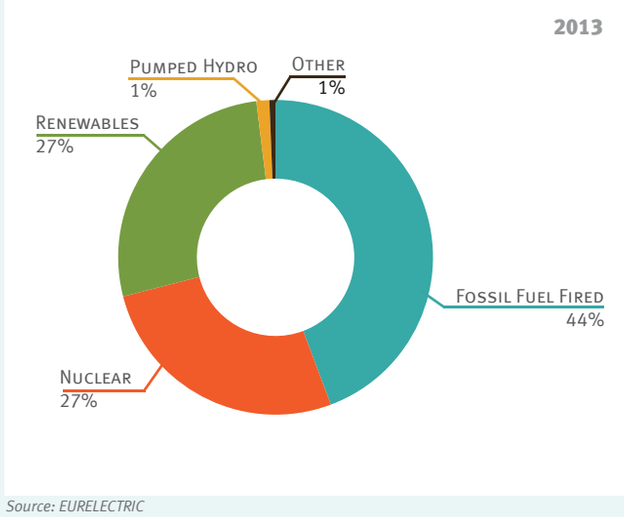
Aggregated net power generation decreased by just more than 1% across EU 28, from 3,136 TWh in 2012 to 3,101 TWh in 2013, following the same trend as power demand. Low-carbon technologies accounted for more than half of total net generation for the second consecutive year, as RES generation continued to increase and fossil fuel fired generation further steeply decreased. Nuclear production, like overall generation, was stable.

Increase in RES generation continues

In 2013 11% more electricity generated by renewable primary sources was fed into European electricity grids than in 2012. The RES generation totalled 836TWh and the share of RES grew by 3.05 percentage point in the EU-28 power mix. Power generation by the key RES technologies grew by two-digit figures, while generation by some less deployed technologies decreased.

Figure 8: Electricity Production by Primary Energy – EU28





Source: EURELECTRIC

Wind: Wind powered generation grew by 15.5%, making up 29% of the total electricity generated from RES in 2013. Of this wind share off-shore generation increased by 27% and contributed 22 TWh to Europe's power mix. Generation by on-shore wind grew by 14%, with a production output of 213 TWh.

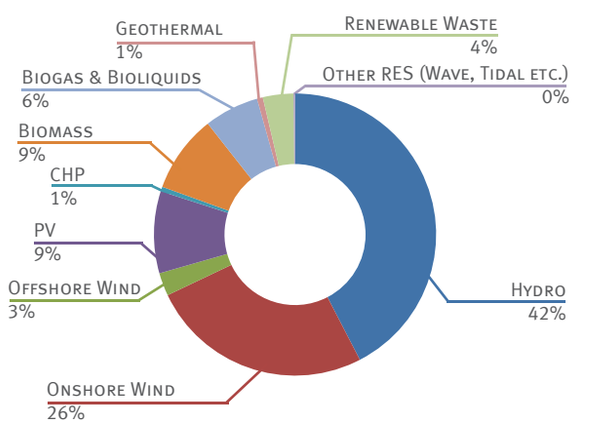
Solar: Solar powered generation rose to 82 TWh in 2013, more than 100 times as high as ten years earlier. PV generation grew at a 17% rate in 2013 and accounted for 95% of all solar powered generation.

Biomass and biogas: Biomass and biogas fired generation grew by 7% and 15%, totalling at 74 TWh and 52 TWh respectively.

Hydropower remained the single largest source for renewable electricity in the EU-28 in 2013, producing 10% more than in 2012.

Geothermal and waste fired generation figures both showed a moderate decrease (3% and 1% respectively).

Figure 9: The share of renewable energy sources in the total EU-28 renewables generation mix for 2013



Source: EURELECTRIC

[6] *The guidelines reflect to a large extent the recommendations of EURELECTRIC's "Renewable Energy and Security of Supply: Finding Market Solutions" report, the result of a year-long in-depth investigation into how future electricity markets should be designed to ensure a cost-efficient transition towards decarbonisation while securing electricity supply*

The share of variable renewables (wind and solar) accounted for 10% of the total European power mix. The additional supply-side variability of these technologies is increasingly not only changing energy market outcomes, but also leading to changes in the operation of the power system as these technologies are not dispatchable. In particular, this evolution of the power mix implies that more flexibility is needed in the form of more flexible generation, demand response and storage to cope with sudden increases or decreases of variable RES output. This situation is further influenced by the fact that variable RES, unlike other generators, are not yet fully exposed to market dynamics such as market prices or balancing responsibility. The new state aid guidelines[6] in place should however ensure that in the future RES producers become responsible for balancing their own position and that RES supports systems are designed in a more cost-effective manner (with the reservation expressed in chapter 1 regarding its limited scope).

Table 2 shows the magnitude of the variable RES challenge: on certain peak days solar and wind output can cover a large part of total consumption. Comparing these peak power numbers with their average generation numbers, highlights the fact that other forms of generation need to be available to keep the balance between supply and demand.

Table 2: Example of countries with a high Peak Solar and Peak Wind Production

PEAK SOLAR						
	Peak Solar powered generation in 2013 in 15 min interval	Date of Peak Solar generation			Final consumption in the 15 minutes of peak solar production	% covered by Solar
Germany	5988	21	Jul	2013	10743	56%
Belgium	2.062	20	Apr	2013	7.119	29%
PEAK WIND						
	Peak Wind powered generation in 2013 in 15min interval	Date of PeakWind generation			Final consumption in the 15 minutes of peak wind production	% covered by Wind
Denmark	4.892	22	Oct	2013	4.914	99%
Portugal	3.864	10	Dec	2013	6.654	58%

Source: EURELECTRIC

Furthermore, the continued addition of solar and wind into the power grid will further decrease the required base load, but increase the amount of rates to ramp power. Such ramping sets new requirements for the remainder of the generating fleet to keep the lights and maintain power quality (e.g. voltage, frequency). The remaining assets (like gas-fired plants or hydro) will need to become more responsive and will need to be adapted to cope with significantly different modes of operation than they were designed for. This will also have as a consequence to increase the maintenance costs for such technology and reduce the lifetime due to increased ramping up and down of the plants.

The best way to pursue the deployment of sufficient flexible resources in the system is through the further development of well-functioning integrated wholesale markets where all generators participate on a level playing field. The completion of the Internal Energy Market (IEM) should therefore be the priority in order to render sound prices that attract all resources in the system to participate in the supply of flexible electricity. Increased renewable generation and stagnating demand also led to low wholesale power prices, making operation and investment in (upgrades of) back-up plants more difficult at a time when it is needed for the system to guarantee security of supply.

Nuclear remains largest low carbon technology in Europe

27% of electricity in Europe was produced by nuclear power both in 2012 and 2013, and nuclear energy thus remains both the most important energy source for power generation in Europe and the largest source of low carbon electricity. The largest annual change in nuclear fired generation took place in Spain where one reactor was closed down and production decreased by 8% from 2012 to 2013.

Fossil fuel generation continues to decrease

The overall decrease (-8%) of fossil fuel generation was mainly driven by a decrease of gas generation (-14% over just one year): its share in the overall mix fell further from 18% in 2012 to 16% in 2013. Electricity production from hard coal (-3%) and lignite (-5%) decreased modestly. In the previous year coal fired generation increased, replacing gas due to the continued low-carbon EU ETS price signal and increased spreads between gas and coal commodity prices on international markets. This coal renaissance has now halted on a European level. However, coal continues to replace gas in a number of Member States, for example in Germany (+5% versus -13%), France (+14% versus -17%) and the Netherlands (+22% versus -19%).

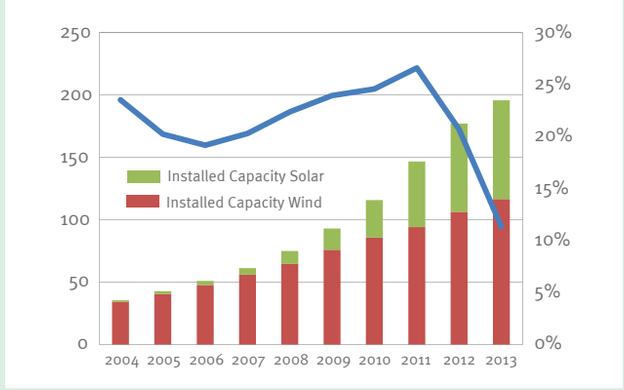
4 Capacity and Investment

A more moderate growth in RES capacity that pushes overall 2013 capacity up

In contrast to the decline in electricity production, the volume of installed capacity grew from 2012 to 2013, although by less than 1%. Whilst Europe witnessed a decommissioning of fossil fuel power plants, RES plants continued to be added to the system – but at a more moderate pace and in a more limited number of member states compared to previous years. More than 70% of the capacity installed in 2013 came from RES.

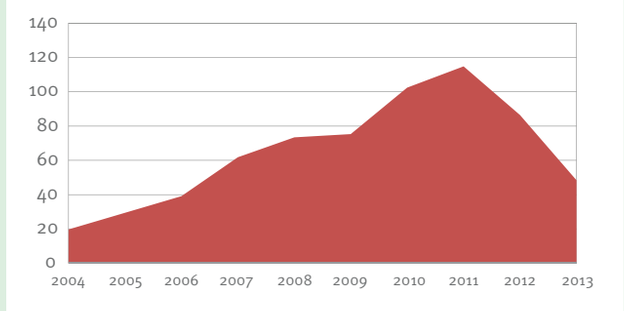
Most of the increase among RES technologies was due to additions in variable capacity: wind power accounted for 32% of new installations in 2013, followed by solar PV with 31% (compared with gas (21%)). All in all, a total of 25.4 GW of renewable power capacity was installed.

Figure 10: Installed capacity variable RES (in GW) and combined year-on-year growth rate



Source: Global Trends in Renewable Energy Investment 2014, Bloomberg New Energy Finance

Figure 11: Annual Investment ($bn) in renewable energy in Europe



Source: Global Trends in Renewable Energy Investment 2014, Bloomberg New Energy Finance

However, investments in both solar and wind in Europe were more limited over the past two years[7]. Part of this can be explained by price effects (e.g. decreasing technology costs, for solar in particular), but also by the scaling back of policy support. Some of this has been in response to political decisions aimed at reducing the level of support and the current situation of overcapacities in the market. Moreover, two thirds of all new EU installations in 2013 were in just five countries, signalling a halt in the solar and wind progression across the EU-28, with the exception of these countries.

Table 3: Countries with the largest variable RES capacity increase in 2013

TOTAL RES CAPACITIES	2012 (MW)	2013 (MW)	New RES added in 2013(MW)	% of total EU new RES capacities
1. Germany	74281	81270	6989	31%
2. Italy	43183	45947	2765	12%
3. United-Kingdom	15551	17507	1956	9%
4. Romania	1947	3752	1805	8%
5. France	33833	35269	1436	6%

Source: EURELECTRIC

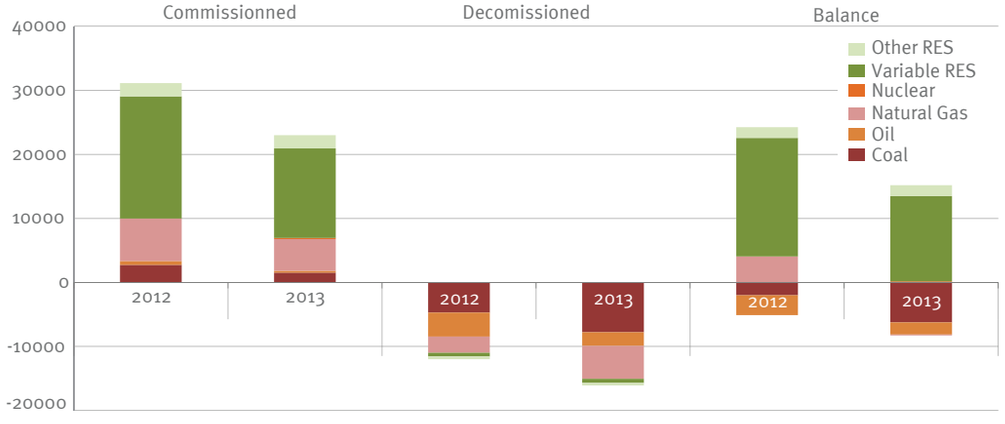
Other renewable technologies have also been increasing their installed capacity over the past 2 years: Hydro (+515 MW), Biomass (+1139 MW), Biogas (+517 MW), Geothermal (+5 MW) and other RES, mainly tidal and wave energies (+210 MW).

The European power sector also continues to move away from coal and fuel oil, with more of such plants being decommissioned[8] than installed. In 2013 in the reporting countries[9] a total of 23,065 MW of fossil fuel fired capacity was decommissioned and 16,295 MW of capacity was commissioned, resulting in a net decrease of 6,768 MW. Old age, environmental legislation such as the Large Combustion Plant Directive, and unprofitability explain the decommissioning of thermal plants.

There was a net increase in gas fired capacity in 2012 and a very moderate decrease (-0.1 GW) in 2013. Read in combination with decreasing power production from gas-fired plants, this suggests that a growing number of gas plants (some of them freshly commissioned) have been either mothballed in recent years due to unprofitability or have become reserve capacity contracted by the TSOs.

[7] *Bloomberg New Energy Finance, 2014*

Figure 12: Commissioned and Decommissioned power plants in 2013 [10]



Source: EURELECTRIC

Conventional thermal technologies closed the year with a balance of -8,263 MW. It is to be noted that the negative balance of fossil fuel fired capacities in 2013 was more than 3 times larger than in 2012. Nuclear capacities remained constant in 2013, apart from a 168 MW addition as a consequence of uprate of existing capacity in Sweden. A 466 MW nuclear unit was closed down in 2012 in Spain, but restarting the plant is under discussion. Around 1,000 MW of renewable power generation capacity was decommissioned both in 2012 and 2013, including mainly hydropower, onshore wind power and solar PV.

Investment outlook

Between 2000 and 2012, investment in power generation was particularly remarkable with an overall amount of € 1.1 trillion spent in new capacity[11]. This volume peaked in 2011 and is since then gradually reducing. The decarbonisation process together with the implementation of stricter EU environmental rules requires continued efforts to invest in a mix of technologies that addresses sustainability, competitiveness and security of supply.

As variable RES are becoming more and more competitive and are gradually facing the same regime as other technologies, furthering investment is becoming critical – and this in a context where wholesale electricity price levels hardly allow investing in any available generation technologies.

Europe will only be able to achieve a successful decarbonisation of the economy if the electricity industry becomes investable again. And indeed, the challenge is immense: according to the IEA, no less than €1.3 trillion of investment is needed by 2025 for generation, transmission and distribution.

If a better business environment is not created, there is a considerable risk that more power generation capacity, especially gas fired generation, will continue to be mothballed or permanently shut down. Reducing overcapacity in a smooth way without jeopardising energy security needs should be prioritized. In the future energy market thermal plants will run fewer hours than in the past. Therefore it will be essential to properly value flexibility and capacity so that plants are adequately remunerated, to accommodate both the short-term variations in the system and the need for system back-up that delivers long-term adequacy.

8 *21 countries were able to provide a breakdown of capacity additions and reductions by primary fuel. Therefore it should be noted that the figures for net installed capacity and disaggregated capacity changes do not cover the same number of countries.*

9 *EURELECTRIC has defined commissioning and decommissioning by their narrowest meaning. Commissioned power plants are those connected to the grid and producing electricity; no plants in the stages of planning, permitting or construction were considered. Similarly, decommissioning numbers include only power plants that are permanently not producing electricity; no mothballed and reserve capacity power plants were considered.*

10 *Belgium, Bulgaria, Cyprus, Germany, Estonia, Finland, France, United-Kingdom, Greece, Hungary, Croatia, Ireland, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Spain and Sweden.*

11 *Reference to IEA investment outlook*

5 Markets

A sharp rise in policy costs/levies and an increasinglycomplex energy policy environment is preventing customers from feeling the full benefits of market integration

The transformative changes on-going in the power sector lead to the emergence of new patterns of generation and trade influencing the development of markets and grid. Whilst markets continue to integrate and get more liquid, the expected benefits have been more moderate with limited or even declining price convergence. Markets are experiencing overall downward pressure on wholesale prices brought by an increasing share of variable renewable energy, a decline in demand and lower fossil fuel costs. Nevertheless, customers are not reaping the benefits of lower prices because wholesale prices reduction are largely off-set by the increase in taxes and levies which grew by 109% for industrial customers between 2008 and 2012 alone.

Progress towards an EU-wide internal electricity market continued: in 2014 day-ahead markets were succesfully coupled in 21 European countries…

On 4 February 2014, the coupling of spot markets of Great Britain with the Central-West Europe (CWE), Nordic and Baltic Regions through the North-West European (NWE) Price Coupling Initiative became operational. The initiative was extended to the South-West Europe region on 13 May 2014 and to Central-East Europe (CEE) on 19 November 2014. To date, the project links organised electricity markets in 21 European countries, enabling more effective power trading through implicit cross-border auctions. Market coupling is thus expected to improve price convergence across these regions in the coming years, fostering competition and providing European electricity consumers with tangible benefits such as a greater choice of services. Work is progressing to extend the initiative to the Central-South Europe (CSE) region by early 2015.

Integrating wholesale markets is a means to provide greater liquidity and flexibility to the energy system. However, despite progress on day-ahead markets, there is still significant delay in developing robust cross-border intraday and balancing markets. Such improvement is crucial to ensure that the system remains balanced as the share of renewables continues to grow.

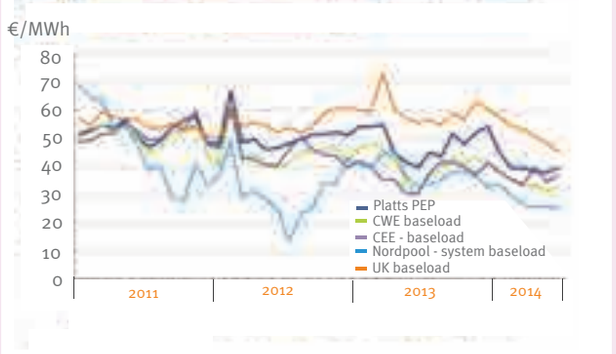
… but market coupling did not necessarily lead to further price convergence

Whilst the Czech, Hungarian and Slovakian prices converged following the extension of market coupling from the Czech Republic and Slovakia to Hungary in September 2012, the same does not hold for other markets. In 2013, the Central-West Europe (CWE) region recorded the most significant decrease in price convergence (down by 32% compared to 2012), following an 18% drop in 2012 compared to 2011[12]. This is explained predominantly by the fact that the growing shares of RES lead to more volatile trade patterns and congestion in the system. Overall, recent market developments suggest that the decreasing convergence trend is likely to continue: in the first half of 2014, the average wholesale price was around 30€/MWh in Denmark and Sweden, while in the UK it was above 50 €/MWh.

Decreasing wholesale prices

Wholesale market prices have fallen in several market areas compared to pre-crisis levels, and particularly since 2012. Figure 13 below shows the evolution of the monthly Platts' Pan-European Power Index (PEP) and average power prices in several European regions. The PEP has been following a downward trend since the beginning of 2012, falling to 38-39 €/MWh in the second quarter of 2014 – the lowest since the summer of 2009[13]. The increasing share of renewables, decreasing industrial demand for electricity, combined with decreasing or flat fossil fuel feedstock costs and consistently low carbon prices on the supply side have all contributed to this trend. On the German market, for instance, future baseload prices fell from an average of 56 €/MWh in 2007 to 40 €/MWh in 2013, whereas peak prices fell from 79 €/MWh to 51€/MWh[14].

Figure 13: Comparisons of the Platts PEP and monthly electricity baseload prices in regional electricity markets (CWE, CEE, Nordpool and the UK)



Source: European Commission 2030 Framework for Climate & Energy, outcome of the October 2014 European Council

[12] *ACER/CEER Annual Report on the Results of Monitoring the Internal Electricity and Gas Markets in 2013, October 2014*
[13] *European Commission, Directorate-General for Energy, Market Observatory for Energy, 2014*
[14] *BDEW 2013, "Kraftwerksplanungen und aktuelle ökonomische Rahmenbedingungen für Kraftwerke in Deutschland", Berlin, August 2013.*

Soaring retail prices

Despite the reduction in the wholesale market prices, retail companies continued to feel the heat over increasing end-user prices, which remain a major concern for domestic, commercial and industrial customers throughout Europe.

The price increases witnessed at retail level were, in fact, largely driven by governments. Between 2008 and 2012 energy and supply costs[15] decreased by 4% for domestic and by 10% for industrial customers. Network costs increased only moderately by 10% and 17% respectively. Meanwhile, taxes and levies rose by as much as 31% and 109% respectively, wiping out any benefits derived from competitive wholesale markets.

Within the taxes and levies component, policy support costs (levies) more than doubled between 2008 and 2012 for domestic customers. However, taxes such as value-added tax and excise duties still make up most of the burden. In fact, European households spent an average of 39 €/MWh on taxes and 25 €/MWh on policy support costs in 2012.

Policy support costs borne by industrial customers more than doubled between 2008 and 2012, increasing by an average of 157% across all reporting countries[17]. In 2012 the average industrial levy was 21 €/MWh. At the beginning of the reporting period 22 countries billed quantifiable policy supports costs to industrial consumers. One year later, this had increased to 26 €/MWh.

Figure 14[16]**:** Evolution of average household price components

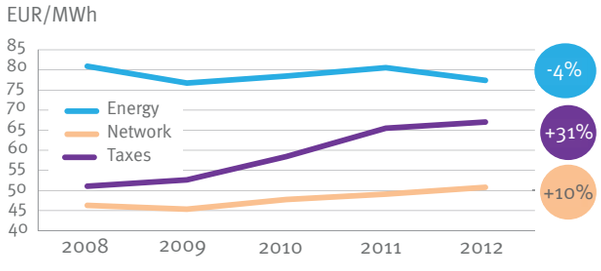


Figure 15: Evolution of average industrial price components

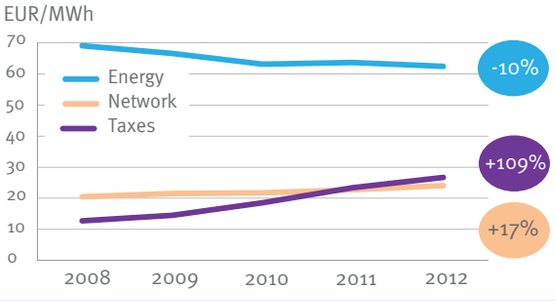


Figure 16: Policy support cost and tax levels borne by domestic customers in 2012 (by country and EU averages (dotted lines))

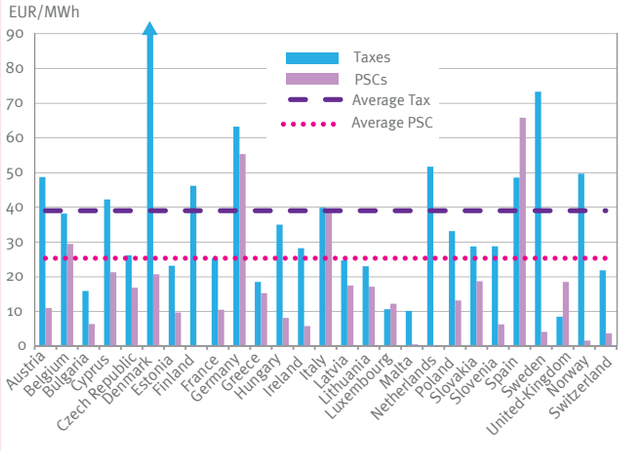
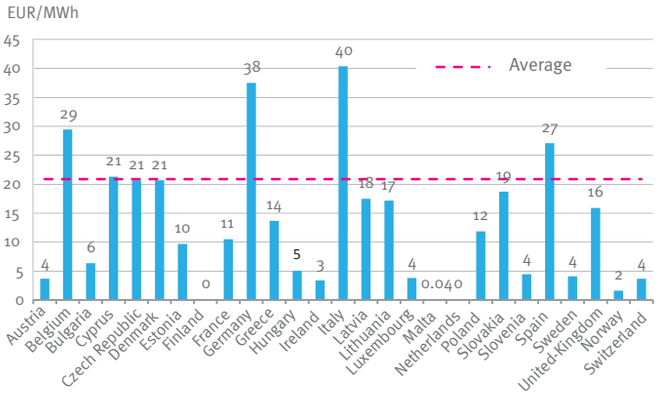


Figure 17: Policy support costs borne by industrial customers in 2012 (by country and EU averages (dotted lines))



Source(Figure14,15,16,17): EURELECTRIC, Analysis of European Power Price Increase Drivers, 2014

15 *Retail prices can be broken down in three components: 1. energy and supply costs, covering the costs to generate, trade and supply electricity as well as suppliers' costs (e.g. customer services); 2. network costs, covering the costs to transport electricity to customers' doorsteps and to maintain and upgrade the electricity grids; 3. taxes and levies (or policy support), covering value-added taxes (VAT), consumption taxes (excise), support to power generation technologies (most notably renewable energy source), support to vulnerable customers, support to energy efficiency and virtually any other expenditure governments wish electricity bills to be a vehicle for (e.g. in some countries the national TV broadcasting fee is levied on electricity bills)*

16 *The figure displays the most common policy support items. It does not aim to provide an exhaustive list. The prices included in this graph are based on consumption band of 2 500 – 5 000 kWh, which is not representative of average household customer in all countries, especially those where electricity is used for heating*

17 *In several countries taxes imposed on industrial consumers are recoverable. Furthermore a significant number of tax exemptions exist. The number provided here refers to only levies (policy support costs) and is therefore different from the number given in Figure 16 above.*

6 Environment

2013 saw a marked decline in CO_2 emissions in most EU member states, largely due to displacement of fossil generation by renewables

Increased generation from renewable sources and the commissioning of new RES capacity played an important role in the overall decline in CO_2 emissions, which was particularly pronounced in Spain, Portugal and Italy. In some countries, however, CO_2 emissions increased. Continued efforts are needed to strengthen the EU Emissions Trading System (ETS) to ensure that the carbon price acts as a main driver of investment decisions towards low-carbon technologies.

Environmental data for 2012 and 2013 show a significant decline in CO_2 emissions from electricity generation in most EU countries. As power generation and demand decreased only slightly, these emissions reductions have translated into a decrease in the overall carbon intensity of the power mix – divergent developments in individual member states notwithstanding.

Increased production from renewables has displaced fossil generation in a number of countries, with significant effects. In Spain fossil generation fell by 30TWh (ca. 22%) from 2012 to 2013, leading to a staggering decrease in CO_2 emissions (-21%). Similar numbers are reported for other countries, e.g. Portugal (-19% CO_2 emissions), Italy (-15%) and the UK (-8%). These results are to be correlated with the overall decrease of fossil generation that fell from 18% in 2012 to 16% in 2013 (as explained in further detail in chapter 3).

Meanwhile, CO_2 emissions in Nordic countries increased considerably: by 8% in Sweden, 12% in Denmark and 24% in Finland. This development was not based on changes in power generation capacity or demand, but was rather due to annual variations in the availability of hydropower. A cold spell in March 2013 in Northern, Mid- and Eastern Europe led to delayed snowmelt and low availability of Norwegian hydro power. As a result, emissions connected to heating also increased in these regions.

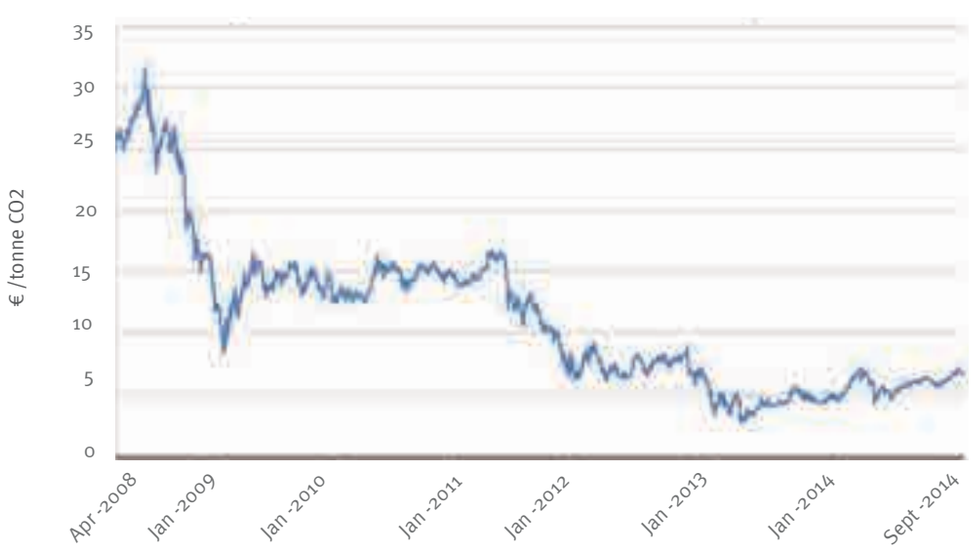
Figure 18: Change in CO_2 emissions 2012-2013

Source: European Climate Exchange (ECX)

The weak CO_2 price signal continued to be a major concern for EURELECTRIC. It results from the overlap in policy instruments to reach the EU's 2020 energy efficiency and renewables objectives with the climate target that increases the cost of delivery of this target and the fact that the ETS was not designed flexibly enough to adapt to lower demand. In 2012 and 2013, the CO_2 price remained well below €10. While first positive steps towards a meaningful reform of the ETS are underway, the sustained surplus of more than 2bn allowances is continuing to undermine the CO_2 price.

To encourage power companies to invest in competitive low carbon technologies, rapid carbon market reform to deal with the current surplus of EU ETS allowances is necessary. In order to deliver cost-effective CO_2 emission reductions in the power sector a profound reform of the ETS must be carried forward as a matter of priority. For 2015 this means adopting strong market stability reserve legislation and initiating the process to review the linear reduction factor, which sets the speed by which emission reductions should be achieved. In particular, EURELCTRIC supports an earlier implementation of the market stability reserve with an immediate transfer to the reserve of the 900 Million allowances already 'backloaded' (i.e. temporarily removed from the system).

Figure 19: Evolution of ETS emission allowance prices



Source: European Climate Exchange (ECX)

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