RENEWABLES: THE GREAT UNCERTAINTY OF THE EU ENERGY STRATEGY

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Tania ZGAJEWSKI

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Egmont – The Royal Institute for International Relations
Address Naamsestraat / Rue de Namur 69, 1000 Brussels, Belgium
Phone 00-32-(0)2.223.41.14
Fax 00-32-(0)2.223.41.16
E-mail info@egmontinstitute.be
Website www.egmontinstitute.be

Eekhout 2
9000 Gent
Tel. 09/233 80 88 Fax 09/233 14 09
Info@academiapress.be www.academiapress.be

All authors write in a personal capacity.

Lay-out: punctilio.be

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EXECUTIVE SUMMARY

For more than two decades, the development of renewable energy sources (RES) has been an important aim of EU energy policy. It accelerated with the adoption of a 1997 White Paper and the setting a decade later of a 20% renewable energy target, to be reached by 2020. The EU counts on renewable energy for multiple purposes: to diversify its energy supply; to increase its security of supply; and to create new industries, jobs, economic growth and export opportunities, while at the same time reducing greenhouse gas (GHG) emissions. Many expectations rest on its development.

Fossil fuels have been critical to the development of industrial nations, including EU Member States, which are now deeply reliant upon coal, oil and gas for nearly every aspect of their existence. Faced with some hard truths, however, the Member States have begun to shelve fossil fuel. These hard truths are as follows: firstly, fossil fuels are a finite resource, sometimes difficult to extract. This means that, at some point, fossil fuels are going to be more difficult to access in Europe or too expensive to use.[1] The problem is that you cannot just stop using fossil fuels when they become too expensive; the existing infrastructure is profoundly reliant on fossil fuels. It is thus almost normal that a fierce resistance to change exists. Secondly, fossil fuels contribute to climate change. They emit GHG, which contribute greatly to climate change. As a consequence, their use needs to be drastically reduced. Thirdly, Member States are currently suffering a decline in their own fossil fuel production. This increases their dependence on increasingly costly fossil fuel imports from increasingly unstable countries. This problem is compounded by global developments: the growing share of emerging economies in global energy demand (in particular China and India but also the Middle East) and the development of unconventional oil and gas production in the United States. All these elements endanger the competitiveness of Member States' economies and their security of supply. Therefore, new indigenous sources of energy and a diversification of energy suppliers and routes to convey energy need to be found.

To solve all these challenges, in 2008 the EU put in place a strategy based on three objectives: sustainability (reduction of GHG), competitiveness and security of supply. The adoption of a renewable energy policy was considered essential for reaching these three strategic objectives.

[1] The abundant reserves of coal and unconventional fossil fuels (oil and gas) and the revolution of fossil fuel technologies will not change anything. They will postpone the occurrence of these two events but will not delay them indefinitely. In addition, it should be remembered that to keep global warming under 2°C – a goal that the most conservative governments have agreed to meet – a large part of these reserves must be left underground to prevent a climate catastrophe.

The adoption of the 20% renewable energy target has undeniably had a positive effect in the EU on the growth in renewables, with the result that renewable energy sources are steadily increasing their presence in the EU energy mix. They are now, it can be said, an integral part of the EU energy system.

However, the necessity of reaching this 20% renewable energy target in 2020, combined with other circumstances, has also engendered in many Member States a certain number of difficulties, creating uncertainties for investors and postponing benefits for consumers. The electricity sector is the clearest example of this downside. Subsidies have become extremely abundant and vary from one Member State to another, compromising both fair competition and single market. Networks encountered many difficulties to develop and adapt. With technological progress these subsidies have also become quite excessive. The growing impact of renewable electricity fluctuations has made some traditional power plants unprofitable and created disincentives for new investments. The EU does clearly need to reassess its strategy. If it repeats the 2008 measures it will risk to provoke increased instability and costs.

INTRODUCTION

For more than two decades, the development of renewable energy sources (RES) has been an important aim of EU energy policy.[2] It accelerated with the adoption of a 1997 White Paper[3] and the setting a decade later of a 20% renewable energy target, to be reached by 2020. The EU counts on renewable energy for multiple purposes: to diversify its energy supply; to increase its security of supply; and to create new industries, jobs, economic growth and export opportunities, while at the same time reducing greenhouse gas (GHG) emissions. Many expectations rest on its development.

The adoption of the 20% renewable energy target has undeniably had a positive effect in the EU on the growth in renewables, with the result that renewable energy sources are steadily increasing their presence in the EU energy mix. They are now, it can be said, an integral part of the EU energy system.

However, the necessity of reaching this 20% renewable energy target in 2020, combined with other circumstances, has also engendered in many Member States a certain number of difficulties, creating uncertainties for investors and postponing benefits for consumers. The electricity sector is the clearest example of this downside. The most spectacular growth of renewables has occurred in this sector,[4] in particular, as a result of the use of wind power and solar photovoltaics to produce electricity. None of the approaches thus far adopted to promote the development of these two technologies have been universally accepted as effective and efficient.

The paper will first recap why the development of RES is necessary (§ 1), then describe the genesis of the renewable energy policy (§ 2). Next, it will examine the progress made within the EU towards its overall 2020 RES objective (§ 3). Electricity generated from renewable sources lies at the heart of the current debate, and we will henceforth concentrate on this topic.[5] Fourthly, the paper will address more specifically the challenges entailed by the growth of wind energy and solar energy in the electricity sector (§ 4). Finally, it will present a series of general considerations

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2 As early as 1986, the Council listed the promotion of RES among its energy objectives (OJ C 241 of 28.09.1986, p. 1). See also COM(97) 599 final, p. 6.

3 COM(97) 599. This document was preceded by the 1996 Green Paper *Energy for the future: Renewable sources of energy* – COM(96) 576.

4 Reliance on imported fossil fuels is still high in heating and transport for most Member States, where the use of renewables has only marginally increased since 2005. See Commission's document SWD(2014) 330 final/2, p. 131.

5 For the (quite different) questions raised by renewables in transport, see T. Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability*, Egmont Paper 68, July 2014.

and evolutions envisaged by the European Commission in its climate and energy package for the period 2020-2030 (§ 5).[6]

Tania Zgajewski[7]

[6] Research for this paper stopped at the end of August 2014.

[7] Tania Zgajewski is a Senior Research Fellow at Egmont and a member of the board of HERA/CEEI. She was for a long time a Research Fellow at the University of Liège.

§ 1. The Necessity of Developing Renewables

1.1. Recap: three strategic objectives

Fossil fuels have been critical to the development of industrial nations, including EU Member States, which are now deeply reliant upon coal, oil and gas for nearly every aspect of their existence. Faced with some hard truths, however, the Member States have begun to shelve fossil fuel. These hard truths are as follows: firstly, fossil fuels are a finite resource, sometimes difficult to extract. This means that, at some point, fossil fuels are going to be more difficult to access in Europe or too expensive to use.[8] The problem is that you cannot just stop using fossil fuels when they become too expensive; the existing infrastructure is profoundly reliant on fossil fuels. It is thus almost normal that a fierce resistance to change exists. Secondly, fossil fuels contribute to climate change. They emit GHG, which contribute greatly to climate change. As a consequence, their use needs to be drastically reduced. Thirdly, Member States are currently suffering a decline in their own fossil fuel production. This increases their dependence on increasingly costly fossil fuel imports from increasingly unstable countries.[9] This problem is compounded by global developments: the growing share of emerging economies in global energy demand (in particular China and India but also the Middle East) and the development of unconventional oil and gas production in the United States. All these elements endanger the competitiveness of Member States' economies and their security of supply. Therefore, new indigenous sources of energy and a diversification of energy suppliers and routes to convey energy need to be found.

To solve all these challenges, the EU put in place a strategy based on three objectives: sustainability (reduction of GHG), competitiveness and security of supply. The adoption of a renewable energy policy was considered essential for reaching these three strategic objectives.

Today, nothing has changed. As a matter of fact, all three strategic objectives remain valid and have even become more urgent. Firstly, GHG emissions continue to rise and carbon prices are not in use in certain regions or countries, or are low, as is the case

8 The abundant reserves of coal and unconventional fossil fuels (oil and gas) and the revolution of fossil fuel technologies will not change anything. They will postpone the occurrence of these two events but will not delay them indefinitely. In addition, it should be remembered that to keep global warming under 2°C – a goal that the most conservative governments have agreed to meet – a large part of these reserves must be left underground to prevent a climate catastrophe.

9 The EU external energy bill represents today more than €1 billion per day (around €400 billion for the whole of 2013) and more than a fifth of total EU imports. See the Commission communication *European Energy Security Strategy: Comprehensive plan for the reduction of EU energy dependence* – COM(2014) 330, p. 1.

in the EU.[10] Secondly, the global demand for primary energy (coal and gas) will continue to surge in the next few years, putting Europe in competition with other parts of the world.[11] Thirdly, in the medium term, the gas and electricity price differential should remain unfavourable to Europe, with the consequence that it could induce the relocation of energy-intensive activities outside the EU, or a sharp fall in new investments in those activities. Unless a miracle occurs, these three reasons alone explain why it is crucial that Europe continues to develop its renewable energies and robustly improve its energy efficiency.

Obviously, the shift to more renewable energy will take time. In the near future, the EU energy system will still be based on fossil fuels (ideally natural gas, to the exclusion of coal), hopefully at the lowest cost and in the most sustainable fashion possible.

1.2. The EU's problematic definition of renewable energy sources

According to the International Energy Agency (IEA), renewable energy is 'derived from natural processes ... that are replenished at a faster rate than they are consumed.'[12] At EU level, and according to Article 2 (a) of Directive 2009/28/EC currently in force, energy from renewable sources means 'energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.'

By comparison with the IEA definition, the EU definition is just an enumeration of non-fossil sources which can produce energy. It remains silent on the varying sustainability of these sources.

As a consequence, in the EU, subsidy regimes and other policies that promote renewable energy encourage some types of energy which are classed as 'renewable' by the EU, but which are in fact utterly unsustainable, and result in highly negative climate, environmental and human impacts. This is particularly the case for biomass sources. Biomass policies have focused on large-scale wood combustion for electricity and heat – which depends on increased logging and the expansion of monoculture tree plantations – and a greater use of transport biofuels (also referred as 'transport agrofuels'). The enormous volume needed to meet an open and global market could be

10 For instance, in February 2014, the CO^2 allowance price under the EU ETS reached €6.90 per tonne (news dated 18 February 2014, published on http://www.citepa.org/en/news/1450-17-february-2014-eu-ets-carbon-price-hits-new-13-month-high). In the period up to 2020, EU CO^2 allowances are expected to trade in a range of €5-10 on average (see an article published in Platts dated 4 June 2014: http://www.platts.com/latest-news/electric-power/london/eu-co2-prices-to-average-eur5-10mt-to-2020-survey-26804376).

11 See SWD(2014) 330 final/3, pp. 13 and 101-102 for Europe.

12 http://www.iea.org/aboutus/faqs/renewableenergy/

extremely damaging in many aspects. In addition, there is a growing volume of evidence that industrial bioenergy (both biomass combustion and transport biofuels) commonly causes more GHG emissions than the fossil fuels they replace. A growing volume of peer-reviewed studies documents the scale of these emissions, which result from indirect land-use change, increased fertilizer use and other causes.[13] This reduces considerably the GHG benefits of using biomass and contributes to climate change. With about half of the 2020 renewables objective depending on biomass,[14] this is worrying.

Furthermore, with this definition of renewable sources, EU legislation has not been very inclined to introduce binding sustainability criteria for the use of biomass for energy. It has achieved this for biofuels for transport (but there are few criteria and the way they are defined is clearly unsatisfactory), it has not done it for biomass used for electricity and heat (only recommendations to Member States have been adopted so far).[15]

All this shows that the existing EU definition needs to be revised.

1.3. The limits

If the use of renewable energy as an alternative to fossil fuels has advantages, one must also be aware of its disadvantages.

1.3.1. Energy intensity and intermittency/variability

One disadvantage with RES is that it is difficult to generate quantities of electricity as large as those produced by traditional fossil fuel generators. This may mean that we need either to reduce the amount of energy we use, notably through energy efficiency measures, or simply build more renewable energy facilities.

Another disadvantage of renewable energy sources is the reliability of supply. Renewable energy often depends on the weather for its source of power. Hydro generators need rain to fill dams to supply flowing water. Wind turbines need wind

13 In response to these issues, the Commission has tabled a legislative proposal still under negotiation. Proposal for a directive amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/82/EC on the promotion of the use of energy from renewable source, COM(2012)595. See also T. Zgajewski, *The EU regime on biofuels in transport: still in search of sustainability*, Egmont Paper 68, July 2014.

14 C. Panoutsou (Imperial College London), B. Kretschmer (Institute for European Environmental Policy), A. Uslu and J. van Stralen (Energy research Centre of Netherlands), *Biomass role for heat, electricity/CHP and transport in EU27 for 2020 and 2030: Summary for policy makers* (policy briefing under D6.4), p. 464 (http://www.biomassfutures.eu/public_docs/final_deliverables/WP6/D6.4%20Biomass%20role%20for%20heat%20electricity%20and%20transport%20biofuels%20for%20EU27%20in%202020.pdf). This publication is part of the Biomass Futures Project funded by the EU's European Intelligent Energy Europe Programme. The goal of the project is to analyse the role that bioenergy can play in meeting the EU's renewable energy targets.

15 SWD(2014) 259 final, p. 27.

to turn the blades and generate electricity. Solar photovoltaics need cloudless skies and sunshine to collect light and make electricity. When these resources are unavailable, no energy is generated. In addition, wind power and solar power are variable in output. Today, although progress has been made, it is almost impossible to accurately forecast wind and solar production.

All this indicates that the energy mix remains essential: renewable energy needs to be backed up by fossil fuel capacity. It also shows that further research on energy storage technologies should be a priority to ensure an adequate power supply to the grid.[16] Clearly, energy storage has become the bottleneck that blocks the energy paradigm's shift to renewables.[17]

1.3.2. Even clean alternatives like renewables require fossil fuels

Even if the EU narrowed its definition of RES to methods that do not increase pollution or deplete natural resources, it would remain an idealized definition. In practice, none of our existing RES would strictly meet it. It is not even clear that some renewable energy options would be viable without the fossil fuel inputs on which they currently rely. In such cases, these options are clearly not truly renewable due to their fossil fuel dependence, even though many of them are treated as such.

Three examples can be given: solar, wind, biofuels. If solar panels and wind turbines create zero emissions in their generation of electricity, the manufacturing process by which their component parts are created is entirely reliant on fossil fuel inputs. Wind turbines are made from steel, the production of which is heavily dependent on coal. They are anchored by concrete, the production of which is a major source of CO^2 emissions. Cheap plastic photovoltaics require polymers made from oil. Both wind turbines and solar panels are produced from scarce rare earth elements. Crops for fuel production are typically grown with fertilizer made from natural gas, as well as pesticides and herbicides derived from petroleum. Corn ethanol is produced using steam normally derived from natural gas, and electricity mostly produced from natural gas or coal. Biodiesel is usually created from an oil feedstock derived from crops and from methanol, which is normally made from natural gas. Many advanced biofuels depend on hydrogen for upgrading, and hydrogen is made almost exclusively from natural gas.

16 Today there are three electricity storage technologies that are considered valid options. The first is pumped hydroelectric storage (PHS). PHS uses excess energy to elevate water that can later be dropped onto a turbine to generate electricity. The second is compressed-air energy storage (CAES). In this technology, air is compressed and stored in large tanks. When needed, the air is released to drive a turbine that generates electricity. The third is battery technology. Each of these technologies have their limits, and a lot of work still needs to be done to make them feasible options for large-scale energy storage from renewable sources.

17 See J. Auer and J. Keil, *State-of-the-art electricity storage systems – Indispensable elements of the energy revolution*, Deutsche Bank, 2012.

It is obvious that with renewable energy, as with all energy sources, we have to make trade-offs. Another important element is that we need to shift away from fossil fuels regardless of CO^2 emissions. So renewable energy makes sense for the future since its potential, if accompanied by technological improvements, is enormous. But shifting from one source of energy to another does not make sense if it is a simple way to tell people ‘do not worry, you can still consume and go on with your life.’ It would be a lazy approach to a complex problem. So, in parallel with the development of renewables, our greatest short-term and mid-term gains lie in continuing to improve efficiency, in particular because before long it will be difficult to quit fossil fuels.

This is all the more important because in its April 2013 report *Tracking clean energy progress*, the IEA highlighted the rise of global energy consumption and the fact that the CO^2 quantity emitted for each energy unit supplied has fallen by less than 1% since 1990, mainly because of the increased use of coal – the filthiest and most polluting form of energy and the most dangerous to extract[18] – and because of the use of inefficient technologies.[19] This trend is partly relevant for the EU, which has trouble doing without cheap coal despite environmental concerns. This coal renaissance and the push to exploit unconventional oil and gas reserves in the EU could threaten efforts to curb carbon emissions, despite the results obtained so far.[20]

1.3.3. The incorporation of renewables into existing infrastructures

The integration of large quantities of RES such as wind and solar power will require changes in the way our transmission system operates. Solutions need to be found and huge investments need to be made.

This integration also demands the extension and upgrading of the networks themselves. Here, too, huge investments need to be made. Although, to be fair, wind and solar power are not the only technologies which will benefit from these improvements.

[18] For instance, according to an article written by Simon Jenkins entitled ‘Renewable energy won’t rid us of the horrors of coal’ (*Guardian*, 15 May 2014), over 1,000 Chinese miners are still killed every year.

[19] IEA, *Tracking clean energy progress*, April 2013, p. 7.

[20] According to EEA in its 2013 report, *Trends and projections in Europe in 2013 – Tracking progress towards Europe’s climate and energy targets until 2020* (p. 10), the EU is close to reaching its 20% GHG emission reduction target by 2020. Even better, projections show that EU emissions (including emissions from international aviation) are expected to reach 21% below 1990 levels with the current set of national domestic measures in place, and 24% if Member States implement the additional measures currently still at planning stage.

§ 2. THE GENESIS OF THE EU RENEWABLES POLICY

2.1. The 1997 White Paper as a starting point

In a 1997 White Paper,[21] the EU set itself the non-binding target of generating 12% of gross inland energy consumption from renewable sources by 2010. This target represented a doubling of the 1997 contribution from renewable energies (5.8%).[22] This policy was based on the need to address sustainability concerns surrounding climate change and air pollution, improve the security of Europe's energy supply and develop Europe's competitiveness and industrial and technological innovation.

The White Paper also contained a comprehensive strategy and an action plan. A key element of the action plan was the establishment of a European legislation to provide a stable policy framework and clarify the expected development of renewable energy in each Member State. As a result, two key pieces of legislation were later adopted: Directives 2001/77/EC[23] on the promotion of electricity from renewable sources in the internal electricity market, and 2003/30/EC[24] on the promotion of the use of biofuels or other renewable fuels for transport. They set indicative 2010 targets for all Member States, and required action to improve the growth, development of and access to renewable energy. Another key element of the action plan consisted of favourable fiscal and finance measures.

Additionally, in 2005 a Biomass Action Plan[25] was adopted. Its aim was to potentially bring down oil prices, reduce GHG emissions and create or protect jobs, often in rural areas. The three sectors in which biomass use had to be prioritized were heat production, electricity and transport. For transport, the Biomass Action Plan foresaw the promotion of 'biofuels obligations' through which suppliers included a minimum proportion of biofuels in the conventional fuel they placed on the market.

The Commission's publication of reports[26] in 2001 and 2004[27] evaluating the progress made towards the 2010 target and the 2006 Renewable Energy Roadmap[28] highlighted the slow, patchy and uneven progress Member States were making and

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21 Communication from the Commission – *Energy for the future: renewable sources of energy – White Paper for a Community strategy and action plan* (COM(97) 599). The Communication was welcomed by the European Parliament in its Resolution of 17 June 1998 (A4-0199/98). In this Resolution, the European Parliament considered the objective of 12% by 2010 to be a minimum.

22 In 1997, the share of RES in the total gross inland consumption of the EU amounted to 5.8% (COM(2001) 69, p. 6).

23 OJ 2001, L 283/33.

24 OJ 2003, L 123/42.

25 COM(2005) 628.

26 COM(2001) 69, p. 28.

27 COM(2004) 366, p. 4.

28 COM(2006) 848. The Roadmap has been an integral part of the review of European energy policy which took place in early 2007 ('Energy Package'). It responded to the request made by the European Council in March 2006 for further promotion of renewable energy sources in the long term.

the likelihood that the EU as a whole would fail to reach its 2010 targets. The 2009 progress report once again confirmed this, and anticipated that only 9% of the 12% would be met in 2010.[29]

2.2. The 2006 Energy Roadmap as a second step

The 2006 Energy Roadmap enumerated the difficulties faced in meeting the 2010 EU and national targets as follows:

- the high cost of renewable energy owing to the investment required and the fact that externalities (the ‘external cost of the different energy sources, particularly their long-term impact on health or the environment’) had not been taken into account, giving fossil fuels an artificial advantage;
- the administrative problems resulting from installation procedures and the decentralized nature of most renewable energy applications;
- the opaque and/or discriminatory rules governing grid access;
- inadequate information for suppliers, customers and installers;
- the fact that the 12% target was expressed as a percentage of primary energy, which put wind power at a disadvantage.

To these five explanations, the 2006 Energy Roadmap added a sixth: the non-binding nature of the EU and national targets and the gaps in the EU legal framework for renewable energy. Hence, as an objective for the future, the Energy Roadmap proposed at EU level a mandatory target of generating 20% of gross inland energy consumption from renewable sources by 2020. This overall EU target had to be reflected in mandatory national targets. The precise way to achieve these national targets had to be set out in National Action Plans. In addition, as biofuels are the only form of renewable energy which can address the energy challenges of the transport sector, the Roadmap proposed a legally binding minimum target for biofuels, to be fixed at 10% of overall consumption of petrol and diesel in transport for 2020. To ensure a smooth implementation of this biofuel target, the Roadmap also proposed, in parallel, a modification of the Fuel Quality Directive (98/70/EC). It also proposed the creation of a new and strengthened legislative framework to enhance the promotion and use of renewable energy. This new framework had to provide the business community with ‘certainty and stability’.

At its March 2007 summit, the European Council greenlit the binding targets, which were integrated into the broader perspective of climate and energy.[30] For further action, it adopted a comprehensive energy action plan for the period

[29] COM(2009) 192.

[30] *Presidency conclusions of the Brussels European Council*, 8-9 March 2007 (Council document 7224/01/07 Rev. 1 of 2 May 2007).

2007-2009[31]. The binding character of the 10% biofuel target was subject to three conditions: the sustainability of biofuel production, the commercial availability of second-generation biofuels, and the consequent modification of the Fuel Quality Directive (98/70/EC) to allow for adequate levels of blending. The European Council also called for a review of the guidelines on state aid for environmental protection and other relevant EU instruments which could provide incentives.

According to a 2008 Commission communication,[32] the EU renewable energy target of 20% had to bring about several advantages for the EU as a whole. It had to

- help the EU reduce GHG and reach a low emission economy, since renewable energies are low-carbon energies;
- improve energy security by making the EU less dependent on imports of oil and gas and, consequently, less exposed to rising and volatile energy prices;
- contribute to the Lisbon Strategy for growth and jobs by creating an estimated one million jobs in the sector; and
- help to save some €100 billion and cut emissions by almost 800 million tonnes a year.

All this led to the adoption of Directive 2009/28/EC[33] on the promotion of the use of energy from renewable sources (also referred to as the RED). The RED is the key instrument for increasing renewable energy production. It had to be transposed by 5 December 2010.

2.3. The 2009/28/EC Directive (or RED) as part of the climate and energy package

2.3.1. The general mandatory goals

The RED sets two mandatory goals: renewable energy should supply 20% of the EU's gross final consumption by 2020, and each EU country is required to significantly increase the contribution of RES to its energy mix. A 10% share of renewable fuels (primarily biofuels) in transport by 2020, part of the overall 20% renewable target, is also fixed under the condition that for biofuels, indirect land-use considerations and other sustainability criteria are taken into account.

It should be noted that the share of all RES at EU level amounted to 8.5% of the total final energy consumption in 2005 (base year). To reach the fixed 20% target, the EU

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31 Annex I to the Council conclusions contains the action plan (Council document 7224/1/07 Rev. 1 of 2 May 2007). This action plan is based on Commission communication *An energy policy for Europe* (COM(2007) 1).

32 See COM(2008) 30, pp. 2, 3, 4 and 8 in fine.

33 Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ 2009, L 140/16). The initial legislative proposal can be found under reference COM(2008) 19 final.

needs necessarily to make an effort of +11.5%. This requires significant infrastructure investments. According to the European authorities at the time, however, such investment costs should fall as other energy producers face the costs of EU Emissions Trading System (ETS) allowances and rising prices for oil and gas.[34] As everyone now knows, this is not what happened.

2.3.2. The distribution of the overall 20% target among Member States

To achieve the 20% goal by 2020, the RED establishes binding renewable energy targets for each EU Member State. Each national renewable energy target is different, with some national targets higher than 20% and some lower.

To ensure that their individual national binding targets are reached by 2020, Member States are also given an 'indicative trajectory'. This provides interim targets to be reached every two years until 2020. By 2011-2012, the Member States should be 20% of the way towards the target (compared to 2005); by 2013-2014, 30%; by 2015-2016, 45%; and by 2017-18, 65%.

In terms of electricity consumption, at the EU level, this means that renewable sources should provide about 35% of the EU's power by 2020.

National overall targets for the share of energy from renewable sources in final consumption of energy in 2020 (Annex I, point A of the Directive)

EU Countries	Share of energy from renewable sources in final consumption of energy, 2005 (S2005)	Target for share of energy from renewable sources in final consumption of energy, 2020 (S2020)
Belgium	2.2%	13%
Bulgaria	9.4%	16%
Czech Republic	6.1%	13%
Denmark	17%	30%
Germany	5.8%	18%
Estonia	18%	25%
Ireland	3.1%	16%
Greece	6.9%	18%
Spain	8.7%	20%
France	10.3%	23%
Italy	5.2%	17%
Cyprus	2.9%	13%
Latvia	34.9%	42%
Lithuania	15.0%	23%
Luxemburg	0.9%	11%

[34] See Commission communication COM (2008) 30, p. 7.

National overall targets for the share of energy from renewable sources in final consumption of energy in 2020 (Annex I, point A of the Directive) *(Continued)*

EU Countries	Share of energy from renewable sources in final consumption of energy, 2005 (S2005)	Target for share of energy from renewable sources in final consumption of energy, 2020 (S2020)
Hungary	4.3%	13%
Malta	0.0%	10%
Netherlands	2.4%	14%
Austria	23.3%	34%
Poland	7.2%	15%
Portugal	20.5%	31%
Romania	17.8%	24%
Slovenia	16.0%	25%
Slovak Republic	6.7%	14%
Finland	28.5%	38%
Sweden	39.8%	49%
United Kingdom	1.03%	15%

AND:

Croatia[a]	13.2% (base year 2004)	20%

a. Croatia became the 28th Member State only on 1 July 2013.

2.3.3. *The sectors concerned*

In the RED, three sectors are concerned with the growth of renewable energy sources: (a) electricity, (b) heating and cooling, and (c) transport.

For the first two sectors, Member States have independently fixed the specific sectoral targets that they want to achieve by 2020. For the third sector – transport – they had no choice. They have to achieve a minimum of 10% of transport fuel from RES.

2.3.4. *The national renewable energy action plans and monitoring*

Each Member State had to submit a national renewable energy action plan to the Commission before 30 June 2010, prepared in accordance with the template published by the Commission. This action plan provides a detailed roadmap of how the Member State expects to reach its binding 2020 target for the share of renewable energy in its final energy consumption. It contains the sectoral targets chosen, the technology mix it expects to use, the trajectory it will follow and the measures and reforms it will undertake to overcome barriers to developing renewable energy.

Member States must provide the European Commission with a regular progress report containing information on their share of renewable energy, support schemes and progress in tackling barriers.

If a Member State fails to reach an intermediate target (cf. point 2.3.2.), it must communicate to the Commission a modified renewable energy action plan that will return it to the indicative trajectory within a reasonable timetable. The Commission evaluates then it and may issue a recommendation.

2.3.5. Further essential elements of the regime governing the sectors concerned

The RED also requires the simplification of the administrative regimes faced by renewable energy, together with improvements to the electricity grid, to increase access for electricity from renewable sources.

Finally, the RED includes different mechanisms that Member States can apply to achieve their targets, such as support schemes, statistical transfer, guarantees of origin, joint projects between Member States (and with non-EU States), as well as rules on preferential grid access for electricity from RES, and sustainability criteria for biofuels and bioliquids.

§ 3. THE 2014 EU SITUATION

3.1. Inland energy consumption until 2012 in the EU-28

Countries use different accounting methods to estimate the share of renewables in their total energy consumption. The EU and its Member States estimate their renewable energy share based on gross final energy consumption.

Over the last two decades, gross inland energy consumption in the EU-28, which stood at 1,670 million tonnes of oil equivalent (Mtoe) in 1990, rose to a peak of 1,830 Mtoe in 2006 and then decreased to 1,680 Mtoe in 2012. This means that between 2006 and 2012, gross inland energy consumption in the EU-28 fell by 8%.[35] This is due to a combination of several factors, including structural changes in the economy of the EU, the economic crisis and efficiency improvements.[36]

The five largest energy consumers in 2012 were Germany, France, the United Kingdom, Italy and Spain. Together these five Member States accounted for 64% of total EU-28 energy consumption and for 77% of the reduction in absolute terms between 2006 and 2012.

3.2. Progress in the EU-28 towards the 20% renewable energy target until 2012 in gross final energy consumption

3.2.1. Progress in all sectors of activity combined

The European Commission assessed Member States' progress towards achieving their national targets in 2011[37] and 2013[38] and these assessments were updated by a March 2014 Eurostat.[39]

Eurostat shows that since the adoption of the RED, renewable energy consumption has grown. Despite the fact that the situation is full of contrasts across the Member States, energy from renewable sources was estimated to have contributed 14.1% of gross final energy consumption in the EU-28 in 2012 (compared to 13% in 2011, 12.5% in 2010, 10% in 2007, 8.5% in 2005, and 8.3% in 2004).

In the electricity sector, the RES growth has been strong. The share of EU-produced renewable electricity increased from 15% in 2005 to 23.5-24.1%[40] in 2012. Addition-

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[35] Eurostat, Energy – 2012 data (STAT /14/25 of 17 February 2014).
[36] SWD(2014) 330 final/3, p. 18.
[37] COM(2011) 31.
[38] COM(2013) 175.
[39] See Eurosat news release on renewable energy in the EU-28 of 10 March 2014 (doc. STAT/14/37). Monthly and annual energy data collections are governed by Regulation (EC) No 1099/2008 on energy statistics (OJ 2008, L 304/1).

ally, in this sector, 'renewables represented the majority of new electric generating capacity for several consecutive years.'[41]

In the heating and transport sectors, reliance on imported fossil fuels remains high in most Member States, where the use of renewables since 2005 has increased very little.[42] The RES share in the heating sector in 2012 was about 16%. In transport, the current 5% of renewable energy share is largely based (above 95%) on first-generation biofuel use, 70% of which on average is produced in the EU, while the remaining share is mainly sourced from Brazil, the United States and South East Asian countries.[43]

The level of 14.1% mentioned above means that the EU has therefore met its indicative target for 2011-2012 and as a whole is on track to meet the 20% of renewable energy for its gross final consumption in 2020. It is only 5.9 points short of the target that it set itself for 2020.

However, the positive picture produced in a context of lower gross final energy consumption (cf. point 3.1.), is not as good as one might think, for the following reasons.

Firstly, from 2004 till 2012, only half the total was achieved. Moreover, if renewable energy consumption increased till 2012, the indicative renewable energy trajectory indicated in the RED – which remains to be achieved – grows steeper. This means that one cannot continue at the same pace. To reach the 2020 target of 20% of RES in its gross final consumption, the EU needs to almost double the growth already achieved.[44] Consequently, those Member States which have not reached their individual target will need to make additional efforts in the forthcoming years in order to reach it.[45] An Ecofys report published in 2012 seems to agree with this analysis.[46]

Secondly, between 2011 and 2012, investments in renewable energy projects contracted markedly, with the result that the new production capacities funded by these investments in the coming years will be lower than expected. Yet it is the

40 *Combined reading of EU energy in figures – Statistical Pocketbook 2014*, p. 121 as well as Commission's document SWD(2014) 330 final/3, pp. 82 and 90. See also Eurostat's table, updated in 2014 (http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdcc330&plugin=1).

41 REN21, Renewables Global Status Report 2014, 2014, p. 14.

42 This weak result could originate in the rather feeble support measures provided by Member States for renewable energy heating and cooling. See SWD(2014) 330 final/3, p. 164.

43 SWD(2014) 330 final/3, p. 163.

44 See *Trends and projections in Europe 2013 – Tracking progress towards Europe's climate and energy targets until 2020*, EEA, pp. 11 and 114-118.

45 Only three Member States (Bulgaria, Estonia and Sweden) have so far achieved their respective binding renewable energy target. Estonia did it in 2011. Bulgaria and Sweden in 2012. Several other Member States are well on track to achieve their individual renewable energy target (in particular, Lithuania, Romania, Czech Republic, Austria). The lowest share of renewable sources in gross final consumption is found in Malta, Luxembourg, United Kingdom and the Netherlands. Though Germany is the largest producer of renewable energy, it has not yet reached its individual renewable energy target in its gross final energy consumption. See a confirmation in the *EU 2014 Statistical Pocketbook*, p. 27.

46 *Renewable energy: A 2030 scenario for the EU*, 2012, p. 8.

investments being made now that will enable the EU 2020 target to be met.[47] 'The second consecutive year of decline in investment – after several years of growth – was due in part to uncertainty over incentive policies in Europe ... and to retroactive reductions in support in some countries. Europe's renewable energy investment was down 44% from 2012.'[48]

Problems are particularly acute in the electricity sector, which has so far contributed the most to the development of RES, especially with the rapid expansion of wind energy and photovoltaic generation.

Therefore, the threat of not reaching the EU renewable energy 2020 target remains plausible. This is bad news when one knows that according to the EU Reference Scenario 2013, fossil fuel import prices are projected to increase by 50% or more in the period 2010-2030, most notably between 2010 and 2020.[49]

3.2.2. Additional data on the electricity sector

A. Stagnation of the electricity demand

Electricity consumption steadily grew until 2008. This growth was due to the general increase in economic activities across the EU, which resulted in growing demand for power.[50]

However, in 2012 electricity demand remained at about 4% (112 TWh) below the peak reached in 2008.[51] Moreover, in 2012 demand stagnated at the 2011 level.[52] This overall picture of stabilization conceals, however, contrasting developments in the different Member States. Some Member States experienced a growth in demand. Some experienced a decline in demand, while others reported stagnation. So there are large divergences across countries concerning electricity demand.

In the 2013 Reference Scenario, electricity demand within the EU is, however, estimated to grow until 2020 at an annual growth rate of 0.5% per year. After 2020, the electricity demand growth rate would increase to nearly 1% per year. Demand evolution patterns are expected to be highly divergent across countries in Europe.[53]

47 *The State of Renewable Energies in Europe*, 13th EurObserv'ER report, 2013, p. 7.
48 REN21, *Renewables Global Status Report* 2014, 2014, p. 17.
49 Commission's document SWD(2014) 15 final, pp. 24 and 26.
50 SWD(2014) 330 final/3, p.88.
51 Dominique Auverlot, Etienne Beeker, Gaëlle Hossie, Louise Oriol, Aude Rigard-Cerison, *The crisis of the European electricity system – Diagnosis and possible ways forward*, Commissariat général à la stratégie et à la prospective, January 2014, p. 21.
52 *Power statistics and trends 2013*, Eurelectric, December 2013, pp. 4 and 10.
53 *Power statistics and trends 2013*, Eurelectric, December 2013, pp. 10-11. See also SWD(2014) 330 final/3, p. 13.

B. Increase of electricity generation from RES

As already stated, in 2012 in Europe, electricity generation from RES amounted to about 23.5%-24.1% (compared to 15% in 2005).[54] Of these, a growing share comes from intermittent generation such as solar and wind power. In 2012, both have provided the most input to renewable production, after hydropower.[55] Indeed hydropower accounted in 2012 for 46% of renewable electricity generation in the EU, wind and solar power for 35%, biomass for 18%.

Both wind and solar have also emerged as alternatives to conventional fossil fuels and nuclear power, although it is important to note that due to their intermittent nature, back-up generation capacities need to be assured to maintain an adequate power supply to the grid. As the share of solar and wind grows, however, further modernization of the grid and system operations becomes more necessary to ensure the electricity supply continues to be reliable.[56]

According to National Renewable Energy Action Plans' (NREAP) technology projections concerning the electricity sector, by 2020 wind would become the most important RES, providing 40% of all renewable electricity. The contribution of photovoltaic and solar-thermal electricity would also grow while the contribution of biomass is expected to remain almost unchanged and the role of hydropower would decrease. The role of geothermal, wave and tidal are still expected to remain marginal in 2020.[57] As a whole, following NREAP projections, renewable electricity will represent about 34% of electricity production in 2020.[58] Industry expectations seem higher. In its 2011 roadmap, it has estimated that renewable electricity could reach 42% in 2020.[59]

C. Increase of RES capacities at a slower pace

RES capacities continued to increase in 2012. That year, RES capacities increased at a rate of 11%. By comparison with 2011, this growth rate is less important. In 2011 it amounted to 15%. This slowdown is expected to continue due to regulatory changes, notably in national RES support policies.

One needs to be careful with the numbers, however. For example, 'new investment in renewable energy excluding large hydro-electric projects slipped 14% in 2013 to $214 billion, but even this disguised one major positive development. One of the two

54 'Combined reading of EU energy in figures' in *Statistical Pocketbook 2014*, p. 121 as well as Commission's document SWD(2014) 330 final/3, pp. 82 and 90. See also Eurostat's table, updated in 2014 (http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdcc330&plugin=1).
55 'EU energy in figures' in *Statistical Pocketbook 2014*, p. 91 as well as SWD(2014) 330 final/3, p. 90.
56 SWD(2014) 330 final/3, pp. 10-11.
57 SWD(2014) 330 final/3, p. 99.
58 SWD(2014) 259 final, p. 32.
59 SWD(2014) 330 final/3, p. 100.

main reasons for this fall in 2013 was a reduction in costs in photovoltaics – even as the dollar investment in solar went down, the number of gigawatts of photovoltaic systems added went up.'[60]

3.3. The improved competitiveness of solar and wind electricity

One essential, and quite positive, evolution in this domain comes from the rapidly growing competitiveness of wind, and, even more so, solar energy. According to an instructive 2014 report from Ernst & Young,

> 'some more recent studies suggest that investment cost estimates made in 2011 by the European Commission and ECF [European Climate Foundation] for renewable energy generation equipment, grids and storage, were overestimated. A recent analysis for Germany shows that on the distribution level, the total cost for grid expansion can be as low as €3 billion: just 10% of earlier estimates. Also, for instance, new storage capacity is found not to be needed in Germany before a share of 60%-80% of renewables is reached. Estimates of system costs such as balancing requirements and back-up capacity resulting from the integration of large shares of renewables are also subject to uncertainty. The specific functionalities of some systems are already integrated in modern technologies, as for example in the case of [photovoltaic] where inverters can now provide reactive power provision or storage. In addition, balancing occurs at the level of an overall power system, and partly depends on the system's interconnection capacity and gate closure time – both factors which are unrelated to the share of renewables. Besides these evolutions in understanding of system requirements, the costs of renewable energy technologies themselves have evolved over the last two years. Several renewable energy solutions have accelerated their cost reduction trajectory beyond expectations, thus making the renewable energy pathway more attractive for Europe. This cost reduction has been so significant that the cost level for [photovoltaic] that was expected for 2050 in the ECF Roadmap 2050 has already been reached.'[61]

However, it must be remembered that renewable electricity's competitiveness does not depend exclusively on this. Wind and solar electricity are by definition irregular and unpredictable. They thus require stability instruments, which must be paid for. They also require more powerful and efficient networks. And be paid for. These additional costs must also be taken into consideration in the general analysis.[62]

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60 FS-UNEP Collaborating Centre, *Global trends in renewable energy investment* 2014, p. 18.

61 Ernst & Young, *Macro-economic impacts of the low carbon transition*, 2014, p. 34.

62 See the excellent analysis of M. Cruciani, *Le coût des énergies renouvelables*, (Institut Français des Relations Internationales or IFRI), 2014.

§ 4. The Main Challenges entailed by the Growing Share of Wind and Solar Power in the Electricity Sector

Renewables – in particular wind and solar power – have penetrated the electricity sector faster than other sectors. This is in line with the EU's overall strategy of first decarbonizing its electricity supply, and then further electrifying the wider economy. Wind and solar power face challenges that can make their future deployment slower than expected, and drive the 20% target further out of reach.

4.1. Changes in the merit order

With the development of wind and solar power, the functioning of the merit order has been disrupted.

As in almost any market, electricity market operators rank power plants based on their cost of producing an incremental amount of electricity. They then start by using the lowest-cost power plants first, and then move up the list (the supply curve) until they have enough electricity to meet demand. The power plant rank order is based on the cost of producing an incremental amount of electricity, so only fuel costs and variable operational and maintenance costs are considered. As a result, wind and solar energy resources are always used first (regardless of the existence of a priority dispatch) as they are free fuels. Because of that, they displace the output of the most expensive and least efficient power plants that otherwise would have operated.[63] In other words, the continuous addition of intermittent energy significantly reduces fossil fuel costs (as well as pollution), but on a basis which cannot be anticipated thanks to weather fluctuations.

In the EU, the zero-fuel costs of wind and solar power have had an impact on the wholesale market price. The wholesale price for all electricity purchasers is set by the last – and therefore most expensive power plant – in the merit order. By offsetting the most expensive operational power plants, wind and solar energy typically cause the electricity price to be set by a more efficient and less expensive power plant than it otherwise would be. The result is lower wholesale market prices for purchasers. For example, the wholesale price in France decreased by 12% between 2012 and 2013, and decreased further at the beginning of 2014.[64]

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[63] See M. Goggin, *The facts about wind energy's impacts on electricity markets: Cutting through Exelon's claims about 'negative prices' and 'market distortion'*, AWEA, March 2014, p. 6.

[64] Conseil Français de l'énergie, *3rd European Energy Forum – What policy measures for energy transition in Europe?*, Paris, 24-25 April 2014, p. 41.

4.2. Overcapacity in the electricity system

The increase of solar and wind capacities (whose output is dispatched first and is produced at zero-fuel cost, thus upsetting the merit order) coupled with the stagnation of electricity demand put a ‘squeeze’ on conventional electricity generation. During 2008 and 2012, renewable production increased by 176 TWh, with the result that demand for conventional production has dropped by 288 TWh.[65]

This situation has led to overcapacity in the electricity system, as the number of full-load hours of operation for conventional power plants has fallen (in particular, gas-fired power plants but also hard-coal power plants). It has become a difficult situation for established utilities. Since 2000, they have overinvested in generating capacity from fossil fuels, and the economic viability of their existing conventional back-up plants is now threatened. This situation is compounded by the fact that wholesale market prices have fallen, and if the wholesale market prices fall, so does the profitability of conventional power plants.

As a result, conventional power generators are currently discouraged from investing in conventional power plants (notably to replace the old inefficient and polluting units) which might suffer from low utilization – or might not even be used once built – while the increased need for flexible back-up units to cover a growing intermittent generation from RES remains. If this issue is not addressed, then in an apparent contradiction, the current overcapacity of conventional power plants could become undercapacity in the future, especially if older plants are dismantled.

In some Member States, this evolution has raised the question of how to ensure adequate investment signals and generation adequacy. As a solution,[66] some states are considering new public intervention such as support schemes for investments in new electricity generation capacity or for remunerating existing plants to keep them operational. The Commission considers that such measures should not result in inefficient plants being artificially kept in operation through public support, or in unnecessary new generation capacity being built. So to ensure this does not happen, it has issued a communication offering guidelines.[67] One can also now see the emergence in some Member States of ‘strategic reserve’ or ‘capacity markets’.[68]

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65 Dominique Auverlot, Etienne Beeker, Gaëlle Hossie, Louise Oriol, Aude Rigard-Cerison, *The crisis of the European electricity system – Diagnosis and possible ways forward*, Commissariat général à la stratégie et à la prospective, January 2014, p. 21.

66 See on this issue notably M.-O. Bettzüge, D. Helm and F. Roques, *The crisis of the European electricity system – Diagnosis and possible ways forward*, Commissariat Général à la stratégie et à la prospective, Rapports & Documents, January 2014, p. 71.

67 Commission communication *Delivering the internal electricity market and making the most of public intervention* – C(2013) 7243 final.

68 See on the subject: *EI Fact Sheet 2013-03, Capacity Mechanisms*, KU Leuven Energy Institute.

4.3. More frequent occurrence of negative electricity prices in power exchanges due to an insufficiently flexible power plant fleet

The profitability of conventional power plants is also damaged by another phenomenon: negative prices. A negative price is a price which falls below zero. It indicates that power generators are willing to pay the consumer to take electricity off their hands.

The occurrence of negative electricity prices on wholesale markets is more and more frequent, especially in certain Member States. It is due to the simultaneous presence of two elements: (a) abundant green electricity generation characterized by zero-fuel costs (such as wind and solar power generation) and (b) a low demand. They are more likely to emerge where the generating fleet as a whole is not flexible enough (too many nuclear and coal-fuelled plants or too little flexibility such as Combined Cycle Gas Turbines (CCGTs) or turbo-gas power plants, or insufficient grid interconnections).[69] According to a 2014 American Wind Energy Association (AWEA) report, localized transmission outages alone can also be responsible for negative price occurrences.[70]

These negative prices are the consequence of opportunity costs – i.e., it is less costly to operate the plant at even negative prices for a very limited period of time than to reduce the plant's output. This allows the plant operator to prepare for the expected increase of demand and/or market conditions bringing/promising higher prices. However, with the continuous increase of renewable energy such as wind and solar power, the opportunity to compensate negative prices will vanish because the risk in remaining operational will become too high. The only option remaining will be to shut down the plant.[71] To illustrate, and as the EU Commission's DG Energy stated in its most recent quarterly report:[72] 'On a Sunday afternoon in mid-June wind and solar assured more than 60% of power generation in Germany, resulting in negative hourly prices in the whole CWE region…'

There are still many power exchanges, both within and outside the EU, that do not allow negative prices on their power exchanges. To date, in the EU, negative power prices have been allowed in the countries covered by the European Power Exchange (EPEX), i.e., France, Germany, Austria, Switzerland, as well as in Belgium and the Netherlands.

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69 See the article by Simona Benedettini and Carlo Stagnaro published in the *Energy Post* on 27 May 2014 and entitled: 'The case for allowing negative electricity prices' (http://www.energypost.eu/case-allowing-negative-electricity-prices/).

70 Michael Goggin, *The fact about wind energy's impacts on electricity markets: cutting through Exelon's claims about 'negative prices' and 'market distortion'*, American Wind Energy Association or AWEA, March 2014, p. 4.

71 *Flexible Generation: backing up renewables*, Eurelectric, October 2011, p. 35.

72 *EU Quarterly Report on European electricity markets. Market observatory for energy*. DG Energy, vol. 6, issue 2, second quarter 2013, p. 1.

4.4. The failure of the EU ETS carbon price effect

A switch from fossil fuels to renewables in the electricity sector is feasible in response to carbon price signals. The EU ETS has produced these carbon price signals by covering about 11,000 installations, but not as expected. To help incentivize the development of renewables and have a substantial impact, these EU ETS carbon price signals need to stay above a certain level (€30-40 as initially forecast by the European Commission). But the levels experienced by the EU ETS carbon price signals over the last few years are significantly beneath that threshold. They have remained well under €10 and sometimes not far from around €3. It is thus a long way from the price range initially forecast by the European Commission.

These repeatedly weak EU ETS price signals come from the emergence of a surplus of around two billion CO^2 allowances (2012 figures). Several causes explain such a surplus: (a) the GHG target for 2020 was set too low; (b) the economic crisis resulted in GHG emissions well below the total EU cap of GHG emissions allowed (although this EU cap is already accompanied by a linear reduction factor of 1.74% per year); (c) the widespread use of international credits allowed under the ETS since 2008; and (d) the RES and energy efficiency policies which contribute to reducing CO^2 emissions in the ETS sectors, in particular in the power sector.

As a result, the consistently weak level of the EU ETS price signal has not been able to significantly affect the price of fossil-fuelled power generation and thus to offset the externalities generated (like, for instance, carbon emissions, air pollution, etc.). As a consequence, mitigation costs are increasing, as no correct carbon price signal is available. This situation also impedes the correct evaluation of nuclear or Carbon Capture of Storage (CCS) benefits.[73] If the problem remains unaddressed it will have a long-lasting effect on the ability of the ETS to provide an incentive to invest in low-carbon energy technologies such as renewables.

4.5. The perverse encouragement of coal

The combination of reduced demand, low wholesale prices and sub-utilization of conventional power plants that reduced profitability, as well as increasingly subsidized RES, has pushed expensive gas out of the market. This impact on gas has been further exacerbated by the fall in coal prices and the inability of the EU ETS carbon price to bridge the gap.

[73] See also T. Spencer, M. Colombier and T. Ribera, *Issues and options with regard to the renewables target in the context of the 2030 EU climate and energy package*, Institute for Sustainable Development and International Relations or IDDRI Policy brief 04/14, 2014, pp. 7-11.

As a result, the EU appears to have shifted from RES plus gas to RES plus coal, and also from nuclear to coal (following the German nuclear decision). To illustrate, from 2011 to 2012, coal-fired generation grew by 13% while gas-fired generation dropped by 23%. Nuclear generation also declined by 2.8%. It is also obvious that coal-fired generation ensured better profitability than gas-fired generation both in Germany and in the United Kingdom in 2012 and 2013.[74] The consequence was a rise in CO^2 emissions.[75]

Moreover, some Member States have resorted to measures such as priority dispatch for electricity generated from domestic coal or peat, including Spain, Slovakia, Ireland and Estonia. This may lead to distortions of the markets, go against climate objectives and pose challenges with state aid rules.[76]

4.6. High variability and instability of public support in Member States

Each Member State has discretion to decide what policies and incentives are offered to stimulate investment in and development of renewable electricity projects. In recent years, they have overhauled these on multiple occasions. Notably, numerous Member States have either suspended/ended their support for RES or have made policy decisions to retroactively reduce financial incentives for renewable electricity projects based on wind and solar power. This was done for several reasons: the difficult financial situations in these Member States; the substantial technology cost reductions; over-subsidization and changing market circumstances.[77] Needless to say, such measures have destroyed investor confidence, in particular in the solar sector.[78] They have contributed to the reduced investments levels experienced in 2012 and 2013.[79] And, by introducing them, EU Member States make it thus more difficult for themselves to meet the 2020 renewable energy targets.

Moreover, with the exception of Sweden and Norway, none of the cooperation mechanisms provided for in the RED have been made use of, and national support schemes are restricted to national production in the absence of these cooperation

74 SWD(2014) 330 final/3, p. 91.

75 On this issue, see K. Gutmann (Climate Action Network), J. Huscher (Health and Environment Alliance), D. Urbaniak and A. White (Worldwide Fund for Nature), C. Schaible (European Environmental Bureau), and M. Bricke (Climate Alliance Germany), *Europe's dirty 30 – How the EU's coal-fired power plants are undermining its climate efforts*, July 2014.

76 SWD(2014) 330 final/3, p.159.

77 Phillip Brown, *European Union wind and solar electricity policies: overview and considerations*, Congressional Research Service, CRS Report for Congress, 7 August 2013, p. 37.

78 See European Photovoltaic Industry Association report on the retrospective measures at national level and their impact on the photovoltaic sector, December 2013 (http://www.epia.org/fileadmin/user_upload/Press_Releases/Restrospective_Measures_at_national_level.pdf) To understand better the evolution, see also a 2007 report made for Intelligent Energy Europe by G. Resch, T. Faber, R. Haas, C. Huber et al., *Assessment and optimization of renewable energy support schemes in the European electricity market* (http://ec.europa.eu/energy/renewables/studies/doc/renewables/2007_02_optres.pdf).

79 SWD(2014) 15 final, *op. cit.*, p.19.

mechanisms.[80] This hinders the convergence of national support schemes methodologies across the EU which could help contribute to the optimization of investment decisions. This situation presents a further challenge to cost-efficient deployment of renewable energy and works against market integration.[81]

Clearly, experience has taught us that

> 'stronger Europeanisation in the renewable energy field will help markets with stable investment frameworks to lend some of their credibility to partner countries. The more countries that pursue similar schemes, the larger the common market that will be established. Smaller countries in particular may benefit from more visibility, allowing them to attract additional competitors in a larger scheme for project planning, development and financing.'[82]

4.7. Obstacles to new and improved infrastructures

The rapid development of renewables and their increased competitiveness have increased the need to facilitate the building of new infrastructures, including both generation projects and networks. However, many administrative burdens and various obstacles remain. Administrative procedures are still complex. Only three countries (Denmark, Italy and the Netherlands) benefit from a single permit system for building renewable generation projects. In addition, once built, renewable projects often find it difficult to get the necessary connection to the low-voltage grid. Grid connection problems for renewables occur within a Member State and thus the new EU regulation on infrastructure, aimed at transnational connections, does not help much.[83]

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80 See ECJ, 1 July 2014, *Ålands Vindkraft AB vs Energimyndigheten,* C-573/12. This case was brought by Ålands Vindkraft, which operates a wind farm in the Åland archipelago, in Finland. It supplied electricity to Swedish companies and sought to benefit from Swedish subsidies for renewable energy. When Sweden refused its request, it filed a complaint at a Swedish court, which referred the case to the ECJ. The case raised the question of whether national support schemes can discriminate against producers from other Member States and whether that is an unjustifiable barrier to the free movement of goods. In its judgment, the ECJ confirmed that subsidies that are made available only to national renewable energy producers are justified by the public interest in protecting the environment and combatting climate change. According to the ECJ, the RED permits, but does not require, the possibility of extending national support systems beyond national borders. Only via an international agreement, in the form of a cooperation mechanism provided for under the RED, could a Member State recognize green energy produced in another Member State.
Some commenters believe that this judgment has compounded the uncertainties about the balance between environmental imperatives and the free movement of electricity. See E. Durand and M. Keay, *National support for renewable electricity and the single market in Europe*, The Oxford Institute for Energy Studies, August 2014, p. 7.

81 SWD(2014) 15 final, *op. cit.*, p.19. On cooperation mechanisms, see also the report written by C. Klessmann, E. de Visser, F. Wingand, Malte Gephart, G. Resch and S. Busch et al., *Cooperation between EU Member States under the RES Directive*, 29 January 2014.

82 S. Müller-Kraenner and S. Langsdorf, *A European Union for Renewable Energy – Policy Options for Better Grids and Support Schemes*, Heinrich Boll Foundation, 2012, p. 32.

83 D. Buchan, *Why Europe's energy and climate policies are coming apart*, The Oxford Institute for Energy Studies, SP 28, July 2013, p. 13.

For wind in particular, the main challenges remain the grid connection of offshore wind farms and the grid extension of transmission lines to transport the power to where it is needed. Higher interconnection between EU Member States is also considered fundamental for the better management of variable output power from renewables. It would help reduce the need (and thus costs) of back-up capacity and system-stabilizing services. It would also help moderate electricity prices.

4.8. Support for renewables affects retail prices

The speed of solar and wind development was not predicted by observers or public authorities.

To finance the costs of renewable electricity subsidization, lawmakers in numerous EU Member States have imposed on electricity consumers ever increasing taxes or levies which add to their electricity bill. In other words, renewable support schemes have begun to have a bigger impact on electricity prices than even reasonably high carbon prices could have.

The retail price of electricity is composed of three elements: (a) the energy cost element, (b) the network costs element and (c) the tax/levy element. The energy cost element is still the largest portion of the price in most Member States. However, of the three elements just mentioned, the share of the tax/levy element has seen the greatest increase since 2008.

As a result, retail electricity prices for households and many businesses have continued to rise to such an extent that electricity prices have become a political battlefield.

Vulnerable households now encounter difficulties in paying their electricity bills, or even cannot pay them, creating what is called ‘energy poverty’.

Businesses, particularly in energy-intensive industries exposed to international competition, complain about competitiveness concerns,[84] although they have managed to obtain in a number of Member States tax and levy exemptions/reductions, which substantially mitigate tax/levy price rises.[85] Such exemptions/reductions, considered as state aids, have given rise to concerns from stakeholders

84 On this issue, see O. Sartor, M. Colombier, and T. Spencer (IDDRI), *Addressing industrial competitiveness concerns in the 2030 EU climate and Energy Package*, Policy Brief N° 03/14 January 2014.

85 At present exchange rates, EU industrial electricity prices (before taking account of tax or levy exemptions for energy-intensive industries) are more than twice those in the United States and Russia, 20% higher than China’s but 20% lower than those in Japan. See European Commission’s MEMO/14/38 of 22 January 2014.

about distortions of competition across Member States.[86] The Commission is preparing an in-depth study to gather consistent and complete data on these tax exemptions.[87]

These factors explain why households and businesses are now more and more reluctant to pay the costs for the development of wind and solar energy. This situation is compounded by the fact that in several Member States (like Germany), the cuts in wholesale electricity prices thanks to the progression of renewable energy are not passed on to final electricity consumers[88] in the form of a reduction of the energy cost element (furthermore, electro-intensive corporations tend to pay wholesale power prices, so the burden of the cost has fallen more onto households than industrial purchasers).[89] It is also compounded by the fact that in certain Member States (for instance, Germany again), despite important renewable subsidies, CO^2 emissions continue to increase.

An on-going study by the European Commission indicates that total expenditure on renewable support in the EU was €13.7 billion in 2009, €18.6 billion in 2010, €30.1 billion in 2011 and €34.6 billion in 2012, but trends vary across Member States and some costs are not reflected in the electricity bills but covered by public budgets, in particular in countries with strong elements of price regulation. On the other hand, the money saved by not importing additional non-renewable fuel was estimated to amount to around €30 billion in 2010.[90]

In conclusion, the experiences of recent years reflect different realities. Firstly, the absence of a correct carbon price increases the need for subsidies for renewables.

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86 On 18 December 2013, the European Commission opened an in-depth state aid investigation into the German Renewable Energy Act (EEG 2012) (European Commission's press release IP/13/1283 of 18 December 2013). In its preliminary assessment, the European Commission has come to the conclusion that the EEG may have given unlawful advantages to energy-intensive companies in Germany. Following an ECJ judgment (21 November 2013, *Deutsche Lufthansa AG vs Flughafen Frankfurt-Hahn GmbH*, C-284/12), national courts, at the request of interested parties, may also order the recovery of the benefits before the Commission releases its final decision, on the basis of the purely preliminary Commission decision to open the state aid investigation. Similar rules in Austria are currently under review at the General Court of the European Union (T-251/11) as Austria seeks to overturn a 2011 Commission decision that a partial exemption for energy-intensive companies from paying the full costs for renewables energy amounted to illegal state aid. This said, on 18 December 2013, the European Commission announced a formal investigation into the UK government's planned nuclear agreement at Hinkley Point (European Commission's press release IP/13/1277 of 18 December 2013). On 27 March 2014, it also opened an in-depth state aid investigation into a French scheme under which energy-intensive companies are exempted from surcharges intended to support renewable energies (CSPE) (European Commission press release IP/14/327 of 27 March 2014).

87 COM (2014) 21/2, pp. 6-9. It should be noted that the problem of competitiveness of intensive energy industries is also addressed by the Commission via state aid guidelines allowing for compensation of CO^2 costs included in the prices of electricity. See the Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (ETS Guidelines), OJ C 158, 05.06.2012, p. 4. They include a list of sectors that can benefit from reductions.

88 According to the European Commission, it can be explained by the fact that competition between suppliers is extremely limited. Regulated prices and passive consumers also reduce incentives for competition. See European Commission's MEMO/14/38 of 22 January 2014.

89 SWD(2014) 15 final, *op. cit.*, p.19.

90 SWD(2014) 15 final, *op. cit.,* p.19.

Secondly, in such a context, subsidies may become permanent[91]. Thirdly, awarding subsidies to renewable projects without price competition often increases costs for consumers.

[91] See M. Kalkuhl, O. Edenhofer, K. Lessmann (Postdam Institute for Climate Impact Research), *Renewable energy subsidies: Second-best policy or fatal aberration for mitigation?*, Nota di Lavoro 48.2011, Fondazione EnI Enrico Mattei, pp. 30.

§ 5. THE PROPOSED REGULATORY FRAMEWORK FOR THE PERIOD 2020-2030

In 2011, different long-term scenarios were described in the Commission communication *Energy Roadmap 2050*.[92] All scenarios suggest a share of renewables of around 30% in gross final energy consumption in 2030 (and 55% in 2050) but at the same time they also suggest that renewable energy growth may fall after 2020 without further EU intervention, due to the higher costs and barriers facing RES compared to fossil fuels.

In 2012 the Commission issued the communication *Renewable Energy: a major player in the European Energy Market*,[93] supplemented by an impact assessment and the Commission's staff working documents.[94] In this communication, the Commission offers guidance for a better functioning of the current framework for renewable energy until 2020. It also underlines the need to adjust public intervention in order to stimulate innovation, increasingly expose renewables to market prices, prevent overcompensation, diminish the costs of support and ultimately end support. It also gives some clarifications for the post 2020 regime, in view of ensuring that the necessary investment is made.

This 2012 communication was followed by a 2013 Green Paper[95] that launched a broad public consultation to create a new framework for EU climate change and energy policies beyond 2020, up until 2030. It questions policy options in the renewable energy sector in the light of the lessons drawn from the current framework, notably asking whether targets should be binding and at which level (EU, Member States, sectors and/or sub-sectors). The results of the consultation revealed mixed views on the usefulness of including a new renewable energy target for the period 2020-2030 due to the significant undesirable impacts it has entailed.[96] The European Council of May 2013 welcomed the Green Paper and invited the Commission to come forward with more concrete proposals.

92 COM(2011) 885/2.
93 COM (2012) 271.
94 SWD (2012) 149; SWD (2012) 163; and SWD (2012) 164.
95 COM (2013) 169.
96 The results of the consultation can be found on the following website: http://ec.europa.eu/energy/consultations/doc/20130702_green_paper_2030_consulation_results.pdf. The full report presenting results of the public consultation can also be found in Annex 7.5. to the Impact Assessement bearing reference SWD(2014) 15 final, from p. 199.

5.1. The debate about a new 2030 target

On 22 January 2014, this provoked the Commission's new proposals, which were intended to define a new climate/energy package for the period from 2020 to 2030. These proposals provide a revised set of policy options. One essential element is a change in EU renewable energy strategy. This new strategy would comprise two main components.

First, renewable energy must continue to play a fundamental role but must be exploited in a way which is, to the greatest extent possible, market driven. The new guidelines on energy and environmental state aid for 2014-2020[97] initiate this reshaping of EU energy policy.

Second, the share of renewable energy in the EU is increased to 27% by 2030 (by comparison, the percentage previously proposed in the Energy Roadmap amounted to 30% by 2030). This percentage of 27% would be binding on the EU but not on the Member States individually, as is currently the case. Member States would, however, undertake clear commitments with a view to delivering the EU-level target collectively. These commitments would be reviewed as part of a new governance process and, if necessary, they would be complemented by further EU action and instruments to ensure delivery of the EU target.[98]

The establishment of this framework for 2020-2030 will be the energy policy agenda for the new European Commission, encompassing a decision on the continuation or not of today's three-target architecture (renewables, CO^2 reduction and energy efficiency).[99]

To help, an Impact Assessment (IA)[100] has been elaborated. It describes the EU Reference Scenario 2013 (baseline scenario),[101] which provides projections of expected developments under existing policies (including policies adopted by late spring 2012) up to 2020, 2020-30 and 2030-50. It then focuses on the broad objectives of the 2030 framework and assesses different policy scenarios[102]. The latter are also compared in the light of the EU Reference Scenario 2013.[103]

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[97] 2014/C 200/01 (OJ C 200, 28 June 2014, p. 1). These Guidelines replace the Guidelines on state aid for environmental protection adopted in 2008 (OJ 2008, C 82, 1 April 2008, p. 1).

[98] *Communication from the Commission on a policy framework for climate and energy in the period from 2020 to 2030* – COM(2014) 15 final.

[99] T. Spencer, M. Colombier and T. Ribera (IDDRI), *The 2030 EU climate and energy package: why and how?*, Policy Brief N° 16/13 December 2013; S. Fischer and O. Geden, *Updating the EU's energy and climate policy – New targets for the post-2020 period*, Friedrich Ebert Stiftung, May 2013; S. Andoura and Stefan Bössner, *Quel nouveau paquet énergie-climat pour l'UE?*, Notre Europe, Tribune, 13 March 2014.

[100] SWD(2014) 15 final.

[101] *EU Energy, Transport and Greenhouse Gas Emissions Trends to 2050: Reference Scenario 2013* (http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2050_update_2013.pdf). The EU Reference Scenario 2013 has been developed through modelling with PRIMES, GAINS and other related models, and has benefited from the comments of Member States' experts.

[102] The policy scenarios are characterized according to whether they are based on *reference conditions* or on *enabling conditions* – SWD(2014) 15 final, p. 39.

[103] On this subject, see T. Spencer, M. Colombier, T. Ribera, *Issues and options with regard to the renewables target in the context of the 2030 EU climate and energy package*, IDDRI, policy brief N° 04/14 January 2014.

A technical analysis and comparison of the different scenarios exceeds the purpose of this paper. The IA offers, however, a series of interesting general considerations and evolutions with regard to the proposed RES target and the challenges raised in this paper in the electricity sector. They are as follows:

5.2. Evolution of the overall RES target

In the EU Reference Scenario 2013, RES in gross final energy consumption should account for 24% in 2030 and 29% in 2050.[104] This said, consumption of RES grows in 2030 in most policy scenarios. The growth is naturally the strongest under scenarios with explicit RES targets.[105]

5.3. Power generation and capacity requirements

In the Reference Scenario 2013, rising electricity demand, together with RES policies and technological progress, bring about a restructuring of electricity generation in favour of RES to the detriment of mainly solid fuels. In electricity generation, the share of RES reaches almost 45% in 2030, and about 50% in 2050.

These changes in the structure of power generation have also brought about profound changes to the capacity requirements, given that the strongly penetrating RES have lower load factors (more generation capacity for a given amount of electricity generation) than, for instance, coal and nuclear plants. Consequently, the share of RES in capacity is even higher than in generation. Net power generation capacities dominated by RES are expected to account for 55% of capacity in 2030 and 62% in 2050.

This expansion of RES capacities throughout the projection period is mainly driven by on-shore and off-shore wind as well as solar.

Following these changes in generation structure and despite growing electricity production, power generation would further decarbonize. This means concretely that the share of RES and nuclear combined in gross electricity generation would increase from the current 49% to reach 58% in 2020, 66% in 2030 and 73% in 2050. In addition, CCS would make some inroads in the long run, with a meagre share of less than 1% until 2030 increasing however to 7% by 2050.[106]

[104] *EU Energy, Transport and Greenhouse Gas Emissions Trends to 2050: Reference Scenario 2013,* p. 31.
[105] SWD(2014) 15 final, pp. 67-68.
[106] SWD(2014) 15 final, pp. 147-149.

5.4. Wholesale prices

The IA acknowledges that the increasing deployment of RES – mainly solar and wind generation – has contributed to containing and even lowering electricity wholesale prices in many markets by shifting the merit order curve and taking the place of part of the generation produced by conventional thermal plants, which have higher marginal cost of production.

In other words, the increasing deployment of RES has had a beneficial impact on the operational costs of power generation costs, further weakening the link between power prices and fossil fuels.[107] To illustrate this, the IA shows that, parallel to an increase in the share of renewable energy in power generation, wholesale power prices have risen less than the prices of oil and gas – and until recently coal – suggesting that the increased share of renewable electricity may have contributed to lessening increases in prices.

5.5. Retail electricity prices

The IA acknowledges that the fall of wholesale prices has scarcely been reflected in retail prices. It explains that this is partly due to insufficient competition and partly due to the cost for renewables support schemes, whose burden has not been evenly shared across consumer segments, with exemptions for some industries and a correspondingly higher burden for households.[108]

In the Reference Scenario 2013, electricity prices are projected to increase significantly, mainly until 2020, although they will remain relatively stable after 2020. From a 2030 perspective, in the policy scenarios electricity price increases are similar to those under the EU Reference Scenario.[109]

Although fossil fuel prices (projected to increase sharply in the run up to 2020[110]) remain key drivers of electricity end-user prices, taxes and levies are projected to remain a significant part of future electricity end-user prices. However, their share is expected to stay roughly the same until 2030.[111]

These price increases for fossil fuel and electricity obviously put pressure on the affordability of energy for vulnerable households and industries exposed to international competition.[112] Nevertheless, according to the IA, ambitious energy efficiency policies in a 2030 horizon can limit the increase of electricity prices, whereas RES policies lead to small increases in prices if accompanied by ambitious energy effi-

107 SWD(2014) 15 final, p. 186.
108 SWD(2014) 15 final, pp. 19 and 22-23.
109 SWD(2014) 15 final, p. 94.
110 SWD(2014) 15 final, p. 29.
111 SWD(2014) 15 final, p. 30.
112 SWD(2014) 15 final, p. 30.

ciency policies.[113] To facilitate energy efficiency investment for vulnerable consumers, targeted assistance may be required. Direct intervention in the market to regulate prices is not advised. A November 2013 report[114] issued by the Commission gives guidance to Member States on how best to assist vulnerable energy consumers.[115]

5.6. EU ETS

The EU ETS surplus is already at over two billion allowances. In the Reference Scenario 2013, this could further increase to over 2.5 billion by 2020, and only gradually reduce afterwards, due to the longer-term effects of current energy policies and the continuation of the linear reduction factor of 1.74% per year after 2020.[116] According to projections in all scenarios (Reference Scenario 2013 and policy scenarios), between 2005 and 2030, ETS GHG emissions should decrease significantly more than non-ETS GHG emissions because key policies affecting the non-ETS sectors do not include such a gradual and continued tightening.[117]

Concerning the EU ETS price, projections retain a significant degree of uncertainty. Under the EU Reference Scenario 2013, the ETS price is expected to reach 10 euros/ tCO^2 in 2020, 36 euros/tCO^2 in 2030 and 100 euros/tCO^2 in 2050. In the policy scenarios, it is expected to reach between 11 and 53 euros/tCO^2 in 2030, depending on the specific scenario. In a 2050 perspective, a continuation of the approach to 2030 would result in 85 to 265 euros/tCO^2, depending on the scenario.[118] Despite the current and projected low levels of the EU ETS prices in the run up to 2020, the ETS CO^2 emission reduction target for 2020 is projected to be achieved by the implementation of additional policies (RES support policies and energy efficiency policies) and thanks to the economic crisis, which has reduced industrial production and power demand.

This said, a structural reform of the EU ETS – in addition to the short-term solution of 'backloading' (postponing)[119] – has been expected for a long time now in order to reduce the surplus of allowances which, as shown by the Reference Scenario 2013, will not decline significantly before 2020. Obviously, such measures require political

113 SWD(2014) 15 final, pp. 94 and 97.
114 *Vulnerable consumer working group guidance document on vulnerable consumers*, November 2013 (http://ec.europa.eu/energy/gas_electricity/doc/forum_citizen_energy/20140106_vulnerable_consumer_report.pdf).
115 SWD(2014) 15 final, p. 96.
116 SWD(2014) 15 final, pp. 25 and 55.
117 SWD(2014) 15 final, p. 55.
118 SWD(2014) 15 final, p. 80.
119 Decision No 1359/2013/EU of the European Parliament and of the Council of 17 December 2013 amending Directive 2003/87/EC clarifying provisions on the timing of auctions of greenhouse gas allowances (Text with EEA relevance) (OJ 2013, L 343/1) and Commission Regulation (EU) No 176/2014 of 25 February 2014 amending Regulation (EU) No 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-20 (OJ 2014, L 56/11).

courage. To address the problem, the Commission adopted a Carbon Market Report in November 2012,[120] listing six possible structural reforms of the ETS. Three of them are inherently linked to the 2030 context, i.e., the revision of the annual linear reduction factor, the extension of the scope of the EU ETS to other sectors and the use of international credits post-2020. The revision of the linear reduction factor will be part of the decisions to be taken on the overall 2030 framework, and will depend on the policy option chosen; international credits need to be considered in the light of the link with international efforts and climate finance. The decision to extend the scope seems to require further analysis.

In the meantime, with regard to the policy options, the conclusions of the IA are as follows: Specific measures to promote renewable electricity or lower electricity consumption through more energy efficiency can be expected to lower the ETS carbon price, because they typically reduce GHG emissions.[121] Consequently, in a 2030 perspective, the adoption of a scenario driven by ambitious levels of renewables and energy efficiency would result in continuing increases of the surplus of allowances in the EU ETS (thus maintaining low carbon prices), and would therefore seriously undermine the future relevance of the ETS in providing the right incentives for low-carbon investment.[122] In other words, in the IA, all policy scenarios based on more ambitious RES and energy efficiency policies demonstrate a significantly lower ETS price. Consequently, according to the IA, for any given GHG emission reduction target in the 2030 perspective, it would be better to focus more on ambitious energy efficiency policies resulting in much higher GHG reductions in the non-ETS sectors, and this would bring about the reductions needed in the ETS.[123]

In addition, the creation of a 'market stability reserve' is also proposed to address the surplus of allowances. This mechanism would allow for a more dynamic supply of allowances which would not focus on prices, but instead on supply/demand imbalances of allowances.[124] A legislative proposal has already been tabled by the European Commission.[125] The idea is to introduce some flexibility on the supply side. If the surplus in the market is above an upper end of the range, a certain amount of allowances are placed in the reserve. If the surplus is below the range, a certain amount of allowances are released from the reserve.[126] This mechanism should be introduced during Phase 4 of the EU ETS in 2021.

120 COM(2012) 652 final.
121 SWD(2014) 15 final, p. 23 and 33 and 55. See also *European Economy, Energy Economic Developments in Europe*, DG ECFIN, European Commission. This document has also been published as a SWD(2014) 19.
122 SWD(2014) 15 final, pp. 19 and 55-56.
123 SWD(2014) 15 final, p. 56.
124 SWD(2014) 15 final, pp. 104 and 109.
125 Proposal for a Decision of the European Parliament and the Council concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC – COM(2014) 20 final.
126 Conseil Français de l'énergie, 3rd *European Energy Forum – What policy measures for energy transition in Europe?*, Paris, 24-25 April 2014, p. 29.

5.7. Support of renewables from Member States

The IA recognizes that short to medium cost efficiency of renewable development has been affected by the choice of some Member States to support a wide range of technologies (although such an approach could reduce costs in the longer term, as has been observed in the case of solar photovoltaic technology) and by national support schemes which in many Member States have not been flexible enough to adjust to changing circumstances (such as technology costs and level of development). On the other hand, changes to established support schemes can increase investor uncertainty, if applied retroactively in particular, and have contributed to the reduced investment levels experienced in 2012-2013.

At a recent IEA workshop specifically on RES financing, it was concluded that technology risk is no longer seen as the main barrier to investment in renewable energy technologies; now policy uncertainty is perceived by developers and investors as the main risk.

In this context, for the electricity sector (wind and solar), the 2013 Guidelines propose – among other measures – to move from feed-in tariffs to feed-in premiums or green certificates. Progressive introduction of competitive bidding processes for allocating public support is also foreseen and, from 2016, generators benefiting from public support will have to sell their electricity in the market and will be subject to balancing responsibilities. Measures to ensure that generators have no incentive to generate electricity under negative prices must also be put in place by Member States. All these requirements, however, should not be applied to small installations or technologies in early stages of development. The problem of export-oriented economies is also addressed, in order to maintain their competitiveness on international markets. For that purpose, the Guidelines allow Member States to grant reductions on the charges levied to support renewable energies to electro-intensive industries exposed to international competition, on the condition that they belong to the sectors listed in its Annex 3. Undertakings not listed in this annex may also be granted reductions under certain conditions. Companies that have been receiving state benefits for which they are no longer eligible will have to pay back what they have received over the past two years.[127]

5.8. Possible increased volatility?

Finally, besides what the IA says, a last remark can be made. The development of renewable electricity has turned things around and could produce new and important challenges. Clearly, transmission and flexible conventional generation will have

[127] So under these new Guidelines, it seems that the German government could largely uphold reductions on the EEG surcharge, though these reductions would have to be scaled back and only granted to a more limited group of companies.

to be strongly improved, for the electricity market should now be able to make predictions on power availability up to the hour, even though it was not designed to function that way.

> 'In line with an increasing penetration of variable RES-E, some scenarios are characterized by an increasing volatility of wholesale market prices. This development is furthermore strongly correlated with the degree of transmission expansion. Whereas scenarios with optimal networks reinforcement lead to converging regional prices and limited volatility, a lack of or limited transmission expansion may result in major regional disparities and extreme levels of volatility in some areas. (…) As the penetration of renewable power generation grows, the role of conventional power generation capacity changes. Running fewer operating hours, operation and revenues of conventional power plants will be less predictable, and they will become more dependent on peak energy prices to earn the margins required to cover their fixed operating and investments costs. In addition, increasing price volatility and short-lived price spikes will require more flexible generation, which is able to react quickly to changing market conditions.'[128]

[128] Imperial College, Nera, DNV, *Integration of renewable energy in Europe*, 2014, p. xxii.

CONCLUSIONS

Renewables will remain needed

Any reflection on the future of renewables must begin with an analysis of the general energy market of the European Union. From this perspective, the last ten years have clearly indicated that the need for renewables will remain, and most likely increase. The threat of climate change becomes clearer, and also more urgent. Furthermore, the Fukushima catastrophe has emphasized again the persistent public safety dangers inherent in nuclear power. The Ukraine crisis has stressed the increasing external dependence of the EU regarding gas, and Iraq's struggles drove home EU reliance on oil. Coal remains dirty and oil increasingly expensive, decarbonization is still a necessity, and thus so are renewables (provided they are genuinely sustainable).

In the long term, renewables will remain needed. It is essential to repeat this. Various difficulties in recent years have obviously reduced the enthusiasm of business and the public for renewables, but they are still indispensible. This does not mean that they will develop cheaply, quickly or easily. Hence the absolute need for a long-term strategy.

The missing cornerstone of the strategy is a correct carbon price

In that general context, the repeated failure of the EU to establish a correct carbon price remains central. This has become quite a systemic phenomenon. On the one hand, the ETS market has repeatedly crashed (even without taking into consideration the impact of the financial crisis). On the other hand, CO^2 taxation in sectors outside the ETS (transport, buildings, agriculture, etc.) has remained insufficient.

In a strategy where market instruments should be used as widely as possible, this repeated failure is critical, especially for renewables. The competitive position of renewables would be different at 20 euros/tCO^2, and extremely different at 40 euros/tCO^2. Additionally, Member States have tried to compensate this weak competitive position through subsidies, which have generated other problems. So, ultimately, distortion breeds more distortion.

With huge fluctuations for renewables, guaranteeing a stability capacity for electricity is mandatory

Solar and wind power can fluctuate strongly, according to the weather. Obviously, this characteristic must be better taken into consideration in the new market's organization. Methods for supervising power generation/consumption/growth in installed capacities are needed in the EU-28. Incentives need to be provided to those who invest in stable capacities. Otherwise, the development of renewables is also the development of insecurity.

Capacity mechanisms have been introduced in many Member States, in various forms. Some of them rely on prices, others on quantities. In this domain, there is a need for more analysis. In any case, any mechanism must itself take into consideration the other objectives of the system, for example, the prevention of new obstacles to competition and to free movement.

Some national policy measures need to be better coordinated

After the rapid launch of the 2008 package, many Member States devised public regimes – especially subsidies – which appeared later to be too simple and/or extensive. They were also generating substantial distortions of competition, even at local level.

In many Member States, the production of renewable electricity has benefited from various subsidies, taking many forms. Different types of special transport tariffs were also established. Subsidies (or guarantees) were sometimes offered for new network elements. Measures were also adopted to stimulate the creation of various capacity mechanisms. Finally, the various supports granted to intensive energy corporations in the framework of the ETS must also be taken into account. There is no further need to explain why the management of electricity projects has become much more complex.

Networks need to be improved and developed

The development of renewables is a source of different challenges for the electricity networks. Firstly, flows are much more instable, generally bigger, and sometimes geographically different. Secondly, the multiplication of decentralized production centres requires more sophisticated networks. Thirdly, the ups and downs in one country require much better interconnectors at the borders.

The necessary adaptations are thus heavy and various. They require time, money and the proper administrative authorizations. Public acceptance is also important. The EU has taken various measures. However, some of them now appear insufficient, and others only weakly implemented.

Research efforts must be increased

This last item is sometimes a little bit neglected. Much progress has already been made in the field of wind, and especially solar, energy. They have strongly increased their competitiveness, and this explains the possibility of reducing the level of public subsidies today. More progress, however, remains necessary. It is also essential that European industry maintains and even increases its present innovation level. Otherwise, the development of renewables will primarily benefit American and Chinese corporations.