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The renewable energy directive and its contribution to the elimination of barriers for the deployment of renewable energy in the EU beyond 2020

-*Trabajo de Fin de Máster*-

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ACRONYMS

CEP	Climate Change and Energy Package
COP	Conference of the parties
EC	European Community
ETS	Emission Trading System
EU	European Union
FITs	Feed-In Tariffs
GOs	Guarantees of Origin
ILUC	Indirect Land Use Change
NECPs	National Energy and Climate Plans
NREAPs	National Renewable Energy Action Plans
RED	Renewable energy directive
REDII	Recast of the renewable energy directive
RES	Renewable energy sources
RES-E	Renewable energy sources for electricity
RES-T	Renewable energy sources for transport
TFEU	Treaty on the Functioning of the European Union
UNFCCC	United Nations Framework Convention on Climate Change
URDP	Union Renewable Development Platform

GLOSSARY[1]

'bioliquids' means liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass;

'biofuels' means liquid fuel for transport produced from biomass;

- *'first generation biofuels'* are produced directly from food crops. The biofuel is ultimately derived from the starch, sugar, animal fats, and vegetable oil that these crops provide
- *'second generation biofuels'* are also known as advanced biofuels. The feedstock used in producing second generation biofuels are generally not food crops. The only time the food crops can act as second generation biofuels is if they have already fulfilled their food purpose. For instance, waste vegetable oil is a second generation biofuels because it has already been used and is no longer fit for human consumption. Virgin vegetable oil, however, would be a first generation biofuel.
- *'third generation biofuels*' have only recently enter the mainstream. It refers to biofuel derived from algae[2]

'biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin;

'district heating' or 'district cooling' means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from central or decentralised sources of production through a network to multiple buildings or sites, for the use of space or process heating or cooling;

'energy from renewable sources' or 'renewable energy' means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas;Conventional energy

'gross final consumption of energy' means the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, the consumption of electricity and heat by the energy branch for electricity, heat and transport fuel production, and losses of electricity and heat in distribution and transmission;

[1] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. PE/48/2018/REV/1, OJ L 328, 21.12.2018, p. 102–105.

[2] Biofuel.org.uk. Disponible en :<http://biofuel.org.uk/>

'support scheme' means any instrument, scheme or mechanism applied by a Member State, or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased, including but not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and sliding or fixed premium payments;

1. INTRODUCTION

From the mid-nineties the European Union (EU) has been considered a frontrunner in the deployment and development of renewable energy sources (RES) with the implementation of EU-wide policies.

The first efforts in the promotion of the RES can be found in the late 1970s after the oil-shocks in 1973 and 1979, where Europe's oil dependence clearly exposed the vulnerability of the European energy security and energy costs. The European Community (EC) adopted by that time some measures that included indicative energy-saving objectives and a "program for the rationalization of the use of energy", including renewable energy research, demonstrations and regional applications, as well as other specific programmes like the VALOREN programme (1986) for the development of certain less-favoured regions of the EC by exploiting indigenous energy potential. But the support of RES at that time came mainly by the national R&D programmes of a few pioneering countries like Germany, the Netherlands, Denmark and neighbours, Finland and Sweden.[3]

It was in the beginning of the 90s, after the Rio Earth Summit (1992), when the climate change moved to the centre of EU's agenda and this factor became the new and definite driving force in the development of RES until today. The main programme adopted at that time was the ALTENER programme in 1993 with the objective of reducing CO2 emissions by means of RES promotion. This programme, nonetheless, did not get a lot of support and contained only indicative targets: 8% of RES in EU energy consumption by 2005, an objective of tripling RES-E generation, and a target of 5% biofuels by 2005. In parallel at national level several member states started to invest in some support programmes for the development of the RES market like Feed-In-Tariffs (FITs) (Denmark, Portugal, Germany, Greece, Luxembourg and Spain) or tendering schemes (UK, Ireland and France)[4].

After these early years of R&D programmes and soft coordination on renewable energies, the publication of the European Commission Green (1996) and White (1997) Papers entitled "Energy for the future: renewable sources of energy" represented a substantive point in the evolution of EU renewable energy policy. The White Paper included an indicative target of 12% RES in EU energy consumption in 2010 as well as a list of measures to promote the development of RES in the sectors of electricity, transport and heating and cooling. The Kyoto Protocol in 1997, where the EU committed to reduce its greenhouse gas (GHG) emissions by 8% below to its 1990 levels by 2008-2012; and the continuous rise of oil and gas prices since the late 90s, which increased the energy security concerns in the EU; stablished the perfect framework for the development and publication of the first legislative proposals under EU environmental competences: one for the promotion of renewable electricity (RES-E) and another one for biofuels (RES-T)[5].

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[3] SOLORIO, I., JÖRGENS, H., *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*, Cheltenham, Edward Elgar, 2017, p. 24
[4] Ibidem, p.25
[5] Ibidem, p.26

The renewable electricity directive (2001/77/EC) set the indicative target of using RES to meet 12% of energy consumption for the EU-15 by 2010, of which electricity would represent a 22.1%. The biofuels directive (2003/96/EC), following the RES-E directive, set as well indicative targets for reaching a 2% share of biofuels consumption in transport by 2005, rising to a 5,75% in 2010. Both directives, although a very good initiative in their conception, turned up to be in the end a loose regulatory framework without mandatory targets that left aside many important issues like the harmonization of the national support systems for RES-E, reduced rates of excise duty on biofuels, or the sustainability concerns on the use of biofuels in transport. The lack of progress towards achieving the 2010 targets led to the adoption of a more comprehensive legislative framework[6].

The new directive that repealed both the RES-E and biofuels directive was the current directive 2009/28/EC on the promotion of the use of energy from RES, also known as the renewable energy directive (RED). This directive was conceived in a context of rising energy imports and security of supply concerns, intensified by the 2006 gas crisis between Ukraine and Russia, and the increasing attention to climate change with the adoption in 2007 of the "Bali Roadmap" by the Kyoto protocol parties. The European Commission proposed then in 2008 the climate change and energy package (CEP) that included the 20-20-20 targets: to reduce EU greenhouse gases by 20%, to reach 20% of RES in EU final consumption and increase energy efficiency by 20%, all by 2020, including a sub-target of 10% of RES in transport. The CEP included among others the draft of the RED with the mandatory target of 20% of RES in final energy consumption by 2020, the 10% RES-T sub-target and a scheme for ensuring the sustainability of biofuel production. The RED was finally adopted in 2009[7].

As part of the RED, by the end of June 2010 all EU Member States had adopted National Renewable Energy Action Plans (NREAPs) with renewable energy targets by sector and technology to 2020. According to the latest progress report of the European Commission, the EU as a whole is on the way to reach its 20% renewable target by 2020. The renewable energy share in the EU reached a RES share of 17% in 2016, and an estimated share of 17.4% in 2017[8]. Figure 1 shows the change in renewable energy share for each EU Member State between 2005 and 2016, and their respective gaps towards reaching the 2020 targets.

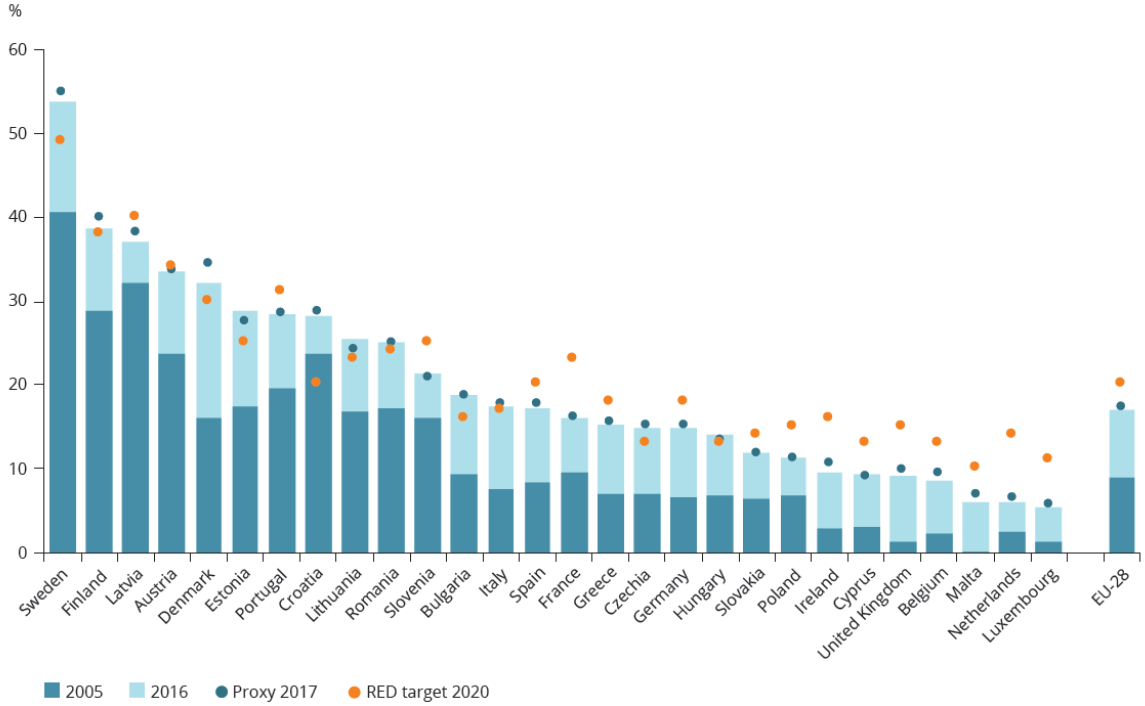
In January 2014, the European Commission proposed the 2030 climate and energy framework to expand the EU 20-20-20 objectives from the year 2020 to the year 2030. In October that year, the European Council reached an agreement resulting in three higher EU-wide targets to be achieved by 2030: a 40% cut in greenhouse gas emissions compared to 1990 levels, at least 27% of renewable energy in gross final energy consumption, and at least 27% energy savings compared with the business-as-usual scenario. This agreement was

[6] Ibidem, p. 26-27
[7] Ibidem, p. 29
[8] European Environment Agency, *Renewable energy in Europe — 2018, Recent Growth and Knock-on Effects*, EEA Report No 20/2018, 2018, p.17

followed by the Energy Union framework strategy of February 2015, which aims to ensure secure, affordable and climate-friendly energy for Europe[9].

In December 2015, the European Union adopted the Paris Agreement (UNFCCC, COP21), which established the goal to limit the rise in global temperatures this century to "well below 2°C" compared to pre-industrial levels. In practice, this entails reducing global carbon emissions from energy use to zero by 2060 and maintaining that level until the end of the century. This long-term decarbonisation objective has profound implications for European climate and energy objectives in the 2030 timeframe. Accelerated deployment of renewable energy and energy efficiency measures are the key elements to achieve these objectives[10].

Figure 1. Actual and approximated RES shares in the EU and its Member States



Notes: The dark blue bars show the RES shares in 2005. The tops of the light blue bars show the levels that the RES shares reached in 2016.

Sources: EEA, 2017; Eurostat, 2018d; RED (2009/28/EC).

In order to bring EU legislation in line with 2030 targets, the European Commission published in November 2016 the package of legislative proposals "Clean Energy for All Europeans" for the period 2020 to 2030, also known as the "Winter Package". This package covers energy efficiency, renewable energy, the design of the electricity market, security of supply and governance rules for the Energy Union. A proposal for a revision of the RED (REDII) was released as part of the Winter Package and after some discussions and revisions, it has been finally adopted in December 2018. The new REDII does not include national

[9] IRENA. *Renewable Energy Prospect for the European Union*. February 2018, p.29
[10] Ibidem, p. 27

renewable energy targets, but a new upgraded binding target at the EU-level of 32% with an upwards revision clause by 2023, a 14% RES-T target, strengthened sustainable criteria for biofuels, and new measures to support self-consumers[11].

In this paper we will analyse the general barriers that can be found in the deployment of renewable energy in Europe (chapter 2), the extent of the contribution of the current EU renewable energy regulatory framework to the elimination of these barriers (chapter 3) and how the newly adopted REDII will solve the pending issues from the previous directive and spur the deployment of renewable energy after 2020 (chapter 4).

2. BARRIERS TO THE DEPLOYMENT OF RENEWABLE ENERGY

The share of renewable energy in the EU has reached a 17% of the overall energy consumption of the EU in 2016, making the EU as one of the main world leaders in the deployment of RE. But renewables still face major obstacles. Some are inherent with all new technologies; others are the result of a biased regulatory framework and marketplace. A manifold of barriers to the deployment of RE can be found in the literature. These barriers can be grouped in four major variables: economic, social, technological and regulatory barriers[12].

2.1. Economic and financial barriers

Subsidies for competing fuels: The energy market is and has been for most of the last century dominated by conventional energies, including coal, nuclear, oil and, most recently, natural gas. The investment in these technologies during this time has been strong, acquiring them a great level of maturity and knowledge, and an immense power in the market. The well-established nature of existing conventional technologies that benefit from existing infrastructure, expertise and policy makes the energy market an unequal playing field for RE and a very important barrier to overcome.

Fossil fuels still benefit from multiple subsidies in different forms: direct budgetary transfers, tax incentives, R&D spending, liability insurances, leases, land rights-of-way, waste disposal, and guarantees to mitigate project financing or fuel project risks[13]. The amount of government subsidies provided to conventional energy is much higher than the subsidies awarded to renewable energy[14]. These subsidies can lower considerably the final energy price, putting RE at a competitive disadvantage if it does not receive the same amount of subsidies.

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[11] Ibidem, p. 29
[12] MOORTHY, Krishna, et al. *Breaking barriers in deployment of renewable energy*. Heliyon, 2019, vol. 5, no 1, p. e01166, p.4
[13] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies And Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 365
[14] MOORTHY, Krishna, et al. *Breaking barriers in deployment of renewable energy*. Heliyon, 2019, vol. 5, no 1, p. e01166, p.5

High initial capital costs: The most obvious and widely publicized barrier to renewable energy is cost, specifically, capital costs. Projects in the field of energy, either the installation of new production capacity or the construction of transportation infrastructure, are generally characterised by high investments cost in absolute terms. But in the case of RE (with the exception of bioenergy), when taking into account the same energy production capacity, RE is characterized by higher upfront costs and low operational costs, due, in particular, to low or zero fuel costs and minimum level of maintenance. The average cost in 2017 to install solar systems ranged from a little over $2,000 per kilowatt (kilowatts are a measure of power capacity) for large-scale systems to almost $3,700 for residential systems. A new natural gas plant might have costs around $1,000/kW. Wind comes in around $1,200 to $1,700/kw.

RE can be though cost competitive on a life-cycle basis. According to asset management company Lazard wind and utility-scale solar can be the least expensive energy generating sources. As of 2017, the cost (before tax credits that would further drop the costs) of wind power was $30-60 per megawatt-hour (a measure of energy), and large-scale solar cost $43-53/MWh. For comparison: energy from the most efficient type of natural gas plants cost $42-78/MWh; coal power cost at least $60/MWh[15].

Nevertheless higher construction costs might make financial institutions more likely to perceive renewables as risky, and depending on the circumstances capital market may require a premium in lending rates for financing renewable energy projects because more capital is being risked up front than in conventional energy projects. Renewable energy projects may also face high taxes and import duties that may increase the high first costs considerations relative to other technologies and fuels[16].

The cost of renewable energy technologies has rapidly declined in the recent years as a consequence of cumulative volume of demand and technological progress. Between 2006 and 2016, the average value of photovoltaic modules themselves plummeted from $3.50/watt $0.72/watt, an 80 percent decrease in only 10 years[17]. But still RE technologies need to continue to be developed to reduce costs, and more investment is required.

The cost of externalities: Currently, in almost all countries, the total cost of fuel includes the cost of exploration, production, distribution and usage, but it does not include the cost of the damage it does to the environment and society. Fuel cycle externalities are the costs imposed on society and the environment that are not accounted for by the producers and consumers of energy. Renewables would have a much bigger share of the market if the cost of externalities is internalized in the total fuel cost calculation. But the value of these fuel cycle externalities is difficult to assess and depend on assumptions that can be subject to

[15] Union of Concerned Scientists, *Barriers to Renewable Energy Technologies*, December 20, 2017. Disponible en: <https://www.ucsusa.org/clean-energy/renewable-energy/barriers-to-renewable-energy>
[16] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies and Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 366
[17] Union of Concerned scientists, *Barriers to Renewable Energy Technologies*, December 20, 2017. Disponible en: <https://www.ucsusa.org/clean-energy/renewable-energy/barriers-to-renewable-energy>

wide interpretation and discretion. Investors rarely take into account these costs when making decisions.[18]

An additional factor neither usually considered when making investment decisions is the risk associated with fluctuations of fossil fuel prices. The reason behind is that this factor is also generally very difficult to assess, and in the end fuel costs are factored into regulated power rates so that consumers rather than utilities bear the burden of fuel price risks.[19]

Considering this, if the calculation of the total fuel cost would be made on a life-cycle basis including the full cost of externalities and the risk of fossil fuel prices fluctuation, renewables would be much better placed in the energy market, even given the current state of technologies.

Unfavourable power pricing rules: Power price includes generation, transmission and distribution. RE power plants are generally located near final costumers rather than at centralized generation facilities, and therefore it does not require the transmission and distribution typical of centralised electricity grids. But utilities apply standard contracts of utility services that do not discriminate between generation, transmission and distribution, which implies wheeling surcharges for RE producers[20].

On the other side as many of RE are inherently intermittent (ex. wind and sun), utilities only pay to RE producers for the energy value at an average rate, instead of using peak time prices, that would fit better to RE considering the time of the day when it is produced, and avoid paying the capacity value of the generation as this capacity will not be ensured considering the nature of the energy[21].

Restructuring power price regulation by means of unbundling generation, transmission and distribution and paying the right price for the energy produced from renewable sources would make the wholesale power market much more competitive for RE.

Lack of access to credit: High cost of capital investment and long pay-back periods without clear indications of the political and regulatory long term scenario, make RE projects not interesting for investors and financial institutions. Combining this with the fact that the scale of many renewable projects is often too small, make that many RE projects are never taken beyond the post-planning stage. In addition microcredits for household systems do not exist. The perceived risks in RE investment are therefore normally overestimated and only a

[18] Communication from the Commission. *Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy.* COM 96 (576) Final. Brussells, 20.11.1996, p. 25
[19] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies and Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 366
[20] Communication from the Commission. *Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy*. COM 96 (576) Final. Brussells, 20.11.1996, p. 26
[21] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies and Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 367

limited number of financial tools and institutions are available in the market for RE projects financing.

2.2. Social barriers

Lack of awareness and information: Regardless of an apparent general support to RE, there is insufficient public information about RE environmental and financial benefits, inadequate awareness of the RE technologies, and uncertainties about the financial feasibility of RE installation projects[22]. This affects a large number of groups from policy makers to investors. Developers, engineers, technicians, installers, financiers, investors, planners, utilities and power companies, which are all important players in the decision making affecting renewables, generally suffer from a shortage of knowledge of the opportunities offered by renewable energy technologies.

Resistance to change: National power production companies, and in particular monopolies, often have negative attitudes towards renewables, mainly based on a general resistance to change. A centralised approach to energy production is seen to be contradictory to the development of renewable energy sources[23].

Renewable energy project proposals often face also opposition from individual citizens, political leaders, grassroots organizations, national interest groups and, in some cases, even environmental groups. Public opposition occurs for a number of reasons, including landscape impact, environmental degradation and lack of consultation concerns among local communities[24].

Lack of skilled personnel: Taking into account the rapid development of renewable energies in the recent years, the number of jobs have increased relatively in this sector and skills shortage appears as one of the main challenges for the penetration of RE. There is a need to teach renewable energy courses and for proper training to be conducted to develop the skills required to install and operate renewable energy projects[25].

Loss of alternative income: Wind and solar farms require a vast area of land to produce an amount of energy equivalent to that which can be produced from a small coal fire power plant. Extensive parts of the countryside, which includes farmland, need to be converted into buildings or roads or any other infrastructure to support a renewable energy power plant[26]. The same happens with biofuels, which require energy crops for its

[22] MOORTHY, Krishna, et al. *Breaking barriers in deployment of renewable energy*. Heliyon, 2019, vol. 5, no 1, p. e01166, p.4
[23] Communication from the Commission. *Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy*. COM 96 (576) Final. Brussells, 20.11.1996
[24] MOORTHY, Krishna, et al. *Breaking barriers in deployment of renewable energy*. Heliyon, 2019, vol. 5, no 1, p. e01166, p.4
[25] Ídem
[26] Communication from the Commission. *Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy*. COM 96 (576) Final. Brussells, 20.11.1996, p. 27

production. Indirect land use change can occur when energy crops are grown on agricultural land and consequently food crops are displaced to previously uncultivated land[27]. The potential use of the land must be then considered when making decisions on RE investments.

Environmental impact: Although the environmental impact of most renewables is much less severe than that arising from conventional fuel cycles, local issues sometimes outweigh the global environmental benefits. While recognising that wind turbines, specifically, may have some negative environmental impact in the form of noise and visual impact, technical solutions are being developed and the overall positive environmental consequences arising from the avoided energy production based on fossil fuels should be taken into account when these concerns are addressed[28].

In the case of bioenergy this aspect is especially controversial, and the sustainability of biofuels has always been highly criticised. In the case of wood, burning it releases the CO2 that trees had captured while growing; this CO2 is gradually removed from the atmosphere if new trees are grown. In the case of energy crops, greenhouse gas emissions also result from fertiliser production, agriculture and processing, with negative impacts on the overall emissions reduction. When energy crops are planted on previously uncultivated land, there can be substantial emissions from land use change[29].

2.3. Technological barriers

Grid integration: RE power plants, unlike conventional power plants, are geographically disperse. They are located where energy resources (sun, wind, water) as well as land are available. In the case of rooftop solar, many small installations are distributed over a wide area. These plants require additional transmission lines to connect to the main grid. Since most of the existing grids are not designed to integrate with renewable energy, these existing grids need to be upgraded or modified. Grid integration is amongst the biggest problems affecting the development of renewable energy projects[30]. An increased interconnection capacity together with the use of digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users (smart grids) would allow renewable energy sources, whose contribution to power generation is intermittent (wind, solar), to be more easily compensated by conventional forms of energy when user demand is high or the energy

[27] ERBACH, Gregor . *Promotion of renewable energy sources in the EU*. European Parliamentary Research Service. June 2016, p. 15
[28]Communication from the Commission. *Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy*. COM 96 (576) Final. Brussells, 20.11.1996, p.27
[29] ERBACH, Gregor . *Promotion of renewable energy sources in the EU*. European Parliamentary Research Service. June 2016, p. 15
[30] ERBACH, Gregor . *Promotion of renewable energy sources in the EU*. European Parliamentary Research Service. June 2016, p. 14

supply from renewables is low[31]. This would reduce the need of storage capacity for wind and solar energy.

Technology complexities: In order to achieve bigger level of commercialization of renewable energy technologies, there should be more standards, procedures and guidelines in renewable energy technologies in terms of durability, reliability, performance, etc. Building regulations, for example, often do not take account of the special requirements of installation of renewable sources of energy. Furthermore, the lack of appropriate standards lead to resource demanding and expensive procedures related to installation of renewables. Technical standards, for example on the performance of consumer products such as solar, thermal, water heating, will help to provide the public confidence which is essential for mass marketing. Biomass fuels are another example of a renewable energy sources currently lacking sufficient standards. In some cases, the individual Member States require equipment to go through specific national testing procedures before installation adding significant to the costs and time required for industry to introduce new types of technology on the market. The lack of European-wide harmonisation of such requirements often create serious barriers to trade in renewable technologies[32]. Standards and certificates are required as well to ensure that the equipment and parts manufactured or procured from overseas are in alignment with the standards of the importing company. These certifications make sure that companies are operating the plant in compliance with local law. Absence of such standards creates confusion and energy producers have to face unnecessary difficulties[33].

Some RES sources like sun and wind vary according to the season, weather and time of the day. The integration of these variable renewables in the electricity grid poses technical challenges with regard to grid stability, transmission capacities and generation capacity in case of demand peaks. The utilities have difficulties on relying in the capacity of these plants for the production of the required electricity and in case of congestion of the grid for having exceed its transmission capacity RES power plants use to be discriminated in front of conventional power plants[34]. Electricity storage, real-time pricing, and smart appliances can help the integration of solar and wind in the electricity grid.

The storage of energy is in fact one of the major technical issues that renewable energy is facing today. Electricity grids cannot operate unless they are able to balance supply and demand so storing electricity in times of high supply and delivering it at times of high demand is necessary for the integration of wind and solar electricity into the grid. Battery storage has seen progress in recent years. Hydraulic energy has the most widely used storage technology that consist of pumping water from a lower to a higher reservoir, but other

[31] European Parliament. *Briefing. Smart electricity grids and meters in the EU Member States*. September 2015, p. 2

[32] Communication from the Commission. Energy for the Future. Renewable Sources of Energy. Green Paper for a Community Strategy. COM 96 (576) Final. Brussells, 20.11.1996, p.27

[33] MOORTHY, Krishna, et al. *Breaking barriers in deployment of renewable energy*. Heliyon, 2019, vol. 5, no 1, p. e01166, p.8

[34] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies and Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 381

technologies are rapidly evolving, ex. compressed air storage, power to gas, and energy storage in molten salts for concentrated solar power plants. Currently, there is no uniform regulatory framework for electricity storage. In some Member States, pumped storage operators have to pay network charges twice (that is, when energy is stored and then when it is delivered)[35]. Storage is then usually more expensive than additional transmission capacity[36]. The required unbundling of electricity production from the electricity grid restricts the possibility for network operators to own and operate storage facilities.

Lack of research and development (R&D) capabilities: Many renewable technologies need to continue to be developed to reduce costs. It is necessary to invest in new renewable technologies, such as ocean energy and concentrated solar energy, and in second and third generation biofuels. It is also necessary to improve existing technologies, for example by increasing the size of offshore wind turbines and blades to capture more wind, and perfect the photovoltaic panels to collect more energy alone

Investment in research and development (R&D) is insufficient to make renewable energies commercially competitive with fossil fuel. Both governments and energy firms shy away from spending on R&D as renewable energy is in its development stage and risks related to this technology are high[37].

2.4. Regulatory barriers

Ineffective policies by government: The EU has various policy instruments for addressing climate change: the EU Emissions Trading System (ETS), support for RES and for energy efficiency. The interactions between these instruments can diminish their effectiveness. Some experts point out that support for RES results in reduced demand and lower prices for emission allowances, reducing the effectiveness of the ETS. They argue that emissions could be reduced at a lower cost by relying on the ETS alone. Others consider that RES support is justified because the carbon market (ETS) alone would not drive the desired changes[38]. Coherence and consistency in the design of the different energy policies not only for renewable energy but for non-renewable as well, is necessary. Regulatory and policy uncertainty, discontinuity in the application of measures, and/or insufficient transparency of policies and legislation act as important barriers to the deployment of renewable energy projects.

Inadequate fiscal incentives: There have not been enough measures by governments to remove tax on imports of the equipment and parts required for renewable energy plants.

[35] ERBACH, Gregor . *Promotion of renewable energy sources in the EU*. European Parliamentary Research Service. June 2016, p. 15
[36] Communication from the Commission. *Energy Roadmap 2050*. COM 2011 (885) Final. Brussells, 15.12.2001, p. 10
[37] MOORTHY, Krishna, et al. Breaking barriers in deployment of renewable energy. Heliyon, 2019, vol. 5, no 1, p. e01166, p.7
[38] ERBACH, Gregor . Promotion of renewable energy sources in the EU. European Parliamentary Research Service. June 2016, p. 16

Feed-in tariffs are the measures by which governments aim to subsidize renewable energy sources to make them cost-competitive with fossil fuel-based technologies, but the absence of these adequate financial incentives results in high costs that hinder the industry's development, operation and maintenance, and stagnate the future[39].

Institutional and administrative barriers: Lack of strong dedicated institutions, lack of clear responsibilities and complicated, slow, or non-transparent permitting procedures are some of the problems arising in the deployment of renewable energy projects. Lack of coordination between different authorities and long lead times in obtaining authorization unnecessarily increase the timeline for the development phase of the project. Higher costs are also associated with obtaining permission due to lobbying. All these factors prolong the project start-up period and reduce the motivation required to invest in renewable energy[40].

3. CONTRIBUTION OF THE RENEWABLE ENERGY DIRECTIVE IN THE ELIMINATION OF BARRIERS FOR THE DEPLOYMENT OF RENEWABLE ENERGY IN THE EU

The prime directive for the promotion of renewable energy sources in the EU is currently the Directive 2009/28/EC, also known as the renewable energy directive (RED) which entered into force in June 2009, and is a core element of the 2020 Climate and Energy Package.

The RED amends and repeals Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market and Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport. The RED covers the electricity and transport sector from the previous directives and includes as well the heating and cooling sector. The aim of the RED is to achieve by 2020 a 20% share of energy from renewable sources in the EU's final consumption of energy and a 10% share of energy from renewable sources in each Member state's transport energy consumption. The RED introduces

The key EU measures introduced by the RED are indicated next:

- Mandatory national overall targets and measures for the use of energy from renewable sources (art. 3).
- National Renewable Energy Action Plans (art, 4).
- Cooperation mechanisms (art. 6-12).
- Administrative procedures, RES in buildings, heating (art. 13).
- Guarantees of origin (art. 15).
- Grid access and operation (art. 16).

[39] MOORTHY, Krishna, et al. Breaking barriers in deployment of renewable energy. Heliyon, 2019, vol. 5, no 1, p. e01166, p.8
[40] Ídem

- RES in transport, biofuels and bioliquids sustainability (art. 17-19, 21).
- Reporting (art. 22 & 23).

In the present chapter we will study these measures in detail. Each section is presented with a description of the measure with the reference of the article in the RED where is contained, how that measure contributed to eliminate barriers in the deployment of RE in the EU and which were the main problems that the measure faced in its implementation.

3.1. 2020 targets, monitoring and control

As opposed to the pure indicative national targets of the previous legislation, the RED stablish mandatory national targets (art. 3) whose contribution to achieve the overall EU level 20% target is based on a flat rate increase in each Member State (same additional share for each country) weighted by gross domestic product (GDP) and modulated to take account of earlier development of renewable energy resources in that Member State. The RED also includes biennial indicative target trajectories. The way the Member States achieve their national targets is discretional. The RED only recommends among others, the use of support schemes and cooperation mechanisms. All Member States have to prepare National Renewable Energy Action Plans (NREAPs) (art. 4) based on a fixed template that define sector targets and specify policy measures for reaching the targets. In order to monitor and control the progress, Member States are requested to submit a progress report every two years indicating the measures taken and planned to promote the growth of RES taking into account the indicative trajectory (art. 22 & 23). The national and EU documents relating to renewable energy shall be made accessible to the public via an online public transparency platform established by the Commission (art 24)

Mandatory targets backed by indicative interim targets seem to be more effective than indicative targets only, especially in MS with low RES shares and investments. They have enhanced investor security, contributed to drive RES technology cost down since they have created a steady demand for cost-effective renewable energy, and opened up more markets in the EU, facilitating further growth of the sector. The indicative interim targets contributed to ensure that measures to achieve the national targets were introduced timely, and allowed a continuing assessment whether MS were on track.[41]

The NREAPs and the biennial monitoring exercise were considered effective in increasing transparency and clarity, and allowed effective monitoring of progress towards the 2020 targets and against the indicative trajectory set in the RED by the Commission. As of today, all Member States have national renewable energy planning policies in place, as opposed to the limited number of dedicated national level RES strategies in Member States back in 2007, when the outline for the new legally binding EU renewable energy framework was laid out in the Renewable Energy Roadmap. The standard templates for planning and reporting minimised administrative burden for national reporting authorities, ensured

[41] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 6

maximum comparability and were considered best practice[42]. Administrative costs are considered reasonable, compared to the benefits[43].

The RED does not foresee a specific enforcement or penalty mechanism in case a MS fails to reach its target. The threat of not meeting national targets is mainly a moral one. Rather, the normal procedures would be applicable and the European Commission could open up an infringement procedure after 2020 (art. 258 of the TFEU), but it seems unlikely that the latter would result in financial consequences. The use of the flexibility mechanisms (ex. Statistical transfers) should serve the MS to reach the national targets in a cost-effective way as there are many MS that have way overachieved its targets.[44]

The way to achieve the 20% EU renewable energy target turned out to be not a cost-effective one. Although the GDP-based allocation method of overall RES targets between MS proved to be effective and broadly considered fair as it balanced the MS' RES potentials with its capacity to exploit them; the cooperation mechanisms between MS introduced by the RED in order to compensate these differences have not been substantially used and therefore MS have not efficiently leveraged RES there where they were more available or less expensive. Incentives in the use of cooperation mechanisms or an alternative method to increase cost-effectiveness should be implemented[45].

The NREAPs became outdated as policies, market circumstances and other variables changed over time. This complicated the monitoring of more qualitative information on policies and measures. However, this limitation has been largely mitigated by the biennial MS renewable energy progress reports that provided regular updates on MS regulatory and support policies in the field of renewable energy and which are essentially based on the same template as the NREAPs.

The information contained in the progress reports need to be updated in order to require from MS some additional useful information relating to administrative reforms, evidence on the impact of increased biofuel production on land use patterns or how the progress on each measure will be monitored[46].

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[42] Commission Staff Working Document. *REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast).* SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016. p. 22

[43] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 6

[44] KLEßMANN, Corinna Barbara. *Increasing the effectiveness and efficiency of renewable energy support policies in the European Union*. Utrecht University, 2012. p.164

[45] Ibidem, p.171

[46] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p.53

Some stakeholders report that the administrative burden can be reduced, e.g. by providing more guidance on the purpose of each question of the reports, and providing a standard methodology where possible[47].

Regardless the improved transparency achieved with the NREAPs and progress reports, the involvement of stakeholders and public debate in MS policy making was limited as well as the public awareness of the plans[48].

3.2. Cooperation mechanisms

In order to achieve the national mandatory targets in a cost-effective way that compensates the uneven distribution of RES potentials across MS, the RED introduced some cooperation mechanisms (art. 6-12). These flexibilities allow those MS with low or expensive RES potential, to partially fulfil their national RES target in other countries with higher RES potential or lower production costs. Three types of cooperation mechanisms are covered by the RED:

- *Statistical transfers*. By this mechanism the renewable energy that has been produced in one MS is virtually transferred to the RES statistics of another MS, counting towards its national RES target.
- *Joint support schemes*. MS coordinate their RES support schemes and jointly define how the renewable energy produced is allocated to their national targets.
- *Joint projects*. The RED allow MS to finance new RES projects jointly, thus sharing the costs and benefits of the project and developed under framework conditions jointly set by two or more MS. The involved MS define which share of the energy production counts towards which MS target. Joint projects can also be implemented between MS and third (non-EU) countries. A precondition is that an amount of electricity that equals the electricity amount generated from RES and subject to this joint project is physically imported in the EU.

The directive defines general accounting rules for using the mechanisms, but does not give any specification of their design. The detailed design and practical implementation of the mechanisms are left to the MS.

Regardless of the potential benefits of the cooperation mechanisms to achieve cost effectiveness, particularly for the RES importing countries, the use of the cooperation mechanisms is very limited to date. This picture might have changed in the recent years with the approach of the 2020 deadline as statistical transfers can be easily used for short term transfers to achieve the national targets, without the negotiation of a complex framework.

[47] Ibidem, p.57
[48] Ibidem p.53

In any case, the experience gained from cooperation mechanisms might contribute to the discussion on a more coordinated European RES support framework[49] and on the European Energy Union[50].

The use of cooperation mechanisms has been very limited so far. Various barriers to cooperation between MS can be identified[51]:

- Political barriers: the preference to invest in RE within the MS to take advantage of its benefits in the form of employment, economic and industry growth, tax income and security of supply; uncertainty about long-term RES supporting framework; difficulties for to forecast their own RES target fulfilments; government-driven process instead of market-driven; lack of regional incentives like financial ones to use the mechanisms, etc.
- Technical barriers: lack of transmission infrastructure and market integration, lack of guidance on design options and cost-benefits measurements methods, difficulties for MS to forecast their own RES target fulfilments, etc.
- Legal barriers, such as potential incompatibility of cooperation mechanisms with national and EU legislation.

Mechanisms are rather considered as a complementary means to secure target achievement than as means to enhance cost-efficiency. MS have made use of different national support schemes instead: feed-in tariffs, feed-in premiums, renewable quota schemes, grants, soft loans, tax credits, etc.

3.3. Administrative procedures, RES in buildings, heating

The RED includes general indications for the implementation of proportionate and necessary national rules regarding the authorisation, certification and licensing procedures, and permit granting for RES projects. Member States are also required to ensure that national and local authorities in charge of permit-granting coordinate their work and ensure timely and transparent treatment of permit requests. Simplified and less burdensome approaches are encouraged for smaller projects and decentralised RES devices. It includes as well provisions requiring Member State action to increase the use of RES in buildings and district heating and cooling, specifically in new buildings or existing ones that are subject to major renovation (art 13).

[49] KLEßMANN, Corinna Barbara. *Increasing the effectiveness and efficiency of renewable energy support policies in the European Union.* Utrecht University, 2012. p.198

[50] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 54

[51] Commission Staff Working Document. *REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)*. SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p.40

The implementation across MS is uneven and the administrative burden and associated costs vary widely[52]. The majority of Member States noted continuous improvements with respect to simplification of administrative procedures [53]

Administrative procedures continue to present in any case a challenge for investors and developers and delay RES developments. A number of barriers are still present and identified by stakeholders: complex licensing procedures, unclear administrative responsibilities, multiple bodies involved, municipalities involved without clear rules set for their responsibilities at national level and lack of one-stop shops, missing online application, no maximum time limit for procedures, no facilitated procedures for small-scale projects, etc[54].

Lead times for renewable energy project development differ significantly across Europe. For major technologies, like onshore wind, permitting processes can last from less than 5 weeks in Denmark, to 3-7 months in Germany and up to a maximum of 7 years in some southern European Member States. This creates significant barriers to internal market and investments[55].

Regarding RES in buildings, few MS have included these requirements in their building codes.

3.4. Guarantees of origin

Member States will be able to issue guarantees of origin (GOs) to energy producers so they can prove to a final customer that a given share or quantity of energy was produced from renewable sources (art.15).

The RED Directive helped to standardise the GO systems for electricity throughout the EU and clarified their rules, reducing risk of fraud and inaccuracies, and GOs have increased transparency on RES generation and have helped to create a voluntary consumer-driven market for RES[56].

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[52] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 57

[53] Commission Staff Working Document. *REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast).* SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p. 26

[54] Ídem

[55] Ídem

[56] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p27

The regulatory framework of the RED has not provided sufficient clarity and suitable provisions for the creation of a comprehensive, liquid and harmonised GO system for all energy sources throughout the EU:

- There is no obligation for MS to make use of GOs mandatory for disclosure purposes.
- The use of GOs between MS does not count for target compliance (art 15.2. paragraph 4), although it can be used voluntarily in the trade between MS, the interest of GOs is focused in domestic markets.[57].
- It is required that each and every MS recognises GOs issued by another MS. In order to recognise and transfer GOs MS developed the Association of Issuing Bodies (AIB). But not all MS are members of the AIB and use a system compliant with the European Energy Certificate System (EECS). This results that GOs from some MS are refused by others[58].
- GOs are traded separately from the physical flows of renewable energy. This allows electricity suppliers to offer renewable energy even if their local electricity generation mix does not include it, and create scepticism among the consumers[59].

3.5. Grid access

Art 16 indicated that MS shall take the appropriate steps to develop transmission and distribution grid infrastructure, to guarantee transmission and distribution of RES electricity, to provide for priority/guaranteed access to the grid, and for priority dispatch.

Priority grid access is considered to be a key provision that supports RES deployment and RES integration in the grid. This provision completely eliminates the traditional problem of utilities policies that gave priority access to conventional power plants when grid congestion occurred. This provision has effectively supported the dispatch of renewable electricity sources, the economics of renewables' projects and has contributed to the achievement of RES national targets. Priority access provisions have in most MS effectively protected renewables against curtailment, here again providing greater certainty on dispatch and revenues for investors, and maximising output by renewables facilities[60].

Art 16 gives plenty of room for interpretation and technical implementation of the guidelines and principles there expressed. For example in the case of bearing and sharing the costs of technical adaptations, art. 16 indicates that transmission system operators (TSO) and distribution system operators (DSO) rules have to be objective, transparent and non-

[57] Ibidem, p. 28
[58] Commission Staff Working Document. *REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast).* SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p. 26
[59] Ibidem, p. 24
[60] Ibidem, p.45

discriminatory but does not indicate the design criteria of these rules and therefore there are diverging grid connection charges applied across MS: some MS charge only direct costs of grid connection, others charge as well for the grid reinforcement. So when grid connection represents a high fraction of total project costs (ex. Offshore wind) it prevents investments to be made in MS where a big amount of connection costs are charged. Thus it results to an uneven deployment or RE projects in the different MS[61]. Coordination of TSOs and DSOs in the investment planning would be then as well necessary to the success of RE projects investments[62].

The priority access provisions although being in first instance a key success factor for RES integration in the grid, it can take to artificial situations in the electricity market where 100% of demand is covered by priority dispatch. The priority access is as well commonly reserved for emerging technologies, leaving behind other mature and cost-effective non-subsidized technologies that represent a large part of the electricity market. Priority provisions can have then a very significant impact on the well-functioning of the electricity market, making power generation not reactive to price signals, and provoking the failure of the market integration. Priority provisions will need to be reassessed and ensure coherence with the on-going electricity market design in order to maintain sustainability, security of supply and competitiveness[63]. Additional investments in both distribution and transmissions grids in order to increase its capacity or interconnection or introduce the use of smart grids are required over the next years to ensure RES integration[64].

3.6. Sustainable criteria for biofuels

The RED includes some sustainability criteria that biofuels and bioliquids have to fulfil in order to be used to comply with the RES targets and to benefit from financial support. Biofuels have to reach a minimum level of greenhouse gas emission savings and do not lead to unintended biodiversity impacts. Solid and gaseous biomass sustainability issues were left to Member States' discretion in line with national competence over forestry management. The RED was amended in 2015 by the ILUC Directive, which introduced a 7% cap for food based biofuels and further incentives for advanced renewable fuels with a view to reduce the risk of indirect land use change (ILUC) and to prepare the transition towards the deployment of advanced renewable fuels[65].

By excluding the production of biofuels on areas of high biodiversity and carbon value, the EU biofuels criteria avoided some risks of direct environmental impacts of biofuel

[61] Idem
[62] Idem
[63] Idem
[64] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 55
[65] Commission Staff Working Document. *REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)*. SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p.9

production. It has contributed also to improve the GHG performance of biofuels through the setting of minimum 35% GHG saving targets[66]. The direct environmental impact has nevertheless been limited[67] as explained below.

The sustainability criteria provisions introduced by the RED have achieved harmonization of voluntary certification systems (voluntary schemes) at European level in a relatively short period of time. In this way companies of the different MS can demonstrate under the same standards that their biofuels comply with the sustainability criteria[68]. These voluntary schemes have limited as well the administrative burden and cost for economic operators[69].

The 10% RES target for transport is controversial, especially due to environmental concerns. Since the beginning, the sustainability of biofuels has been always questioned. Particularly in 2008 when the expansion of biofuels and competition between food and fuel crops caused a great volatility in the food price which lead to riots in several countries across the global South, from Egypt to Haiti[70]. The displacement of other activities by biofuel production, i.e. the indirect land use change (ILUC), has been highly discussed in terms of GHG emissions reductions. The long political discussion on ILUC and the late adoption of the ILUC amendments in 2015 created a lot of uncertainty that prevented investments in both food-based biofuels, as well as in second generation biofuels. This fact limited the progress towards the RES-T target[71].

In the case of solid biomass, the guarantee of its sustainability is entirely in the hands of the MS[72], as sustainability criteria from the RED only apply to biofuels and bioliquids. This can bring to a situation where the use of the land for the same feedstock has to comply with some sustainability criteria or others depending on the final energy use, which is not coherent[73].

MS had difficulties in the implementation of the sustainability criteria provisions as they required more complex measures. This resulted in many infringement cases in comparison with other provisions of the directive[74].

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[66] Ibidem, p. 29
[67] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 56
[68] Ídem
[69] Ibidem, p. 58
[70] SOLORIO, I., JÖRGENS, H., *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*, Cheltenham, Edward Elgar, 2017, p. 31
[71] CE Delft, Ecologic Institute, Ricardo-AEA, REKK, E-Bridge *Mid-term evaluation of the Renewable Energy Directive A study in the context of the REFIT programme*, Delft, April 2015. p. 8
[72] Ibidem, p. 56
[73] Commission Staff Working Document. R*EFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast).* SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p. 30
[74] Ibidem, p. 17

4. THE RECAST OF THE RENEWABLE ENERGY DIRECTIVE: IMPACT AND CHALLENGES BEYOND 2020

In December 2018, the revised renewable energy directive 2018/2001/EU (also known as REDII) entered into force, as part of the Clean Energy for all Europeans package, which includes a set of eight different legislative acts for the period 2020-2030:

- Energy Performance in Buildings Directive (adopted in May 2018)
- Renewable Energy Directive (adopted in December 2018)
- Energy Efficiency Directive (adopted in December 2018)
- Governance Regulation (adopted in December 2018)
- Electricity Directive (scheduled for adoption in May 2019)
- Electricity Regulation (scheduled for adoption in May 2019)
- Risk-Preparedness Regulation (scheduled for adoption in May 2019)
- Regulation for the Agency for the Cooperation of Energy Regulators (ACER) (scheduled for adoption in May 2019)

The REDII, which amends and repeals the RED, establishes a new binding renewable energy target for the EU for 2030 of at least 32%, with a clause for a possible upwards revision by 2023.

The key EU measures introduced by the RED are indicated next:

- Binding overall Union target for 2030 (art. 3)
- Support schemes and cooperation mechanisms (art. 4-13)
- Administrative procedures (art.15-17)
- Guarantees of origin (art. 19)
- Grid access, self-consumers and energy communities (art. 20-22)
- Renewable energy in heating and cooling (art. 23-24)
- Renewable energy in transport and sustainability criteria for biofuels, bioliquids and biomass fuels (art. 25-31)

In the present chapter we will see in detail the main provisions of the new directive. Each section is presented with a description of the measure, the expected contribution to the elimination of pending barriers from the previous directive, and the main challenges that may need to be tackled.

4.1. 2030 targets, monitoring and control

REDII establishes an EU-level binding target for 2030 and moves away from the national binding targets set in the RED. MS shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 32 % (art 3). The contribution of MS to meet, collectively, the binding overall Union shall

be set in their integrated national energy and climate plans (NECPs) in accordance with Articles 3 to 5 and 9 to 14 of Regulation 2018/1999 of 11 December 2018 on the Governance of Energy Union and Climate Action. All monitoring and reporting obligations from the RED are transferred to this regulation, which integrates all EU's 2030 energy and climate targets (40% cut in GHGE, 32% share of RE, 32.5% energy efficiency and 15% interconnection in the internal energy market). National targets shall be set according to the formula indicated in Annex II of the governance regulation which includes the MS' national binding target for 2020 as baseline plus four different contributions: a flat-rate contribution (same for each MS), a GDP-per-capita based contribution, a potential-based contribution and a contribution reflecting the interconnection level of the MS[75]. The monitoring stablished on the governance regulation is based on the NECPs (art 3), the indicative trajectory with interim targets (art 4) and the biennial progress reports (art. 17 &20). Art 3 of the REDII includes as well a review clause by 2023 for an upward revision of the EU level target in two circumstances: substantial costs reductions in the production of renewable energy and/or significant decrease in energy consumption in the Union.

The provisions regarding the new EU RES target and its tracking send four positive messages: commitment to the deployment of renewable energy, long term diligence, consistency with the rest of energy and climate objectives, and regional solidarity, which brings security and certainty for investors.

The agreed increase in the 2030 RES target from 27% to 32% is a clear commitment of the European institutions to the deployment of renewable energy. Although the Parliament and some MS would have liked an even higher objective the upwards revision clause by 2023 still gives some room for a more ambitious target and clearly indicates that in case things becomes easy for the MS to reach the target i.e. the energy consumption falls and local RES automatically increase its share in the energy mix versus the imported conventional fuels, EU will increase the 2030 RES target, confirming its long-term commitment to RE, so the MS do not slow down the pace in the deployment of RE.

The integration of the different EU's 2030 energy and climate targets in the NECPs really eliminates the disconnection of the different EU climate and energy directives ex. buy ETS allowances vs invest in energy efficiency vs invest, and improves the consistency and coherence of the efforts made with the different legislative acts included in the new Clean Energy for All Europeans package to move towards a real Energy Union.

The elimination of the national binding targets, leaving only the obligation on a EU level, together with the incentive measures of the cooperation mechanisms through new

[75] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance.) PE/55/2018/REV/1. OJ L 328, 21.12.2018, p. 58

financial instruments, can be seen as a way to increase the Europeanisation of the objective and improve the cost-effectiveness of the challenge in the light of the spirit of solidarity as indicated in the Energy title of Lisbon treaty (art 194.1. TFEU):

"In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

- ensure the functioning of the energy market;
- ensure security of energy supply in the Union;
- promote energy efficiency and energy saving and the development of new and renewable forms of energy; and
- promote the interconnection of energy networks."

The absence of binding national targets could create in the contrary some uncertainty among investors especially in MS with low RES potential or in those governed by euro-skeptical parties whose messages to its markets will not be for the sake of European solidarity. The option of reintroducing national targets did not seem feasible politically during the negotiations of the 2030 energy and climate targets. Considering then that the EU is not other thing than the will of its MS, the lack of commitment to oblige themselves to reach a determined level of RE send a contradictory message to the investors.

On the other hand in a practical way we have seen that the mandatory national targets of the RED were rather moral, as there were no penalties or enforcement procedures implemented. By eliminating the binding national targets, REDII is in this sense more coherent with the possibilities of the EU to enforce the compliance to meet the RES target as energy is really a competence of the MS and EU's involvement is only in the light of the principle of subsidiarity. The Energy Union Governance regulation maintains the weakness of the RED with regards on how to guarantee the compliance of the RES targets. The Commission shall require the MS to revise their plans in case they seem to be insufficient to contribute to the EU binding target and a close iterative dialogue is expected to be created to address these issues.

4.2. Support schemes and cooperation mechanisms

REDII add some new provisions to the support schemes and cooperation mechanisms:

- Support schemes, either national or regional ones, are now required to be market-based, avoid unnecessary market distortions, take into account the possible costs of system integration and grid stability, and respond to market signals though competitive tendering (art 4.2)
- MS may voluntarily open participation in support schemes for electricity from renewable sources to producers located in other MS and this could be mandatory to a certain degree by 2025 should it be deemed necessary after a Commission evaluation by 2023 (art. 5)
- Retroactive changes to RES support schemes are forbidden (art 6.1)

- MS must publish a long-term schedule on their expected financial support schemes, covering the main aspects of the expected support in the following five or three years (in case of budgetary constraints). The schedule shall be updated annually or as necessary to take into account recent market developments (art 6.3)
- The Commission shall establish a Union Renewable Development Platform (URDP) where MS can voluntarily include the amount by which they expect to fall short of or exceed their contribution, and an indication of the price at which they would accept to transfer any excess production of energy from renewable sources from or to another MS (art 8.2).
- An additional condition has been added for the joint projects of MS with third countries: these countries must be signatories of an international convention or treaty on human rights (art. 11.2).

The market based support schemes granted through competitive processes is the main contribution of the REDII with regards to the supporting measures for the deployment of RE. Although the necessity of this kind of support schemes was already introduced by Commission's guidance for the design of RES support schemes (2013) and the Guidelines on State Aid for Environmental Protection and Energy (2014), REDII is the first binding framework of the EU energy legislation to include them. The rigid design of the national support schemes implemented by some MS after the entry into force of the RED, did not allow them to adjust rapidly to the technological cost decrease of renewables, and created a technological bubble. This was the case of the solar industry in Spain, Italy or Germany[76]. It is clear that support schemes are necessary to make certain renewable energy technologies competitive. The new requisites of the support schemes provides them with flexibility to adapt to the market and allows to address the support to some specific technologies or to projects located in regions with specific conditions of isolation and external dependence, instead of opening the process to all producers of RE[77].

The possibility of opening of the domestic tendering processes to renewable energy producers located in other MS will be a key step towards a real internal energy market in the EU. In order for this measure to be effective, and probably the reason why this will not be mandatory until 2025, is that it shall be accompanied, in the case of the electricity sector, in parallel with the development of the transmission and distribution grid infrastructure, intelligent networks, storage facilities and interconnections, so the level of renewable energy in the electricity system will be technically feasible and economically affordable. For this, the REDII includes as well the Commission's commitment for raising additional funds for the support of grid development and integration (art. 5.c). The efforts really made on this subject will be crucial for the deployment of RE in the mid-term future as the grid has raised

[76] Commission Staff Working Document. REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast). SWD/2016/0416 final - 2016/0382 (COD). Brussels, 30.11.2016, p. 42

[77] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. PE/48/2018/REV/1, OJ L 328, 21.12.2018, p. 106

technically as the main limitation to the further development of the RE to gain competitiveness now that some RE technologies like wind and photovoltaics have reached a certain degree of maturity.

The new article 6 of the REDII for the stability of the financial support prohibiting the retroactive changes to RES support schemes to avoid past experiences like in Spain in 2010[78], as well as the obligation of publishing the expected financial RES support of the MS in the mid-term, will facilitate notably the increase of investors' security and certainty about the strategy followed by each MS in the deployment of renewables and where to address their investment decisions with less risks.

Cooperation mechanisms have barely changed in relation to the previous directive. Therefore no big contributions in the deployment of RE are expected with these measures. The only expected contribution could be the advanced planning (vs the last minute use with the RED) in the use of statistical transfers thanks to the URDP. If used, this platform could help to incentivise a bit more the deployment of RE in MS with higher potential thanks to the additional monetary contribution obtained by selling the excess of RE with the statistical transfers.

The human rights clause added as a condition for the third countries to be eligible to participate in joint projects with MS, seems too vague to be effective as the majority of the countries have signed an international agreement on human rights irrespective of its current implementation. The effectiveness of this clause will depend in the end on the discretional use made of it by the Commission in the assessment of the notifications of the joint projects.

Still some barriers from the RED will be difficult to overcome regardless the efforts made with the new provisions of the REDII, particularly the following ones:

- The national preference of investing within the MS. The only solution is to make the national energy markets interesting enough to attract investments to the territories
- The development of the grid infrastructure and interconnection

Regardless the effort to Europeanise the RES objective and its supporting measures, energy is still a regulated strategic sector closely controlled by the national governments. The market-based and financial stability provisions introduced by the REDII will shape the future towards a less government and more market-oriented rules in the internal energy market.

In the case of the grid system, it seems that the development of the RE technology progresses more rapidly than that of the grid system limiting the integration of the RE in the energy market. The investments really made on the grid during this new period will be key for an extensive deployment of RE in the future.

[78] SOLORIO, I., JÖRGENS, H., *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*, Cheltenham, Edward Elgar, 2017, p. 148

4.3. Administrative procedures

REDII limits to one the number of contact points in the Administration that applicants of RES projects shall be required to contact for guidance and facilitation of the entire administrative permit application and granting process of the projects (art 16.1).

The permit-granting process shall not exceed (art.16):

- Two years for power plants
- One year for installations with an electrical capacity of less than 150 kW.
- Six months for simple notification procedures for grid connections for repowering projects.

Where duly justified on the grounds of extraordinary circumstances, the first two cases may be extended by up to one year.

MS shall establish a simple-notification procedure for grid connections whereby installations or aggregated production units of renewables self-consumers and demonstration projects, with an electrical capacity of 10.8 kW or less (art. 17).

In principle the provisions considered in the new directive should simplify and solve all the difficulties that arose in the previous 2010-2020 period as highlighted in chapter 3.3.

The initial set up of the structure and work-flow for a timely permit-granting process by the MS will most probably be the most laborious and demanding part producing most likely some difficulties for applicants in the beginning. The time and costs incurred by the MS in this initial phase will probably be compensated by a smooth and cost-effective process for both MS and applicants once the process is in operation.

4.4. Guarantees of origin

RED II barely modifies the provisions with regards to guarantees of origin in comparison with the previous directive. GOs will now cover all energy produced from renewable sources. When a renewable energy producer benefits from a support scheme, the market value of the guarantee of origin for the same production must be appropriately taken into account in the relevant support scheme. In the previous directive if a producer received a guarantee of origin he/she could not be receive a support scheme for the same production. MS and designated competent bodies shall ensure that the requirements they impose on the issuing, transferring and cancellation of GOs are compliant with the standard CEN - EN 16325.

The main contribution to the deployment of RE is the additional incentive of having the possibility of receiving both instruments GOs and support schemes

The REDII does not solve the key issues from the RED with regards to the GOs (see chapter 3.4.).

4.5. Grid access, self-consumers and energy communities

Obligations relating to grid access and priority dispatch for RES generation are transferred to the new regulation on the internal market for electricity. The proposal for the new regulation eliminates general priority dispatch to renewables from RED but allows it for some specific cases. According to this proposal the dispatching of power generation facilities and demand response shall be non-discriminatory and market based with some exemptions: RES or high efficiency cogeneration installations with a total capacity under 500 kW (or under 250 kW from 2026, or if the total capacity of generating installations subject to priority dispatch is higher than 15 % of the total installed generating capacity in a MS); demonstration projects for innovative technologies; and any RES or high efficiency cogeneration installations commissioned under priority dispatch rules prior to the entry into force of the new regulation and has not been subject to significant modifications thereafter[79]. The new electricity regulation and the new electricity directive have not yet been published on the official journal of the EU. They have been adopted by the European Parliament on March 23th 2019 and are scheduled to be adopted by the Council on May 2019.

REDII introduces the figures of renewables self-consumers and renewable energy communities in order to regulate their contribution on the development of renewable energy. According to the REDII MS shall ensure that citizens are entitled to produce renewable energy for their own consumption, to store it and to sell excess production without being exposed to disproportionate or discriminatory costs or charges or unjustified charges. MS may apply non-discriminatory and proportionate charges on self-consumers of renewable energy in relation to their self-generated renewable electricity which remains on their premises: (i) from 1 December 2026, if the overall share of self-consumption installations exceeds 8 % of a Member State's total installed electricity capacity or (ii) if the renewable electricity produced by self-consumers is produced in installations with a total installed electrical capacity exceeding 30 kW (art 21).

Regarding renewable energy communities, MS shall also provide a favourable framework to promote and facilitate their development. MS shall ensure that final customers, in particular household customers, are entitled to participate in a renewable energy community without being subject to unjustified or discriminatory conditions or procedures.

As indicated in chapter 3.5 the elimination of priority dispatch is necessary in order to maintain sustainability, security of supply and competitiveness of the energy market. However it was a key provision for the promotion of RES in the 2010-2020 period, so special attention to the dispatch discrimination in case of grid congestion has to be made during the

[79] Proposal for a Regulation of the European Parliament and of the Council on the internal market for electricity (recast). COM/2016/0861 final - 2016/0379 (COD), p. 44

2020-2030 period and observe if the exemptions in the REDII where priority dispatch is foreseen are enough for the proper development of RE.

The implementation of the renewable self-consumers provisions were highly demanded by the civil society in order to be able to have a access to affordable and sustainable forms of energy without the risk of suffering of disproportionate charges by the utilities like it was in the case of Spain with the so called tax to the sun. The regulation of the self-consumption will be a source of qualified and local jobs in Europe, with the installation for example of rooftop solar systems.

The effect of the elimination of the priority dispatch as indicated above has to be closely observed during the 2020-2030 period. The same with regards to the behaviour of utilities lobbies in the different MS in relation with the evolution of the self-consumers market. Although there are some exceptions included in the REDII where utilities can apply charges, the rapid development of the self-consumers in high populated areas can be an interesting case to follow-up closely.

4.6. RE in heating and cooling

Although taken into account with regard to its contribution to the RES target, there were no specific RES objectives in the RED for the heating and cooling sector, which accounts for the 50% of the EU's energy consumption[80]. In order to promote the use of RE in this sector REDII introduces now the requirement for MS to increase the share of renewable energy supplied for heating and cooling by an indicative 1.3 percentage points (1.1 percentage points if waste heat and cold is not used) as an annual average calculated for the periods 2021-2025 and 2026-2030, starting from the share of renewable energy in the heating and cooling sector in 2020 (art 23). REDII introduces as well some new provisions in order to ensure the efficiency of district heating and cooling systems. MS must ensure that information on energy performance and the share of renewables in their district heating and cooling systems is provided to final consumers in an accessible manner. Customers of district heating or cooling systems that are not efficient are allowed to terminate their contracts in order to produce heating or cooling from renewable energy sources themselves. (art 24).

The share of renewable energy in the heating and cooling sector was 19.1% in 2016. The 87% of the renewable heat consumed in the EU was derived from biomass, the rest from heat pumps (10%), solar thermal (2%) and geothermal (1%)[81]. With this important share, biomass, and solid biomass in particular, is a key component of the drive to reach the renewable energy targets in the heating sector. Solid biomass is by far (91%) the first source of fuel used for bioheat, most of it being woody biomass. Both for environmental and economic reasons, this is mostly sourced from by-products of forest management operations and the wood industry, such as sawmills[82]. Sustainability and GHG emissions saving criteria

[80] European Commission, *Heating & Cooling*. Disponible en: <https://ec.europa.eu/energy/en/topics/energy-efficiency/heating-and-cooling>
[81] Bioenergy Europe, *Statistical Report*, 2018 Edition, p. 66
[82] Bioenergy Europe, *Statistical Report*, 2018 Edition, p.74

apply only to solid biomass installations with fuel capacity equal or above 20MW (RED II art 29). The 88% of the solid biomass installations are small and medium size installations (1-20MW) while only the 12% are installations with a capacity higher than 20MW. However the 1-20MW installations consumed only 25% of the fuel wood while installations over 20MW use 75% of the total consumption. This data shows that the 20MW threshold of the RED II would be effective and appropriate in terms of sustainability as it would cover a large share of biomass fuels, while only concerning a limited number of installations, therefore limiting the administrative burden related to proving that the criteria are fulfilled[83]. The question now is if the solid biomass consumed in the EU in this big installations will fulfill the criteria. Considering the ambitious increase of 13% of the RES-H&C target in the 2020-2030 period, the expectations will not probably be only that the criteria will be fulfilled for the biomass currently used but to extend its use in the residential sector that represents the 50% of the use of bioheat, followed by the industry (26%) and district heating (16%)[84]

The H&C sector is still dominated (80% in 2016) by the consumption of fossil fuels, mainly natural gas. The target has to be accompanied by complementary supporting measures to the discretion of the MS, e.g introducing carbon taxes or internalizing the external costs (see chapter 2.1, "the cost of externalities").

The share of bioheat in the residential (50%) and service sector (schools, hospitals, hotels) (5%) shows that there is a great number of small and medium installations producing bioheat. In order to avoid detrimental environmental side-effects with the extension of the use of biomass in these sectors, it is also important to replace the existing stock of old and inefficient biomass installations with highly efficient nearly-zero emissions modern biomass installations, not only to improve the increase the resource efficiency but also improve air quality. Increasing awareness and establishing financial support at local level will be essential for the deployment of modern biomass heating installations.

4.7. RE in transport and sustainability criteria for biofuels, bioliquids and biomass fuels

MS shall ensure that by 2030 at least a 14% (minimum share) of fuel for transport purposes comes from renewable sources (vs the 10% RES target indicated in RED), in accordance with an indicative trajectory set by the MS. As in the case of the overall RES target, the RES-T target is subject of an upward revision by 2023 in case of substantial costs reductions in the production of renewable energy. The share of advanced biofuels and biogas in the transport sector shall be at least 0,2 % in 2022, at least 1 % in 2025 and at least 3,5 % in 2030 (art. 25). First generation biofuels, based on food crops, must be capped at 2020 levels (with an extra 1%) and in no case exceed 7% of final consumption of road and rail transport. From 2019 onwards, the contribution of first-generation biofuels to EU targets is expected to decrease gradually to zero by 2030 (art. 26). Renewable liquid and gaseous

[83] Bioenergy Europe, *European biomass landscape*. Disponble en: <https://bioenergyeurope.org/european-biomass-landscape/>
[84] Bioenergy Europe, *Statistical Report*, 2018 Edition, p.74

transport fuels of non-biological origin (e.g. hydrogen fuel) and recycled carbon fuels shall be taken into account for the calculation of the minimum share (art. 25). The Commission will create a Union database that allow the traceability of eligible transport fuels and mitigate the risk of fraud (art 28.2).

The directive includes detailed provisions to improve the sustainability and greenhouse gas (GHG) emissions-saving criteria for biofuels, bioliquids and biomass, including new sustainability criteria for forest biomass. The required GHG emissions savings from biofuels and bioliquids consumed in the transport sector shall be at least 65% for installations starting operations from 2021 onwards, 50% for installations in operation before 5 October 2015, and 60% for installations starting operation from 6 October 2015 until 31 December 2020. For biomass fuels the required GHG emissions savings shall be at least 70% for installations starting operation from 1 January 2021 until 31 December 2025, and 80 % for installations starting operation from 1 January 2026 (art.29).

The provision regarding the gradually disappearance of the contribution of first generation biofuels to the RES-T target until its complete disappearance in 2030 is the expected final step after the implementation in 2015 of the 7% ceiling by the ILUC Directive (chapter 3.7), putting an end to an enduring controversy over the sustainability of first generation biofuels since the proposal of the legislative package for the promotion of biofuels in 2001[85]. This, together with the trajectory of the share of advanced biofuels and biogas in the transport sector set in art 25, and any potential European or national support schemes for advanced biofuel technologies, will help to shift investments towards advanced biofuels in order to move away from its current production in demonstration or small-scale commercial plants[86].

In recent years, a significant volume of biofuels could not be demonstrated to be compliant with the sustainability criteria for inclusion in the calculation for the RED[87]. The implementation of a Union database that includes the sustainability characteristics of the complete life-cycle of the biofuels, if effectively implemented and used, could really help to increase the traceability of transport fuels that are eligible for being counted towards the RES-T target.

The extension of the applicability of the sustainable criteria to biomass and not only to biofuels or bioliquids as in the previous directive, and the tightening of these criteria, ex. higher minimum level of GHG emissions saving, will for sure help to reduce the negative impacts of bioenergy on biodiversity, food prices and land ownership and justify its use as an alternative to conventional fuels.

[85] SOLORIO, I., JÖRGENS, H., *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States,* Cheltenham, Edward Elgar, 2017, p.28
[86] IRENA. *Renewable Energy Prospect for the European Union*. February 2018 p.90
[87] European Environment Agency, Renewable energy in Europe — 2018, Recent Growth and Knock-on Effects, EEA Report No 20/2018, 2018, p.34

Transport is the sector with the lowest share of renewable energy in the EU energy system (7.1% in 2016 vs 29,6% of the electricity sector and 19,1 % of the H&C sector[88]) and the 2020-2030 period, regardless the positive provisions included in the new directive, will be a transitional period as the lack of ambition of the RES-T target from 10% in 2020 to 14% in 2030, or the 3.5% target for advanced fuels reveals. Advanced biofuels will not be able to supply the volumes required to meet EU renewable energy targets in the mid-term and despite the positive outlook for electric mobility, replacement of the existing vehicle stock will take a couple of decades[89]. In addition, transport is the main sector where renewables deployment is impacted by crude oil prices, so MS will need to implement specific national support schemes if they want to protect biofuels producers from price volatility and changing market trends. The economic interest of the agribusiness lobby and of several governments in Europe is probably behind this lack of ambition in this sector[90].

5. CONCLUSIONS

The transition of the energy sector towards clean, sustainable and affordable forms of energy requires overcoming quite a variety of obstacles that range from raising social awareness of the need and benefits of the change, assessing its social and environmental collateral impacts, addressing the investments and the financing to increase the cost-efficiency and market competitiveness of the new technologies, ensuring a suitable grid infrastructure and adequate market changes to accommodate these technologies, and guaranteeing that the whole regulatory framework is favourable and coherent with the objectives to be achieved and does not create unnecessary administrative burden to stakeholders. These are profound changes to undertake moreover in a region with such a mature and established energy and industrial sectors like the European Union with a lot of interests at stake.

Although there have been previous efforts to foster the development of renewable technologies in the region, it was not until the entry into force of the directive 2009/28/EC (RED) on the promotion of the use of energy from renewable sources in 2009 that the EU made significant progress in the development of RE in the region. The most relevant provision of the directive that represented the main contribution to spur the deployment of RE was the introduction of mandatory national targets and national renewable energy action plans, that were properly monitored with the help of an indicative trajectory of the target through the 2010-2020 period, and the submission of biennial progress reports. This created a lot of certainty among investors, and RES projects quickly bloomed within the region which, thanks to the demand, favoured an unexpected quick reduction of RE technology costs. The economic viability of the RES projects was supported by other important provision of the directive: the priority access and dispatch of RE, that helped to overcome the limitations of the grid and avoid the discrimination of the new comers in the electricity sector. But the implementation of the real support to promote the RE was in the hands of the MS

[88] Bioenergy Europe, *Statistical Report*, 2018 Edition, p.27
[89] IRENA. *Renewable Energy Prospect for the European Union*. February 2018 p.90
[90] SOLORIO, I., JÖRGENS, H., *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*, Cheltenham, Edward Elgar, 2017, p.38

that made use of many different instruments all across the region: feed-in tariffs, feed-in premiums, renewable quota schemes, grants, soft loans, tax credits, etc. that in most of the cases were not responsive to market signals making the electricity market inefficient. However the benefits of the RED were more focused on the electricity sector than in the heating and cooling sector or the transport sector. Regardless the sustainability and GHG emissions saving criteria introduced in the RED, the concerns of the environmental impact of the biofuels and in particular the risk of indirect land use change prevented the development of bioenergy and the transport sector. Other important issues arose after the implementation of the directive that were required to be treated on a regional level: the simplification and harmonization of the administrative procedures through the one stop shops, the regulation of self-consumption that was subject of discrimination in certain MS, and the grid interconnection and modernization.

The revision of the renewable energy directive, the REDII, adopted in December 2018, tries to resolve some of the pending issues of the RED: simplifying the administrative procedures, empowering self-costumers and energy communities, increasing competition and market integration of renewable electricity via tendering processes, accelerating the uptake of renewables in the heating & cooling and transport sectors with voluntary targets, strengthening the sustainability of bioenergy, phasing out food crop-based biofuels, and providing long-term certainty to investors with the mandatory EU level target. The elimination of the national mandatory targets and the integration of the renewable energy directive under the governance of the Energy Union together with other energy and climate directives and regulations are the main features of the revamp of the renewable energy directive.

The directive on the promotion of the use of energy from renewable sources has been very successful creating a favourable and certain regulatory framework that fostered the investment in renewable energies and allowed the MS to implement its own national price setting or quantity forcing policies that supported these investments. And the new directive has taken the best of the previous experience and introduced some improvements that will certainly make repeat an even greater success in this new decade. But to get to this point some issues will be necessary to be tackled by parallel distributed generation and power sector restructuring policies that upgrade the energy grid and make the energy market more competitive, like:

- Net metering: the customer pays only for the net amount of electricity used in each billing period and is sometimes allowed to carryover net electricity generated from month to month[91].
- Real time pricing: the rate structure is based on the utility's real time production costs. When used in conjunction with net metering customers receive higher peak rates when selling power into the grid at peak times[92].

[91] BECK Fredric, MARTINOT Eric. *Renewable Energy Policies and Barriers*. Encyclopedia of Energy, Vol. 5, 2004, p. 380
[92] Idem

- Unbundling of generation, transmission and distribution and increase competition especially among transmissions system operators and distribution system operators[93].
- Standard interconnection agreements, in order for small producer to negotiate with the utility[94].
- Etc.

Some of these measures are partially being implemented like the smart grids initiative, which is part of the Energy Union package[95] and probably others are already included in the electricity market regulation and directive that are going to be adopted in May 2019. A detailed assessment of these new legislative acts should be performed in order to evaluate the integration of the renewable energies in the electricity market and the update of the grid system.

The development of renewable energies in the EU have served not only as a tool to fight against the external dependence of the fossil fuels, or against climate change. It has been as well as a starting point to move towards the integration in a European internal energy market under the governance of the Energy Union.

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[93] Ibidem, p. 379
[94] Ibidem, p. 381
[95] European Parliament. *Briefing. Smart electricity grids and meters in the EU Member States.* September 2015, p.1

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