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2020 report on the State of the Energy Union pursuant to Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action

1. INTRODUCTION

From the onset of the COVID-19 crisis, the European Commission has worked to help navigate Europe through an extraordinary situation. The 2020 State of the Energy Union report therefore takes into account the challenge of recovery. In the context of the EU's Recovery Plan, our goal is to build back our economy better by embracing the green and digital transitions as part of the process. Energy, climate and environment policies will be critical in driving the recovery and resilience of the European Union's economy towards sustainable growth.

This report is issued against the background of the EU's renewed ambition in the context of the European Green Deal. The Green Deal is Europe's new growth strategy that aims to transform the EU into a fair and prosperous society and combines policies to tackle climate change, to protect and restore biodiversity, eliminate pollution, to move to a circular economy, and to ensure that no one is left behind in the green transition.

In the first 10 months of its mandate, the current Commission has proposed a European Climate Law [1] that will enshrine the goal of EU 2050 climate neutrality into legislation, provide predictability and make the transition towards a climate-neutral economy irreversible. It has turned the European Green Deal into an investment and reform plan for Europe that offers a double dividend, as the reforms and investments needed for the green transition can also boost the recovery. To start the process of steering Europe's policy and regulatory framework towards the EU's renewed ambition, the Commission has presented new strategies to better prepare for the challenges ahead, for instance by energy system integration and by increasing the use of hydrogen.

Member States have worked tirelessly with the Commission to finalise national energy and climate plans. Detailed assessments of these 27 national plans and related guidance on their implementation in a recovery context complement this report, while the EU-wide assessment of national plans was presented already in September this year [2] .

The progress achieved underlines the EU's determination to play a leading role on the international stage in fighting climate change and environmental degradation and in accelerating the clean energy transition. This is a continuous process. While the EU has already made significant progress on decoupling economic growth from greenhouse gas emissions, more action is required within the Union for Europe to achieve climate

neutrality by 2050 while grasping the opportunities of the clean energy transition and internationally.

The Commission has therefore proposed to step up Europe's 2030 climate ambition [3] by reducing greenhouse gas emissions by at least 55%. This increased 2030 target is ambitious but achievable and, above all, beneficial for Europe. It will require changes to our legislation. To this end, the Commission intends to present proposals to revise key climate and energy-related legislation in mid-2021. In parallel, Member States must implement their national plans fully and update them in 2023 in light of more ambitious EU climate and energy targets for 2030.

This 2020 State of the Energy Union report presents the many initiatives that the EU and its Member States have taken in the last months to shape a better Europe [4] . It is the first to be issued under the governance framework of the Energy Union and climate action [5] . It is accompanied by several thematic reports (see Box 1) and a Commission recommendation on energy poverty [6] ; it also provides an overview of the state of progress of the Energy Union in the broader context of the EU climate action and sustainability objectives.

2. THE ENERGY UNION – A SOLID FOUNDATION

2.1. Decarbonisation

Greenhouse gas emissions

The EU has set itself the objective of becoming the first climate-neutral continent by 2050 [7] , and the Commission has proposed a European Climate Law to anchor this goal in legislation and to provide means to ensure that the EU remains on the pathway to do so.

The EU has already overachieved its target of reducing greenhouse gas emissions by 20% below 1990 levels by 2020 under the United Nations Framework Convention for Climate Change. Total EU-27 greenhouse gas emissions are at their lowest level since 1990. Emissions have decreased significantly, mainly driven by emissions from energy supply. This is reflected in a strong drop in emissions from activities covered by the EU emissions trading system (EU ETS), whereas emissions from activities not covered by the EU ETS have generally remained on a sideways trend in general for several years.

At the same time, emissions from international aviation [8] have continued to increase over the past 5 years (until the outbreak of the COVID-19 crisis). After a decrease in emissions between 2007 and 2013, overall transport emissions have also increased in each of the last 5 years.

The average greenhouse gas intensity of fuels supplied in the EU has improved since 2010, but further action is needed to ensure that the 6% reduction target set by the Fuel Quality Directive is met by 2020.

Over the past 5 years, emissions from stationary installations performing activities covered by the EU ETS have decreased significantly. This development reflects in particular changes in the fuels used to produce electricity, including the increasing use of renewable energy sources. In 2019, overall emissions from industry and power covered by the EU ETS continued to decline (by 9.1% compared to 2018). The power sector was the main driver of this trend, with a substantial decrease in greenhouse gas emissions of almost 15%. Emissions from industry decreased by 2%, marking their strongest decrease in phase 3 of the EU ETS (2013-2020) so far. Intra-European Economic Area aviation emissions grew modestly by almost 1%.

The Market Stability Reserve, which started operating in January 2019, has substantially lowered the surplus of emission allowances. The carbon market surplus indicator [9] was published in May 2020 for the fourth time and showed that the surplus has decreased to around 1.39 billion allowances. Based on the surplus and the revised EU ETS legislation for phase 4 of the EU ETS (2021-2030), the number of allowances auctioned was reduced

by around 375 million in 2020. Auction volumes in 2021 will be reduced under the same legal basis. The Market Stability Reserve will be reviewed for the first time in 2021 within the wider context of EU ETS revision to achieve the proposed greenhouse gas emission reduction objective of at least 55%.

With the exception of a temporary price drop due to the COVID-19 crisis at the beginning of 2020, the carbon price signal remained stable at around EUR 24 [10] on average between January 2019 and June 2020. The total revenues generated by the EU ETS from the auctions between 2012 and 30 June 2020 exceeded EUR 57 billion.

The Commission will soon publish a package of climate reports as a follow-up and linked to this report [11] . The package will contain detailed information on greenhouse gas emissions, the EU's carbon market and on fuel quality.

Renewable energy

Overall, the EU is on track to achieve the 2020 renewables targets, but greater progress is still needed in some Member States [12] . The share of renewables in gross final energy consumption increased to 18% in 2018 in the EU [13] . In 2018, 12 Member States were above their 2020 national binding targets, but five Member States remained below the indicative 2017-2018 trajectories to achieve the targets.

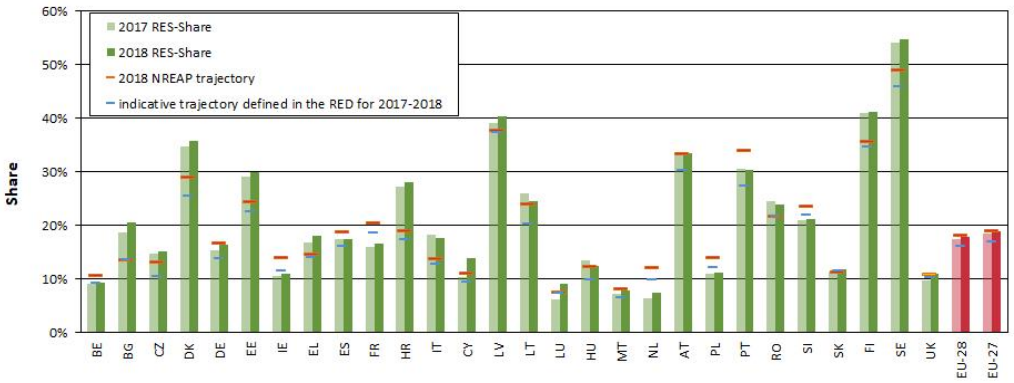


Figure 1. Actual renewable energy shares in 2017 and 2018 compared to indicative trajectories set in the Renewables Directive and national renewable energy action plans. [14]

The renewable energy progress report [15] projects that the EU will reach 22.8% to 23.1% in gross final energy consumption in 2020. Investments in renewable energy are increasingly driven by market decisions. Member States increasingly grant support for renewable energy through competitive tenders and ensure that renewable energy installations are integrated in the electricity market, as required by State aid [16] and internal energy market rules. Although the majority of Member States will meet their targets, three Member States are at severe risk and two Member States are at moderate risk of not meeting their targets. This analysis takes into account the likely impact of COVID-19 on higher shares of renewables in consumption due to lower consumption.

Member States are encouraged to explore all options to use cooperation mechanisms, including statistical transfers, to ensure they achieve their national binding targets for 2020. The Commission is ready to support the process and dialogue among Member States to conclude statistical agreements, including through the EU Renewable Development Platform [17] , that is being prepared.

Beyond 2020, all efforts should be on achieving the national contributions towards the 2030 target. This includes making use of the 2021 Annual Sustainable Growth Strategy and its European 'Power up' [18] flagship to frontload future-proof clean technologies and accelerate the development and use of renewables as part of our efforts to recover from the impact of the COVID-19 crisis [19] . The deployment of renewable energy entails numerous benefits: reducing emissions, boosting energy independency, creating jobs and growth and reducing pollution, together with maintaining the EU's leadership position in the sector worldwide. To help achieve the national contributions, the recently agreed EU renewable

energy financing mechanism [20] allows Member States to invest in renewable projects in exchange for a statistical attribution to the participating Member State. The accelerated deployment of renewables will be underpinned by the revision of the relevant State aid guidelines, in particular the Guidelines on State aid for environment and energy to reflect the objectives of the Green Deal.

2.2. Energy efficiency

Member States need to step up their efforts to increase energy efficiency. The Energy Union has recognised the key role of energy efficiency in achieving all climate and energy targets and has enshrined the 'energy efficiency first' principle in legislation [21] . In 2018, final energy consumption in the EU fell by 5.9% compared to 2005, to 1124 million tonnes of oil equivalent (Mtoe). This is 3.5% above the 2020 final energy consumption target of 1086 Mtoe [22] and an increase of 0.2% compared to 2017. Primary energy consumption in the EU decreased by 9.8% to 1552 Mtoe; down from 1721 Mtoe in 2005. This is 4.6% above the 2020 target of 1483 Mtoe. Following 3 years of increases, a year-on-year drop of 0.6 % was recorded in 2018 [23] . Growth in economic activity continued to push energy consumption up in 2018 to the point where new policies and measures that Member States implemented were not sufficient to reduce energy consumption and get it back on track towards the 2020 target. Direct jobs in energy efficiency have increased steadily from 244,000 in 2000 to 964,000 in 2017, and their growth has outpaced the rest of the economy, with an annual average growth of 17.4%; at a time where the rest of the economy, has had an average annual growth of 0.5% [24] .

Partial data for 2020 indicate that the COVID-19 crisis has had a significant impact on energy demand. Even if this might help meet the 2020 energy efficiency targets, it would not lead to a structural reduction in energy consumption. Rebound effects are expected as soon as the economy recovers.

Making additional long-lasting efforts to achieve the 2030 targets on energy efficiency is therefore of utmost importance, also in the context of the 2021 Annual Sustainable Growth Strategy and its European flagship 'Renovate' [25] . The flagship aims to improve the energy and resource efficiency of public and private buildings and to boost digital development through smart living and metering, thus helping to recover from the COVID-19 crisis. The Commission is developing additional guidance and is anchoring the 'energy efficiency first' principle in all relevant policy proposals, such as the EU strategy on energy system integration, the 'renovation wave' initiative and the upcoming revision of the Trans-European Networks for Energy. Member States also need to consider energy efficiency measures in planning, policy and investment decisions across the economy.

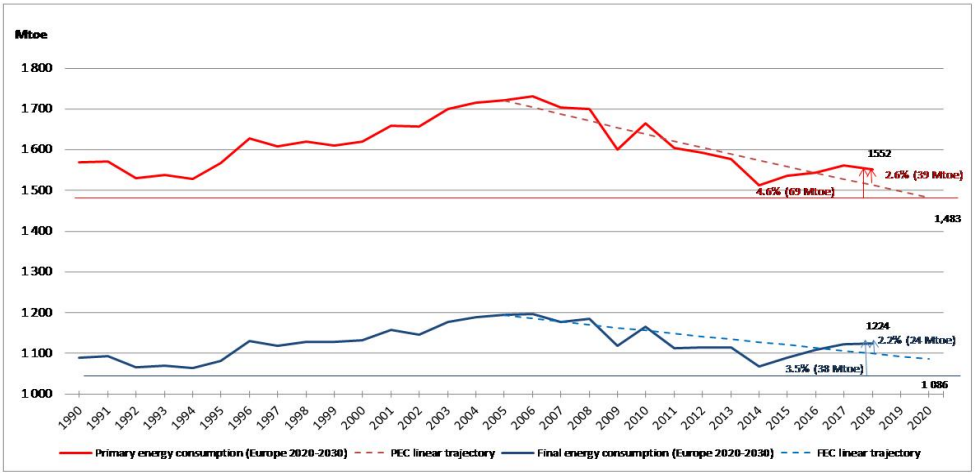


Figure 2. Energy efficiency – progress on 2020 targets [26] (in Mtoe)

2.3. Energy security

Despite the considerable stress that the COVID-19 crisis has exerted on energy demand in terms of wide departures from the normal consumption patterns for this period, Member States' preparedness has proved robust and ensures continuity of essential operations. The Energy Union legislative framework on energy security – in particular, the Regulation on Risk Preparedness in the electricity sector and the Regulation on Gas Security of Supply – has been instrumental in managing the impacts of the crisis in the energy sector.

In the midst of the COVID-19 pandemic, the Commission published good practices and lessons learned for the energy sector in June 2020. The expert groups created by EU legislation [27] played a key role to facilitate cross-border coordination alongside the extensive cooperation and information sharing between the Member States, system operators and relevant agents in the energy sector. As a follow-up, the Commission is assessing potential vulnerabilities and options for improving the resilience of critical supply chains for energy technologies.

The EU Security Union Strategy [28] includes a proposal to strengthen the resilience and cybersecurity of critical energy infrastructure, whose importance has been highlighted by the pandemic. The Commission has also started work on a network code to ensure the cybersecurity of cross-border electricity flows [29] .

In the electricity sector, implementation of the Risk Preparedness Regulation [30] ensures that Member States have tools to cooperate with each other in order to prevent, prepare for and mitigate electricity crises. In addition, two new methodologies [31] have allowed the European Network of Transmission System Operators for Electricity (ENTSO-E) to identify, for the first time, the most relevant regional electricity crisis scenarios and carry out the first seasonal adequacy assessment for the past summer based on a new methodological approach (the Summer Outlook 2020). This will serve as a basis for preparing national scenarios and Member States' risks preparedness plans. The Commission also adopted a recommendation on fair compensation [32] for Member States when they provide each other with assistance to prevent and manage crises.

Infrastructure is key for a market to function properly and efficiently. The EU has therefore set electricity interconnection capacity targets. Eight Member States [33] have not yet met the 10% interconnection target for 2020 [34] . Projects of common interest can also boost Member States' decarbonisation efforts and lay the foundation for hydrogen lead markets in Europe. These may involve support from the Connecting Europe Facility and actions in the framework of the Recovery and Resilience Facility's flagship 'power up' in view of integrating clean technologies and renewables through modernised networks and enhanced interconnectivity.

Efforts are also being made to ensure full use of existing interconnectors and operational digital platforms. Implementing the provisions related to internal electricity market design and, in particular, the rollout of market coupling has seen a large increase in the efficiency of electricity trading in Europe [35] , [36] .

On the security of gas supply, Member States have prepared preventive action and emergency plans [37] , [38] . These contain measures for mitigating the impact of a gas supply disruption and risks identified at national and regional level.

The Commission continues to help Member States implement the solidarity principle [39] ; this is also to ensure uninterrupted gas supplies to the most vulnerable consumers even in severe gas crisis situations.

The Commission has assessed experiences with current legislation on the safety of offshore oil and gas operations and will submit its report to the European Parliament and Council this autumn.

On nuclear safety and security, the EU has a comprehensive framework that covers the full nuclear life cycle, including the safe and responsible management of spent fuel and radioactive waste [40] . The Commission has continued to carefully monitor the implementation of this framework in Member States. The EU has also continued to

promote high levels of nuclear safety outside the EU, particularly in neighbouring countries that operate or plan to build nuclear power plants. This includes support in conducting stress tests and follow up to promote proper and transparent implementation of recommendations. The European Council has underlined in particular the importance of ensuring nuclear and environmental safety of the Belarusian Nuclear Power Plant in Ostrovets.

2.4. Internal energy markets

A fully integrated and well-functioning internal energy market is the most efficient means of ensuring affordable energy prices, necessary price signals for investments in green energy, securing energy supplies and enabling the least cost path to climate neutrality. Important initiatives have strengthened the internal electricity and gas markets. Despite good progress, more work is needed to ensure that electricity and gas markets are further integrated.

On electricity, the 'Clean energy for all Europeans' package, and in particular the new electricity market design rules adopted in 2019 [41] , have paved the way to better cope with the new realities of energy markets, dominated by renewable energy production. These rules have created better conditions to foster consumer participation in energy markets and a level playing field for new market entrants. Planned implementing acts on data interoperability are expected to help operationalise this and to assist customers together with new service providers to get more actively involved in the market. The Electricity Regulation [42] aims to ensure further integration of electricity markets by strengthening in particular the rules on maximal utilisation of electricity interconnectors. These rules will enhance cross-border trade, enabling energy resources to be used more efficiently in the EU as a whole. Progress is being made on implementing a comprehensive set of technical EU regulations (network codes), with positive results [43] .

Since 2016, total retail electricity prices have been converging across Member States, but there are still sizeable differences. Electricity prices for household consumers in 2019 ranged from EUR 98/MWh in Bulgaria to EUR 295/MWh in Denmark. The average price for the EU was EUR 216/MWh. Overall, retail prices are still dominated by components that are not the result of competition but are set by regulators (e.g. regulated network charges and taxes/levies).

Figure 3. Household electricity prices in the EU in 2019 (DC band) [44]

At wholesale level, incumbents still hold a dominant position in a majority of Member States more than 20 years after the start of market liberalisation. In some countries, they even hold market shares above 80%, coming close to a monopoly. The tendency to regulate prices in these countries has often proved to be an additional barrier for market entrants to enter into competition with established incumbents [45] .

Over the last decade, retail electricity prices have risen above inflation. However, industrial electricity prices have risen below industrial price indexes, and even have fallen for larger consumers. In recent years, network charges, taxes and levies have been stable or have risen only slightly. Moreover, lower pressure of renewable levies on prices is observed at the same time as the wider use of market-based instruments that promote renewables and as the gradual phase-out of old support schemes. As a result, the end user prices were driven mainly by changes in generation and supply costs. However, these changes were not enough to provide sufficient market signals. This is due, inter alia, to the fact that the regulated component in the end use price still constituted a relatively big share of the end use price. Therefore, the fact that the main electricity retailers across the EU lost market shares and, as a consequence, the retail electricity market concentration decreased, has not always fully translated into sufficiently effective price signals.

The combined impact of all taxes and levies has a significant effect on the final energy price, in particular for electricity. As highlighted by the EU strategy on energy system integration [46] , this can create distortions in the use of specific energy carriers. Member

States could consider the impact of taxes and levies on final energy prices to ensure that reforms and changes to price signals lead to a clean and fair energy transition in line with Green Deal objectives. Addressing distributional effects of final energy prices and, related, concerns on energy poverty will be instrumental in ensuring that the green transition is also socially fair.

The Energy Taxation Directive [47] does not achieve anymore its primary objective related to the proper functioning of the internal market. Minimum tax rates have lost their effect and divergent national rates are applied in combination with a wide range of tax reliefs. These exemptions and reductions are, de facto, forms of fossil fuel subsidies, and not in line with the objectives of the European Green Deal. The revision of the Directive aims to overcome those shortcomings.

The internal market has made good progress on completion in the area of gas. The rise in traded volumes on natural gas hubs continued into 2020, with traded volumes on European gas hubs recording a 32% year-on-year increase in Q1-2020 (up to 5010 TWh). Connectivity and access to different sources of gas also continue to improve. Only three markets in the EU had access to less than three sources of supply. Price convergence has improved in recent years and was highest in north-west Europe. However, at European level it declined in 2019, showing higher price differences between markets on more days during the year.

Overall, retail gas prices increased in 2019 compared to 2018. However, since they follow the evolution of wholesale prices with a slight time lag, they are likely to drop again in the near future. Gas prices for household consumers ranged from EUR 33/MWh in Hungary to EUR 116/MWh in Sweden. The average price for the EU was EUR 68/MWh. Consumers in Luxembourg spent the least on taxes and levies. In Denmark, the share of generation and supply costs was the lowest, while the taxation share was the highest. As for electricity markets, taxes/levies and network charges were stable or rose slightly, resulting in prices been driven by generation and supply costs changes.

Figure 4. Household gas prices in 2019 (D2 band) [48]

The EU's energy import bill highlights its reliance on fossil fuel imports and its exposure to volatile international markets. The import bill rose between 2016 and 2018, reaching over EUR 330 billion per year. This reverses the downward trend from the highest peak of 2013 (EUR 400 billion). The impact of the COVID-19 pandemic on energy prices will reduce the energy import bill in 2020. Prices are expected to rise as the economy picks up, but may need until 2021 to recover to 2019 levels.

Energy poverty

With nearly 34 million Europeans unable to afford to heat their homes adequately in 2018 [49] , energy poverty remains a major challenge in the EU. While this indicator evolved favourably on average in 2010-2018, there were significant differences in the pace of change across the EU. In Bulgaria, Latvia, Poland, Portugal and Romania, energy poverty has fallen significantly. On the other hand, Greece recorded a significant increase. While European households' energy expenditure fell in recent years, there are still sizeable differences between Member States in terms of both absolute expenditure and the share of energy in total household expenditure. In 2018, the poorest European households still spent 8.3% of their total expenditure on energy (up to 15-22% in some central and eastern European countries).

Adequate warmth, cooling, lighting and the energy to power appliances are essential for ensuring a decent standard of living and health. [50] The EU's policy efforts will continue in this field as the economic impact of COVID-19 may make the situation worse, especially for the poorest. Most Member States have presented an overview of energy poverty in their national energy and climate plans, with many providing indicators to analyse its impact. However, most of them have not yet adopted a systematic approach to addressing energy poverty. To support their efforts, the Commission has issued a recommendation on energy

poverty [51] together with this Communication. It also continues to support the EU Energy Poverty Observatory, which collects data, develops indicators and disseminates best practices for tackling energy poverty.

2.5. Research & innovation and competitiveness

Research & innovation

On research & innovation (R&I), public and private spending trends in the EU are not encouraging. Member States are spending slightly less on clean energy R&I compared to previous years, while the EU's overall public R&I investment in clean energy technologies as a share of GDP is the lowest among major economies (see Figure 5). This mirrors a global trend. The International Energy Agency observes that public sector spending on low-carbon energy technologies was lower in 2019 than in 2012.

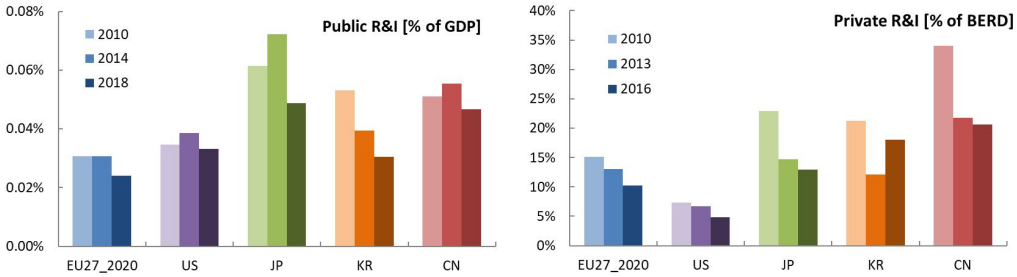


Figure 5. Estimated public [52] and private [53] R&I financing in the Energy Union priorities. BERD = business expenditure on R&D.
Source: JRC [54] based on International Energy Agency, Mission Innovation, Eurostat/OECD.

In line with these results, the overall patenting activity in clean energy technologies has also been declining since 2012, while patenting in high value technologies such as batteries and smart applications has been increasing.

The estimated private investment in Energy Union R&I priorities (spanning a number of business sectors) has been decreasing in recent years. Moreover, R&I investment in the activities set out in the European Strategic Energy Technology Plan, agreed between Member States, industry, the research community and the Commission, represents only 15% of the estimated needs up to 2030 [55] . In addition, few Member States have national objectives that would show appropriate pathways to 2030 and 2050 [56] . A range of support instruments is available to Member States, such as Horizon Europe, the Innovation Fund and Invest EU. The Green Deal call under Horizon 2020, with a budget of EUR 1 billion, is addressing key energy and system integration challenges. This includes the production of offshore and onshore energy, support for large-scale electrolysers, and the use of clean energy in ports, airports a carbon-neutral industry, and energy and resource efficient building and renovation.

Competitiveness

The first competitiveness progress report [57] shows that EU industry has been successful in grasping the opportunity created by increased demand for clean energy technologies. The competitiveness of the sector is outperforming conventional energy source technologies with regard to value added, labour productivity, employment growth and penetration rates. Moreover, in terms of GDP, the clean energy sector is gaining importance in the EU economy, whereas the importance of conventional energy sources is decreasing.

EU industry benefits from a first mover advantage in wind, renewable hydrogen and ocean energy technologies. However, the expected increase in capacity in these segments suggests that its structure will inevitably change.

Sustained efforts to catch up and build a competitive edge are also needed in areas where the EU does not have (or has lost) a first mover advantage. Solar and lithium ion batteries are particularly relevant given the projected increase in demand for them, their modularity and spillover potential to other applications such as the integration of solar power systems in buildings, vehicles or other infrastructure.

The Battery Alliance, as a showcase for industrial alliances, has proven how greater coordination between Member States, the research community and industry can provide the necessary impetus for industrial stakeholders to invest in producing clean technologies in the EU. It is time to extend this idea to other key technologies and business areas. Building on this successful blueprint, the Commission has launched a European Clean Hydrogen Alliance and a European Raw Materials Alliance.

Similarly, other key technologies such as smart grids are important as they create value for everything connected to the grid. The EU smart grid industry is expected to experience significant growth over the next decade.

Sustained efforts to ensure undistorted trade and investment in third countries are necessary, also in areas where the EU is strong in terms of competitiveness but increasingly confronted with distortions such as local content requirements and discriminatory domestic procedures. Considering that the vast majority of investments in green technologies will be outside the European Union, it is necessary to ensure the EU industry can compete on a level playing field and harness the jobs and growth potential of the European Green Deal.

Subsidies

There is a clear need to step up efforts to reduce subsidies from wasteful energy consumption and to promote the energy transition. Better data on energy subsidies are key to monitor this. Data on energy subsidies remains fragmented, with reporting in the national energy and climate plans largely incomplete. The Report on energy subsidies in the EU [58] indicates that energy subsidies amounted to EUR 159 billion in 2018, up by 5% compared to 2015. More than half of the subsidies support the clean energy transition.

As further detailed in the annex on energy subsidies, fossil fuel subsidies amounted to EUR 50 billion in the EU in 2018 (representing one-third of all EU energy subsidies), have been relatively stable over the past decade, with a peak of EUR 53 billion in 2012. They started to increase again in 2015, growing by 6% until 2018. However, some Member States such as Austria, Denmark, Estonia and Hungary went against this overall trend and reduced their fossil fuel subsidies significantly.

2.6. The Energy Union in a broader Green Deal perspective

Just transition

The Energy Union objectives are clearly intertwined with the broader objectives of the Green Deal. This is the case for the ‘just transition’ and the principle of making sure no one is left behind.

To this end, the Commission proposed the Just Transition Mechanism, including the Just Transition Fund, which addresses economic and social costs of the climate transition in the most vulnerable coal, lignite, oil shale, peat and carbon-intensive regions. A dedicated just transition scheme under InvestEU programme is available under the Just Transition Mechanism and a public sector loan facility also will support public sector investments relevant for a just transition. As a precondition for unlocking these funds, for example to support economic modernisation and diversification, reskilling and upskilling [59] or small-scale investments in clean energy transition, Member States need to prepare territorial just transition plans aligned, among other, with their national energy and climate plans.

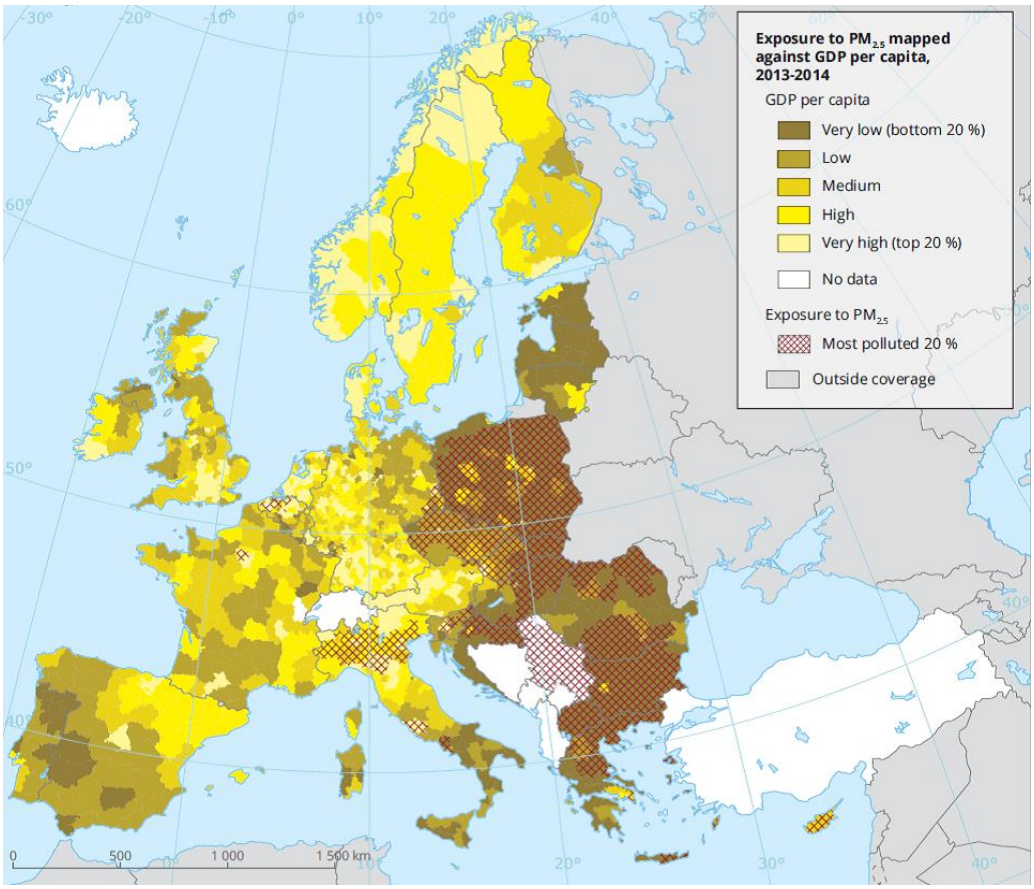
Territorial just transition plans are also relevant in the context of the Recovery and Resilience Facility. To assist stakeholders, the Commission has created the Just Transition Platform to provide information on the funding opportunities, updates on regulations, and

facilitate the exchange of best practices and sector-specific initiatives. It will build on and expand the work of the existing initiative for coal regions in transition [60] offering tailored, needs-oriented assistance and capacity building. The initiative for coal regions in transition will keep its role in advising the fossil fuel regions as one of the two workstreams under the platform.

Air quality

Air quality continues to improve, but is still a concern in several regions and cities. Joint efforts by the EU and Member States have led to decreases in air pollutant emissions in the EU in recent decades, with the notable exception of ammonia. This has led to a decrease in the number of air quality zones exceeding EU limit values for particulate matter, and a decrease in the estimated number of premature deaths caused by air pollution from around 1 million per year in 1990 to around 400,000 per year in the latest estimates [61] .

Air pollution also brings social costs as those with lower incomes tend to be more affected because of both greater exposure and higher vulnerability. In general, EU regions with the lowest GDP per capita experience higher exposure to concentrations of fine particulate matter than other regions [62] . Furthermore, energy poverty is linked to the use of solid fuels for residential heating and cooking, leading to poor indoor and ambient air quality [63] .



Map 1. European Environment Agency, 2018. Unequal exposure and unequal impacts: social vulnerability to air pollution, noise and extreme temperatures in Europe. Report 22/2018.

Structural changes induced by Energy Union policies have helped reduce the sector's air pollutant emissions: in particular, through increased energy efficiency in buildings, steps towards the phasing-out

of coal and the development of non-combustible renewable energy and more sustainable means of transport [64] . The European Green Deal also sets out a zero-pollution ambition for a toxic-free environment, with the objective to remedy pollution better.

International dimension

Despite global efforts, the latest scientific evidence shows that greenhouse gas emissions continue to increase. While the next United Nations Climate Change Conference has been postponed until 2021 [65] , 2020 remains a crucial year for raising climate ambition across the globe.

Thanks to strategic partnerships to implement the Paris Agreement, the EU helps its partners translate their vision for a low-emission and climate-resilient economy into actionable policies and measures, including in the field of energy. On the diplomatic front, the EU has organised ministerial meetings with China and Canada on climate action and carried out several targeted demarches through the EU Delegations in non-EU countries. It is also working closely with G7 and G20 presidencies and partners to promote the global climate agenda and is placing increased emphasis on supporting the efforts of the EU's immediate neighbours in the Western Balkans, in the context of the Eastern Partnership, the Southern neighbourhood and Africa. Some progress has also been made in recent years at international level on addressing aviation and maritime emissions. Action on emissions from maritime and aviation is urgently needed considering their respective growing contributions to greenhouse gas emissions, in the EU and globally.

The EU also promotes clean energy investments in partner countries, constituting business opportunities for pioneering European low-carbon industries. These investments also strengthen the EU's global leading role in clean energy technology, promoting exports, and boosting growth and jobs in the EU.

[66] Multilaterally, the EU promoted international cooperation on renewables in the framework of the International Renewable Energy Agency and on clean technology development and deployment in the framework of the Clean Energy Ministerial and Mission Innovation. The EU is actively involved in the negotiations to modernise the Energy Charter Treaty and has tabled substantive, comprehensive and ambitious proposals that aim at updating the Treaty's provisions on investment protection and aligning the Treaty with the long-term objectives of the Paris Agreement and EU's energy transition policies.

[67] [68]The EU's international engagement has contributed to diversifying Europe's sources of energy and ensuring energy security. The EU maintains a regular energy dialogue with key energy suppliers and partners bilaterally and through multilateral platforms seeking also to ensure a liquid and flexible global liquefied natural gas (LNG) market. At the end of 2019, the European Commission has facilitated the successful conclusion of talks between Ukraine and the Russian Federation, allowing the continuation of transit of natural gas from Russia via Ukraine.

Through the Energy Community, the EU has continued to assist contracting parties to adopt key elements of the EU's energy and climate acquis and to allow for further market integration with the EU. Work is continuing on the development, by Contracting Parties, of National Energy and Climate Plans and on the identification of 2030 energy and climate targets.

Ensuring nuclear safety beyond the European Union's borders has been a key area of attention for the European Commission. Technical experts from the European Nuclear Regulators Group and the Commission carried out a peer review of the implementation of Armenia's and Belarus' nuclear stress test action plans.

The EU has demonstrated its continued commitment to the implementation of Annex III of the Joint Comprehensive Plan of Action on civil nuclear cooperation with Iran. The

EU has implemented a number of activities focusing on safety and integration of Iran into the international nuclear legal framework and aims to enhance also clean energy and climate cooperation.

3. PURSUING GREEN RECOVERY AND A SUSTAINABLE ECONOMY

The Green Deal, adopted in December 2019 [69] , supports the EU's transition to a fair and prosperous society that responds to the challenges posed by climate change and environmental degradation, improving the quality of life for current and future generations and pursuing a just transition.

From the outset of the COVID-19 crisis, the Commission has put the green transition at the core of the EU's Recovery Plan. Accelerating the green transition will strengthen Europe's competitiveness, resilience and position as a global player. In the context of the European Green Deal, dedicated measures are taking shape in energy, industry, farming, food and biodiversity (box 2). Other important initiatives to steer Europe's decarbonisation in energy and transport are expected by the end of 2020.

Box 2. Sample of initiatives since 1 December 2019

- Communication on the European Green Deal (COM(2019) 640)
- Proposal for a European Climate Law (COM(2020) 80)
- European Green Deal Investment Plan (COM(2020) 21)
- Proposal for a regulation establishing the Just Transition Fund (COM(2020) 22)
- A European strategy for data (COM/2020/66 final)
- Circular Economy Action Plan (COM(2020) 98)
- Farm to Fork Strategy (COM(2020) 381)
- EU Biodiversity Strategy for 2030 (COM(2020) 380)
- Proposal for a regulation establishing the InvestEU programme (COM(2020) 403)
- Communication on stepping up Europe's 2030 climate ambition (COM(2020) 562)
- EU-wide assessment of final national energy and climate plans (COM(2020) 564)
- Amended proposal for a European Climate Law (COM(2020) 563)
- Communication on energy system integration (COM(2020) 299)
- A hydrogen strategy for a climate-neutral Europe (COM(2020) 301).
- Communication on an EU strategy to reduce methane emissions (COM(2020) 633)
- A renovation wave for Europe (COM(2020) 662, SWD(2020) 550)
- Strategy for sustainable and smart mobility (forthcoming)

Alongside this State of the Energy Union report and the EU-level assessment of national energy and climate plans [70] , the Commission is publishing the country-specific assessment of the 27 integrated final national energy and climate plans. These documents [71] assess whether and how the national objectives, targets and contributions will help collectively

achieve the goals of the Energy Union strategic framework. The assessment also focuses on the extent to which Member States have taken account of the recommendations that the Commission issued in June 2019 [72] . The national energy and climate plans are the basis for a continued iterative process between the EU and its Member States. As such, the assessment invites Member States to take further action in several domains. The shortcomings and remaining gaps will have to be addressed through a collective effort both by Member States and at EU level. EU-level policy measures will strengthen and complement actions at national level.

3.1. Transforming the EU's energy system

To achieve deep decarbonisation in all sectors of the economy, the EU needs to ensure that its energy system undergoes a profound transformation. To this end, the Commission adopted an EU strategy on energy system integration in July 2020 [73] . It outlines the Commission's vision to accelerate the transition towards a more integrated energy system and to ensure coordinated system planning and operation. In July 2020, the Commission also adopted a hydrogen strategy, setting out its vision to significantly increase the role of clean hydrogen as an energy carrier [74] . This includes the path towards ensuring that renewable and low-carbon hydrogen and hydrogen-derived synthetic fuels becomes cost-competitive. Together with the hydrogen strategy, the Commission also launched the European Clean Hydrogen Alliance.

The new climate ambition and the profound changes necessary in the functioning of the EU's energy system also require a new vision for the EU's energy infrastructure. The Commission is therefore revising the guidelines for the Trans-European Networks for Energy [75] . While the focus will remain on electricity infrastructure that is necessary to integrate renewable energy, it will also set up a framework to further improve the deployment of innovative technologies and infrastructure, such as smart grids, hydrogen networks or integrated offshore grids. This will play also an important role for the transition to sustainable and smart mobility in the EU.

3.2. Stepping up climate ambition

Updating the policy framework

In view of the EU's ambition to become climate neutral by 2050, the Commission adopted a Communication in September 2020 on stepping up Europe's 2030 climate ambition [76] and an amended proposal on the European Climate Law [77] to increase the EU's climate ambition for 2030 from at least 40% of greenhouse gas emission reductions compared to 1990 to at least 55% including emissions and removals. The Communication also outlines the actions required across all sectors of the economy and launches the process of reviewing the key legislative instruments by June 2021 in order to achieve this increased ambition. It is also working on new rules for fluorinated greenhouse gases and for ozone depleting substances, to be presented by the end of 2021.

The Green Deal also announced the adoption of a new, more ambitious EU strategy on adaptation to climate change. Climate change impacts are already felt in the energy sector, e.g. the less predictable production of hydropower or even the closing of certain nuclear power plants due to low availability of cooling water during severe droughts [78] . There are massive challenges ahead [79] .

Moreover, the Green Deal includes the European Climate Pact. It aims to engage individuals and communities in climate action. Building on existing initiatives, the Climate Pact will provide a space to design new climate action, share information, launch grassroots activities and to present solutions that others can follow.

The Commission has also adopted a Communication on an EU strategy to reduce methane-related emissions. The strategy will deliver proposals to help achieve reductions in methane emissions in the EU as well as promote and support similar action across the globe. It covers all the main methane-emitting sectors of agriculture, energy and waste. On the energy side, the strategy focuses on improved measurement, robust and transparent reporting and credible verification of methane emissions.

The increased climate ambition requires unprecedented growth of renewable energy production. As announced in the Green Deal, offshore renewables will play a key role in this. To facilitate this process, the Commission will adopt its strategic vision for offshore energy produced from natural and clean sources such as wind, solar, wave and tidal in autumn 2020.

Sustainable alternative fuels also will contribute to the transition to a more sustainable transport system. The Commission will soon put forward a strategy for sustainable and smart mobility and is working on initiatives to boost the supply and uptake of sustainable alternative fuels, notably in airborne and waterborne transport.

Overview of Member States' submissions for long-term decarbonisation strategies

All parties to the Paris Agreement were invited to communicate, by 2020, their mid-century, long-term low greenhouse gas emission development strategies. Setting out a process for the Member States to prepare these strategies, the Governance Regulation requires them to prepare and submit to the Commission, by 1 January 2020, their long-term strategy with a perspective of at least 30 years.

Only 16 Member States [80] have submitted a long-term strategy so far. Thirteen of those refer explicitly or implicitly to climate neutrality [81] , while the other three aim to cut their emissions from 80% to 95% compared to 1990. However, a clear definition of the term used for the overall goal is often lacking, and it is often not clear whether the targets that Member States set are legally binding. Mandatory content reporting also varies between Member States. As a result, the Commission cannot yet provide a detailed assessment of whether the national long-term strategies will be enough for the collective achievement of the EU climate neutrality objective, or provide information on any collective gap.

3.3. Energy and climate policies critical to recovery

The COVID-19 crisis has had a significant impact on the EU economy. However, it has not changed, in a structural way, the investments and reforms needed to achieve our increased climate ambition. The challenge of mobilising significant additional investments and promoting a just transition is real. In the context of the COVID-19 recovery, Europe faces a unique opportunity for investments that can support the recovery of the EU economy, while accelerating the green and digital transitions. Relaunching our economies on any other path, which would result in lock-in into unsustainable practices, is simply not an option.

The EU recovery plan and the Recovery and Resilience Facility as its key instrument will play a crucial role in these investments and reforms. It will provide financial support through EU financing programmes to reforms and investments undertaken by Member States to mitigate the economic and social impacts of the pandemic and to make the EU economies more sustainable, resilient and better prepared for the challenges posed by the green and digital transitions. In addition, cohesion policy will be crucial for a balanced recovery and making sure no one is left behind.

Member States will identify and report on reforms and priority investments. In view of the 30% climate mainstreaming target agreed at the European Council's meeting of July 2020 [82] , the Commission invited Member States to ensure, for each recovery and resilience plan, that a minimum of 37% of climate-related expenditure is included. In the 2021 Annual

Sustainable Growth Strategy [83] the Commission strongly encourages Member States to include, in their plans, reforms and investment in a limited number of flagship areas in order to address common challenges through a coordinated approach and reap tangible benefits for the economy and citizens. These include the 'Power up' flagship frontloading future-proof clean technologies and in particular renewables and hydrogen; the 'Renovate' flagship to improve the energy and resource efficiency of buildings; and the 'Recharge and refuel' flagship to accelerate the use of sustainable, accessible and smart transport, charging and refuelling stations and the extension of public transport.

In doing so, Member States should build on their national energy and climate plans. They should provide early indications in their recovery and resilience plans on how they will ensure consistency and complementarity and how specific investments or policies and measures set out in national energy and climate plans could be fast-tracked with the help of the recovery and resilience plans.

In support of this, the individual assessments of the national energy and climate plans provide important guidance for Member States on key energy and climate-related investments and reforms that could contribute to a sustainable and green recovery across the EU. The Commission invites Member States to consider such guidance. The Commission is engaging in a dialogue on these priority areas with Member States in the context of discussions on recovery and resilience.

Buildings are responsible for around 40% of energy consumption and 36% of greenhouse gas emissions in the EU. Most existing buildings are likely to still be in use in 2050. We therefore have no time to lose in renovating them and making them more energy efficient to become climate neutral by 2050. This is why the Commission has adopted a Communication on the renovation wave for Europe [84] , aiming to at least double the annual energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations. Investing in energy-efficient buildings will reduce energy poverty and increase well-being. It will also create a much needed stimulus for the construction and renovation ecosystem, which has been hard-hit by the COVID-19 crisis.

Making it easier to renovate buildings, in particular for low-income households, is key to ensuring a just transition. Cohesion policy will remain an important EU funding source for direct investments into the energy efficiency of buildings and their renovation to better energy performance levels. However, more will be needed. The Just Transition Fund described above will mobilise funds in EU regions where extra effort will be needed to transition to a climate-neutral economy by 2050.

Furthermore, the new ETS financing mechanisms (Innovation Fund and Modernisation Fund) will provide an additional EUR 24 billion for the demonstration of innovative low-carbon technologies across the EU and the modernisation of energy systems in beneficiary Member States. The Commission has already launched the first call for the Innovation Fund, while the Modernisation Fund will start operation in 2021.

National recovery and resilience plans are a once-in-a-generation opportunity to 'build back better' and invest in an economic model that is fit for the 21st century. Beyond the EU, governments around the world will also seek to invest heavily in order to support economic recovery [85] . The investment needed to kick-start their economies must relieve the burden on future generations, not make it heavier. The EU is fully engaged with its international partners to put in place green recovery strategies and direct investment in environmentally sustainable economic activities.

4. CONCLUSION AND OUTLOOK

The Energy Union is, more than ever, an essential pillar for achieving the Green Deal objectives. The integrated planning framework set out in the Governance Regulation, overall, has been implemented well. The Energy Union framework has proven to be robust in the face of the significant stress caused by the COVID-19 crisis, with wide departures

from normal consumption patterns testing the resilience of our energy system. Overall, this can support the EU's transition to climate neutrality by 2050.

And yet there is no room for complacency. The following months will be crucial, and the Commission will support Member States fully in developing robust and future-proof national recovery and resilience plans to propel Europe forward in a sustainable and socially fair way. Its support will build on the guidance issued to Member States as part of its assessment of the individual national energy and climate plans and rely on the European flagships identified as part of the 2021 Annual Sustainable Growth Strategy in the context of the Recovery and Resilience Facility.

Against this background, efforts to reduce support for wasteful energy consumption and redirect it towards measures that promote the clean energy transition need to be stepped up without delay. As outlined in the European Green Deal, fossil fuel subsidies should end. To foster action and promote the efficient use of allocations under the Recovery and Resilience Facility, the Commission will cooperate with Member States to reinforce action to reduce fossil fuel consumption and to phase out fossil fuel subsidies. This includes actions announced in the Communication "An EU-wide assessment of National Energy and Climate Plans" [86] .

Moreover, the Commission will initiate efforts to counter the observed decrease in research and innovation investments at national level in order to strengthen the long-term sustainable growth potential. This includes combining public and private funding across the value chain through industrial alliances, such as on batteries or hydrogen. In the upcoming discussions with Member States, industry and stakeholders, the Commission will focus on industries and innovators in the EU that will develop the clean technologies needed and can promote them worldwide.

The Commission will continue to work closely with Member States and propose specific solutions where efforts are still needed to implement agreed legislation. This includes, for instance, the EU Renewable Development Platform and the EU renewable energy financing mechanism. Beyond the already agreed legislation, the initiatives being launched today on buildings and methane complement our efforts to step up Europe's 2030 climate ambition. They will be followed by initiatives on offshore energy and trans-European energy infrastructure later this year.

Drawing on broad public debate and consultation process, the Commission will prepare the key legislative proposals by June 2021. This will pave the way for swift adoption in order to achieve the increased climate and energy ambition for 2030 and to contribute to the objectives of the European Green Deal.

The Governance Regulation conceived the State of the Energy Union report as the basis for the European Parliament and the Council to address the progress achieved and for discussions with all interested parties. More than ever, this dialogue is crucial this year.

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(1) COM(2020)80 and COM(2020)563.
(2) COM(2020) 564 final.
(3) COM(2020) 562.
(4) In the areas of greenhouse gas emissions reduction (including renewable energy sources), energy efficiency, energy security, energy markets, research and innovation, and competitiveness.
(5) 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; OJ L 328, 21.12.2018, pp. 1–77.
(6) C(2020) 9600.
(7) European Council conclusions of 12 December 2019, EUCO 29/19.
(8) In principle covered by the EU ETS, but currently limited to flights in the European Economic Area.
(9) C(2020) 2835.
(10) Source: InterContinental Exchange.
(11) The necessary data to underpin these analyses will be available at the end of October 2020.
(12) For a detailed assessment, see COM(2020)952.
(13) The figures include the UK, an EU Member State in the 2018 reporting period.
(14) Eurostat.
(15) COM(2020)952; this includes an assessment of the sustainability of biofuels.
(16) Guidelines on State aid for environment and energy 2014-2020, OJ C 200, 28.6.2014, p.1.

(17) In accordance with Article 8 of 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
(18) COM(2020) 575 final.
(19) 'Power up' also lays the foundation for hydrogen lead markets in Europe and the related infrastructure, aiming to support 6 GW of electrolyser capacity and the production and transportation of 1 million tonnes of renewable hydrogen across the EU by 2025
(20) C(2020) 6123 final.
(21) 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.
(22) As the rights and obligations of a Member State apply to the UK until the end of the transition period on 31 December 2020, this target refers to the energy consumption of the EU plus the UK.
(23) https://ec.europa.eu/eurostat/documents/38154/4956218/Energy-Balances-April-2020-edition.zip/69da6e9f-bf8f-cd8e-f4ad-50b52f8ce616 . The figures include the UK, an EU Member State in the 2018 reporting period. The UK is bound by the 2020 energy efficiency target.
(24) COM(2020)953.
(25) COM(2020) 575 final.
(26) In line with the methodology used for defining the energy efficiency targets and with the nomenclature used by Eurostat, PEC stands for primary energy consumption (Europe 2020-2030) and FEC for final energy consumption (Europe 2020-2030).
(27) SWD(2020) 104 final. The document is a valuable guide to ensuring resilience in the face of pandemic risks and builds on the input of the Electricity, Gas, and Oil Coordination Groups, the European Nuclear Safety Regulators Group, and the European Offshore Authorities Group.
(28) COM(2020) 605 final.
(29) In line with the requirement of the recast Regulation on the internal electricity market (Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity).
(30) Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector.
(31) Developed and implemented by the European Network of Transmission System Operators for Electricity.
(32) Commission Recommendation (EU) 2020/775 also covers technical, legal and financial elements.
(33) Ireland, Spain, France, Italy, Cyprus, Poland, Portugal and Romania.
(34) The agreed cross-border capacity ratio corresponds to the import capacity over installed generation capacity for Member States.
(35) ACER market monitoring report 2018 of 11 November 2019.
(36) Of final electricity trades, market coupling contributed to an increase from 60% in 2010 to 87% in 2018 of the amount of trades going in the right direction i.e. from lower to higher priced areas. This delivers an affordable model for the energy transition ensuring that least-cost electricity can be dispatched around Europe for the benefit of consumers.
(37) https://ec.europa.eu/energy/topics/energy-security/secure-gas-supplies/commissions-opinions-preventive-action-plans-and-emergency-plans-submitted-member-states-2019_en?redir=1
(38) These plans are developed within the framework of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010.
(39) Article 13 of Regulation (EU) 2017/1938.
(40) Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation; Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations, as amended by Council Directive 2014/87/Euratom of 8 July 2014; Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.
(41) Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity OJ L 158, 14.6.2019; Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU ; Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators OJ L 158, 14.6.2019, p. 22–53.
(42) Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity OJ L 158, 14.6.2019.
(43) In addition, the implementation of EU-wide electricity trading ('market coupling') has advanced, in particular with the move towards intraday trading. At retail level, Electricity Directive 2019/944 empowers consumers by helping them to switch suppliers and by rolling out smart meters quickly. In 2018, there were around 99 million smart electricity meters across the EU or 34% of all electricity metering points, compared to around 12 million smart meters for gas.
(44) COM(2020)951 based on Eurostat [nrg_pc_204_c].
(45) End-user electricity price regulation is still applied to households in nine Member States, and end-user gas price regulation in eight. In the non-household sector, end-user electricity price regulation existed in six Member States and gas price regulation in four Member States.
(46) COM(2020) 299 final.
(47) Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (OJ L 283, 31.10.2003, pp. 51-70).
(48) COM(2020)951 based on Eurostat [nrg_pc_202_c].
(49) Eurostat, SILC [ilc_mdes01].
(50) Related services also enhance social inclusion. The European Pillar of Social Rights places energy among the essential services to which everyone has the right to access.
(51) C(2020) 9600.
(52) This excludes EU funds. 2018 value; partly estimated for the EU-27.
(53) Private R&I estimates for China are particularly difficult to estimate due to differences in intellectual property protection and the difficulty in mapping the corporate structure (e.g. state-backed companies) and financial reporting.
(54) JRC SETIS https://setis.ec.europa.eu/publications/setis-research-innovation-data ; JRC(112127) SETIS Research & Innovation country dashboards [Dataset] PID: http://data.europa.eu/89h/jrc-10115-10001 , according to JRC(105642) Monitoring R&I in Low-Carbon Energy Technologies, and

JRC(117092) Monitoring R&I in Low-Carbon Energy Technologies, Revised methodology and additional indicators.
(55) Source: Implementing the SET Plan, Publications Office of the European Union, 2019.
(56) COM(2020) 564 final.
(57) COM(2020) 953.
(58) See annex to this report.
(59) Related, the updated European Skills Agenda (COM(2020) 274 final) addresses the skilling needs of the green transition. Youth Employment Support (COM(2020) 276 final) addresses help for young people to harness opportunities arising from the green transition. The European Social Fund (ESF+) will remain an important funding source for up- and reskilling activities.
(60) https://ec.europa.eu/energy/topics/oil-gas-and-coal/EU-coal-regions/initiative-for-coal-regions-in-transition_en
(61) European Environment Agency, 2020. 'Air Quality in Europe – 2020 Report', EEA Report (forthcoming).
(62) SWD(2019) 427 final.
(63) European Environment Agency, 2020. 'Healthy environment, healthy lives: how the environment influences health and well-being in Europe", EEA Report 21/2019
(64) COM(2018) 446 final/2 and 'Renewable energy in Europe 2019 - Recent growth and knock-on effects', Eionet Report ETC/CME 2019/8.
(65) https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_20_583
(66) EU Member States that have joined the Mission Innovation initiative (Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Sweden) and the European Commission have increased their funding in the mission innovation clean energy research and development focus areas by EUR 1 Billion between 2016 and 2019.
(67) e.g. with Norway, the U.S., Algeria, Egypt, Azerbaijan, Gulf countries, Japan, Canada, Korea, Eastern Mediterranean countries.
(68) e.g. G7, G20, IEA, OPEC, Union for the Mediterranean.
(69) COM(2019)640 final.
(70) COM(2020) 564 final.
(71) SWD(2020) 900 to 926.
(72) C(2019) 4401 to C(2019) 4428.
(73) COM(2020) 299 final.
(74) COM(2020) 301 final.
(75) Regulation (EU) 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure. The public consultations closed on 13 July 2020, and the Commission is currently working on the proposal.
(76) COM(2020) 562. https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/com_2030_ctp_en.pdf
(77) COM(2020) 563.
(78) https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/water-energy-nexus-europe
(79) https://ec.europa.eu/jrc/en/peseta-iv/energy-supply
(80) Austria, Czechia, Denmark, Estonia, the Netherlands, Sweden, Belgium, Finland, France, Germany, Greece, Hungary, Latvia, Lithuania, Portugal and Slovakia, available at: https://ec.europa.eu/info/energy-climate-change-environment/overall-targets/long-term-strategies_en .
(81) A few Member States refer to carbon neutrality instead of climate neutrality, but include non-CO2 greenhouse gases in their objective.
(82) European Council conclusions of 21 July 2020, EUCO 10/20.
(83) COM(2020) 662, SWD(2020) 550.
(84) The International Monetary Fund estimated in April 2020 that governments around the world would spend around EUR 10 trillion in the next 2 years just to support recovery. https://www.imf.org/en/Publications/FM/Issues/2020/04/06/fiscal-monitor-april-2020
(85) COM(2020) 564 final.

EUROPEAN COMMISSION

Brussels,
14.10.2020

COM(2020) 950 final

ANNEX
to the

REPORT TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE

OF THE REGIONS

2020 report on the State of the Energy Union pursuant to Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action

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1. Introduction

While the internal market has often been considered as an instrument to keep prices for consumers in check and set efficient investment signals for investors, it has become clear in recent years that it is also of key importance for delivering on the EU's ambitious climate targets. The integration of 27 national energy systems into one EU-wide market is crucial for efficient decarbonisation, as it will allow renewable energy to be traded across borders, benefiting from diversity and complementarity of the generation potential in the different EU regions. Cross-border markets can save significant CO2 emissions from fossil backup generation which would be necessary in fragmented national energy systems. Well-connected markets also improve security of supply.

Despite all efforts involving public spending, it alone will not be able to cover the enormous investments needed for the energy transition. Only well-organised and well-regulated markets will be able to mobilise the private investments needed to bring about a carbon-free economy. A fully integrated and well-functioning internal energy market is the most efficient means of ensuring i) the needed price signals for investments in green energy and technologies, ii) affordable energy prices, and iii) secure energy supplies on a least-cost path to climate neutrality [1] .

The 'Clean Energy for all Europeans' Package, and in particular the new electricity market design rules adopted in 2019 [2] , paved the way to better cope with the new realities of energy markets increasingly dominated by renewable energy production, and to foster consumer participation in energy markets. It enables renewables to become the new backbone of the electricity system. The "Clean Energy for all Europeans" Package has also prepared the ground for better use of interconnectors between Member States (see section 2.2.3.1 for more detail). Clear rules to maximise usage of interconnection capacity will boost cross-border trade, allowing energy resources to be used more efficiently in the whole EU. The implementation of the comprehensive set of technical EU Regulations (network codes) is progressing with good results, as evidenced by the successful roll-out of EU market coupling in electricity, or the success in diversifying supplies and increasing liquidity in gas markets (see section 2.2.1 for more detail).

However, shortcomings still exist in the energy market, both at retail as at wholesale level, which unnecessarily increase costs for consumers and industry. Fixing these shortcomings is, therefore, a crucial aspect for a successful recovery and the foundation for the transition of the economy towards climate neutrality. The need to decarbonise the energy system also brought about new challenges, such as designing state interventions needed to support the energy transition in a manner that does not unduly hamper or fragment the internal market.

Questions of market compatible support schemes for renewable energy or for traditional generation ('capacity mechanisms') have had a growing impact on the functioning of the market in recent years. The 'Clean Energy for All Europeans' Package addressed this problem and includes dedicated rules to optimise such state interventions.

The year 2020 brought great challenges due to the COVID crisis. Energy markets had to cope with the impact of social distancing measures which suddenly reduced energy demand and radically changed the behaviour of hundreds millions of Europeans. Despite increased volatility and fluctuating liquidity, the internal energy market withstood the shock and proved its resilience in the face of the crisis, while power systems successfully coped with record levels of renewable electricity.

In line with requirements in the Governance Regulation [3] , and applicable sectoral legislation [4] , this Report analyses the overall progress made in creating a complete and operational energy market and, particularly, in implementing the Gas and Electricity Directives.

2. Electricity wholesale markets

2.1. Key indicators:

2.1.1. Wholesale prices - indications that markets deliver

Recent observations about prices at wholesale level decreasing in a mid-term view since 2009 [5] have been found to be true for the last 2 years. While other factors, such as the rapid growth of renewable generation, contribute to this development, the steady decline of prices at wholesale level provides evidence that competition has tangible effects at wholesale level [6] .

After increasing between 2016 and 2018, wholesale prices fell abruptly in 2019 as renewable penetration reached new records, coal and gas prices dropped and demand remained subdued. The decrease in prices across the continent was uneven, which resulted in growing price divergence among different regional markets. In the first half of 2020, as compared with the same period in 2019, prices fell between 30% in some southern European regional markets to up to 70% in some northern regions. The rising differences could be explained by insufficient interconnection capacities, renewable generation rising unevenly across markets, and a significantly strengthened CO2 price, which particularly affected Member States which have a stronger presence of fossil fuels in the generation mix. In 2020, all these trends were magnified due to the negative impact of COVID on economic activity that has caused a significant drop in the demand for electricity, which, together with rising renewable penetration and falling gas prices, has pushed wholesale prices to very low levels [7] .

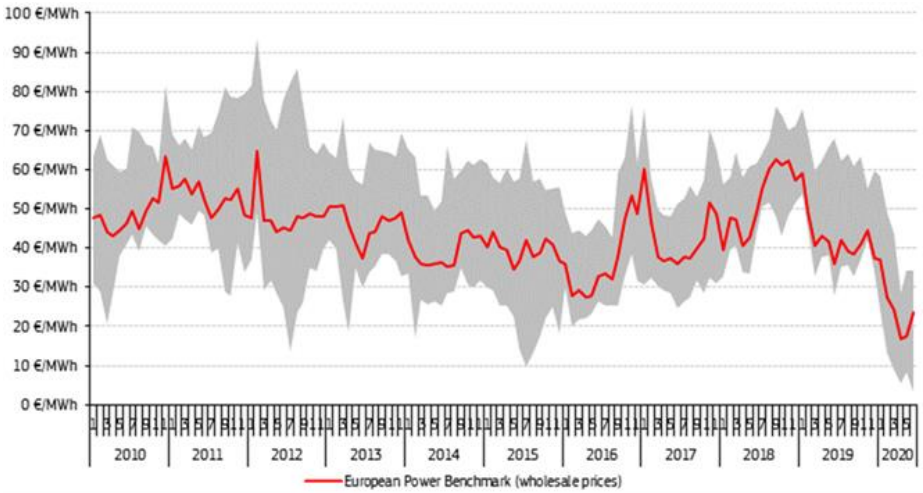

Figure 1: Wholesale electricity prices lowest and highest regional prices

Source: Platts, European Power Exchange

Note: The grey background represents the difference between maximum and minimum price

2.1.2. Geographic scope of electricity markets - still work to do to overcome fragmentation

The further implementation of market coupling has brought tangible progress in improving supply opportunities across national borders (see section 2.2.1 below for more detail). There are indications that cross-border competition is increasing in certain regions, such as the Nordic region, and electricity imports and exports have been steadily increasing in recent years.

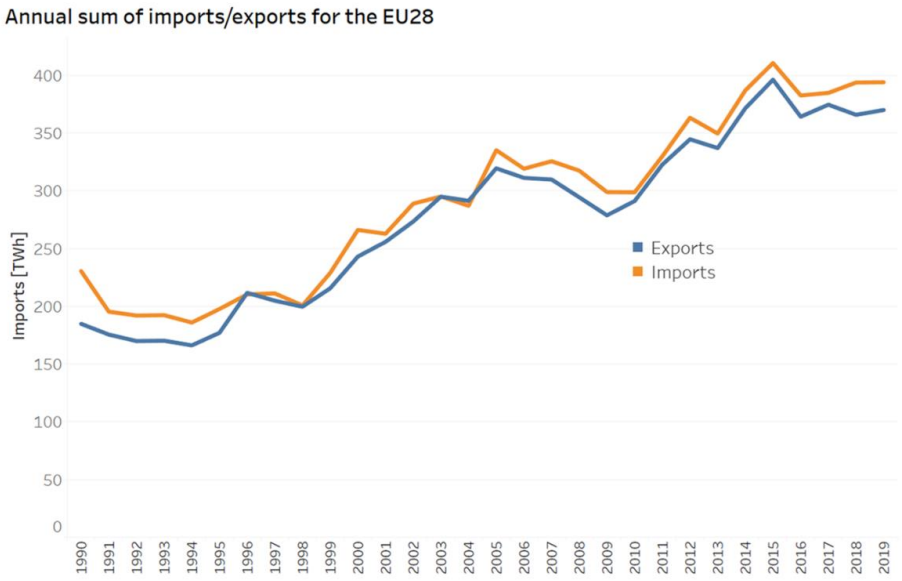

Figure 2: Annual sum of imports/exports for the EU 28

Source: " EUROSTAT [NRG_CB_E]"

However, the analysis of the structure of EU electricity markets shows that conditions for supply and demand still differ significantly between most Member States, and that continued efforts to remove cross-border barriers are necessary [8] . Rolling out EU-wide market coupling and fully implementing the EU network codes and guidelines, which are meant to reduce existing technical barriers, will be crucial to overcoming the remaining fragmentation of EU markets.

2.1.3. Market concentration - dominance of incumbents remains an issue in many countries

Functioning energy markets require a minimum degree of competition. The lower the market concentration, the higher the degree of potential competition is. In general, markets with higher levels of competition (i.e., lower concentration) show a lower price level than markets dominated by one or few players. An analysis of how competition developed in the European electricity wholesale market shows that more than 20 years after market liberalisation began, incumbents still hold a dominant position in a majority of Member States. In some countries, incumbents even hold market shares of over 80%, coming close to a monopoly. It should be noted that the size of a country will strongly influence the level of market concentration. Small and unconnected markets are not likely to support a large

number of suppliers. Moreover, the tendency to regulate prices in these countries has often proven to be an additional barrier for entrants that wish to enter into competition with the established incumbents [9] .

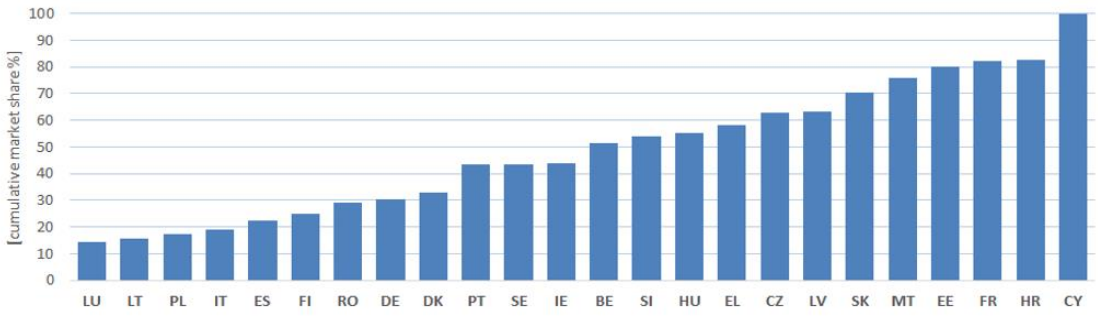

Figure 3: Market share of largest electricity generation companies in 2018

Source: DG ENER country datasheets based on Eurostat surveys on electricity markets indicators

Figure 3 shows that despite liberalisation, the share of the main generator in national production remains high in many countries. Therefore, enabling competition at generation and supply level needs to remain a priority for national and EU energy policy, including through competition law enforcement. Figure 3 also shows the benefits of linking markets across borders, as more physical interconnection and more efficient electricity trading systems like market coupling can at least partly substitute supply alternatives that are lacking at national level, to the benefit of consumers. Market-viable renewable electricity also has facilitated the entry of new market players and contributed to the decrease in market concentration.

2.2. Key regulatory developments

2.2.1. A unique project: EU market coupling

Important work was done on the EU project to connect national markets by way of market coupling. The project has advanced further in the last year, with significant progress notably with intraday market coupling.

The fact that EU electricity markets operated in a largely uncoordinated manner and electricity was not flowing to where it was most needed, led some Member States to start voluntary market coupling projects some 10 years ago. Market coupling allows electricity bids and offers to be aggregated across several Member States, in order to ensure that electricity flows to where it is most needed within the region in question. [10] The stepwise introduction of market coupling was made legally binding in 2015.

The introduction of market coupling across more than twenty countries, benefiting 380 million customers remains the only project of its kind worldwide. Despite its technical complexities, it was close to completion in 2019. The charts below show the evolution of the extension of the pan-EU intraday (i.e. short-term) and day-ahead (i.e. within 24 hours) market coupling project. 2018 and 2019 were particularly successful years, as they saw the launching and extension of the single intraday coupling to the majority of EU countries, and the extension of the day-ahead coupling project to new areas.

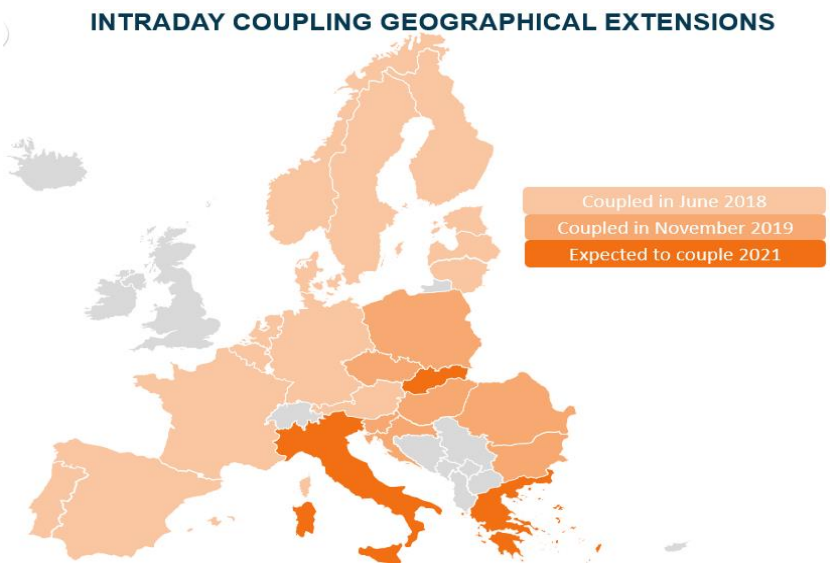

Figure 4: Intraday coupling geographical extensions

Source: DG ENER

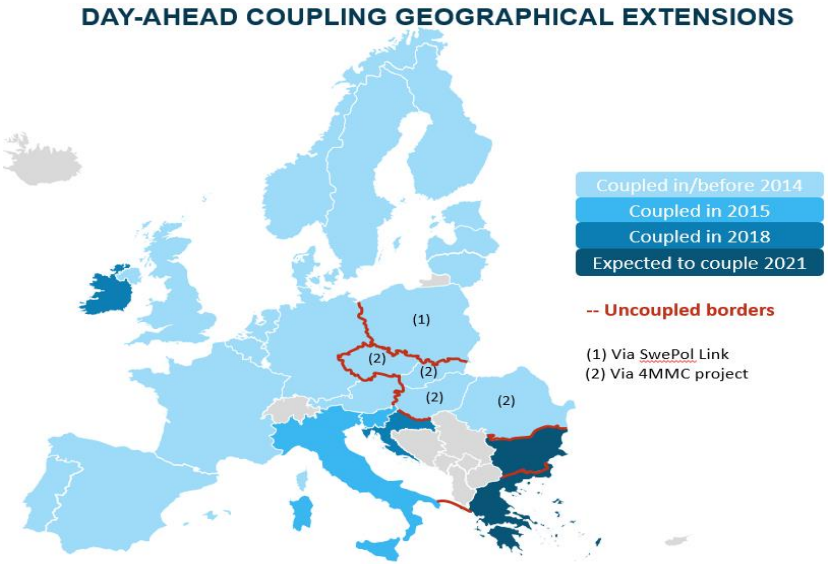

Figure 5: Day-ahead coupling geographical extensions

Source: DG ENER

With the extension of day-ahead and intraday market coupling, the European markets and electricity systems have become increasingly resilient, efficient and liquid, and are more able to integrate renewables at a lower cost.

2.2.2 Comprehensive harmonisation of trade and system operation rules through network codes - a new form of collective EU-wide energy harmonisation

The roll-out of market coupling is the most visible evidence that the implementation of the electricity network codes began successfully. The eight electricity network codes were adopted between 2015 and 2018 to remove remaining technical barriers for electricity trade and coordinated grid operation by way of a stepwise harmonisation process [11] . For this

purpose, the network codes provide a comprehensive framework for the joint development of common harmonisation methods [12] . Transmission system operators and power exchanges are obliged under the network codes to develop joint harmonisation proposals in a given field (e.g. market coupling or coordinated system operation). The national regulators then have to review and, if necessary, rewrite these common harmonisation methods, and jointly approve them. In the case of diverging views, they can decide by way of a qualified majority [13] .

Experience with the implementation of the network codes and the development of the necessary methodologies has shown that the new instrument and the possibility to decide with qualified majority has brought significant progress to overcome the existing fragmentation in market and grid operation. Since 2015, more than 100 methods have already been jointly approved by regulators under the new collective harmonisation framework.

However, in some fields, the delivery of the required methods has been delayed. This is particularly the case in the field of joint capacity calculation, where some proposals for joint methods were not submitted within the required timeframe and where coordination among regulators proved to be particularly complex. As the benefits of removing the barriers resulting from uncoordinated capacity calculation are particularly significant for progress with the internal electricity market [14] , the Commission, in close cooperation with national regulators and the Agency for the Cooperation of European Energy Regulation (ACER), will remain vigilant to use all available enforcement tools to ensure progress with the adoption of the required coordinated methods.

2.2.3. 'Clean Energy for all Europeans' Package: Progress made putting in place new electricity market design

The new electricity market design, adopted as part of the 'Clean Energy for all Europeans Package', represents a significant step forward for the internal electricity market. However, now that the legislation has been adopted, its success will depend on it being implemented swiftly and effectively. Many of the market design rules are contained in the recast Electricity Regulation [15] , which entered into force in January 2020. In particular, the provisions to make the market fit for larger shares of renewables, distributed generation and demand response (shorter term markets, full market participation for renewables and storage, etc.) and to make renewables fit for the market (phase-out of priority dispatch for new large installations and introduction of full balance responsibility) are now in force. In addition, the recast Electricity Regulation contains some important but complex elements regarding cross-border trade and capacity remuneration mechanisms.

2.2.3.1. Unblocking electricity borders – the "70 % rule"

Over recent years, the single market for electricity has become increasingly integrated with more and more interconnection capacity being built between Member States. Interconnection improves competition, to the benefit of consumers, contributes to more secure electricity supply and supports decarbonisation, because their flexibility allows the complementarities between the differing generation mixes across Europe to be fully utilised, for example, between thermal and variable renewable generation, and enables different areas to share system services and backup generation.

However, as has been regularly reported by ACER in its Market Monitoring reports [16] , capacities physically available at interconnectors are regularly limited in certain regions. Underutilised interconnectors prevent the full benefits of these projects from filtering down to consumers.

The main reason for these limitations relates to internal structural congestion. Structural grid congestion occurs when the internal grid of a bidding zone (or price zone) is not sufficient to flow electricity from where it is generated to where it is consumed. This can result in using the interconnectors and neighbours' electricity grids instead to ensure that the electricity flows. When this happens, it effectively prioritises internal trades over cross-border trades which should not occur in the single market. Indeed, this runs counter to

several EU Treaty articles, including, Article 18 TFEU which prohibits discrimination. Such behaviour by a transmission system operator, may also be found to violate Article 102 TFEU, which prohibits abuse of the dominant position. Until now, potential violations of these rules have been investigated primarily under antitrust cases by DG Competition, notably Case 39351 – Swedish Interconnectors from 2010 [17] and Case 40461 DE/DK Interconnector from 2019 [18] .

The recast Electricity Regulation, negotiated as part of the 'Clean Energy for all Europeans Package', confirms the key principles on which, in line with the EU Treaty, the rules for electricity trading are based: maximisation and non-discrimination. These principles, which already existed both in Annex 1 of Regulation 714/2009 [19] and the CACM Guideline [20] , are maintained in Article 16 and complemented by certain additional elements. While recast Electricity Regulation reconfirms the importance of reducing internal structural congestion, it also introduces a new minimum 70% target for interconnector capacities to be made available for cross-border electricity trade [21] , while giving Member States flexibility in how they choose to reach the target. Member States may be able to expand their grid, choose to reconfigure their bidding zones to better reflect structural congestion or to adopt an Action Plan with network investments in order to relieve this structural congestion by the end of 2025.

Although based on the EU Treaty and the sectorial electricity rules the transmission system operators already today have an obligation to fully maximise the interconnection capacities, the 'Clean Energy for all Europeans" Package [22] , is meant to guarantee that a minimum of 70% of the capacity is available at the latest by the end of 2025 on every single EU interconnector. This new legislation balances the objective of increasing trade through introducing a target, while ensuring that Transmission system operators ("TSOs") have the tools they need to maintain the safe operation of the system.

2.2.3.2. More coordinated and less harmful capacity mechanisms

Over recent years the European electricity market has quickly transformed with the rapid surge of variable power generation coupled with decreasing demand for electricity following the 2008-2009 financial and economic crisis. Variable renewable power generators with low marginal cost have displaced or significantly reduced the running hours of thermal power plants. At the same time, thermal plants, such as gas-fired power plants, can provide important flexibility to the system. This development has raised concerns with some stakeholders and governments over whether the power system will be able to meet demand in the long run. In response, many Member States have introduced capacity mechanisms in support of generation adequacy.

Capacity mechanisms support power plants to be available for generating electricity when needed. In exchange, the mechanisms provide payments to these power plants. These capacity payments are in addition to the earnings power plants gain by selling electricity on the power market. Inappropriately designed capacity mechanisms can severely distort the internal market [23] . The recast Electricity Regulation sets out a new framework for the introduction and design of capacity mechanisms to facilitate the European Commission's state aid enforcement work and complement existing rules governing capacity mechanisms.

The new rules require Member States with adequacy concerns, which were identified based on the adequacy assessment conducted in line with the EU-wide adequacy assessment methodology, to develop and execute an implementation plan (market reform plan), setting out how they intend to address the root causes of their adequacy problem with market reforms. They are required to submit this plan to the Commission for its Opinion on whether the proposed market reforms are fit for purpose [24] . A process was introduced to monitor how these reforms are being applied. [25] . The new rules ensure that the design choices for capacity mechanisms minimise their impact on market functioning. This means they should be:

- open to participation from generators across the border;

- be limited in time; and
- phased out when the underlying adequacy problems are resolved.

Capacity mechanisms should also be open to all technologies, including renewables. However, there is one important condition: power plants participating in capacity mechanisms cannot emit more than the emission limit of 550gr CO2/kWh. [26] This ensures that truly polluting power plants, such as coal fired generation facilities, are effectively excluded from the mechanisms.

By now, the Commission has issued opinions on six market reform plans [27] . Some of these measures are relatively concrete. For example, the rules suggest phasing out regulated end consumer price regimes (or at least relaxing price regulation), removing any price restrictions on wholesale markets, pricing in the value of system reserves in balancing energy prices (the 'shortage pricing function'), and increasing interconnection with neighbours. Another group of measures are relatively open, such as removing all regulatory distortions or enabling demand side participation, self-generation, and energy efficiency.

There is currently additional work being carried out by ACER, the national regulatory authorities (NRAs) and TSOs to implement the new legislation. ACER has adopted methodologies for a state-of-the-art EU adequacy assessment, calculation of the Value of Lost Load, and the Reliability Standard. In addition ACER and the European Network of Transmission System Operators (ENTSO-E) are also developing a set of methodologies to enable cross-border participation in capacity mechanisms. Furthermore, ACER has issued guidance on how to calculate the CO2 emission limit [28] .

The new legislation aims to bring a coordinated approach to capacity mechanisms, making sure they do not distort the EU's internal electricity market more than necessary and that they are not used to replace necessary reforms in Member States. The new legislation will also complement the European Commission's work on enforcing state aid that will continue to be the EU's chief tool to ensure individual capacity mechanisms are compliant with the internal market rules. Finally, it will help to reconcile security of supply objectives with the imperative of the clean energy transition.

2.2.3.3. Proper implementation of the unbundling rules for storage

Storage of electrical energy using various technologies (such as pumped hydro storage, chemical storage in batteries or air pressure) is an important aspect of the electricity system. With growing shares of variable renewable energies in total electricity production, and advances in different storage technologies, storage is expected to play an increasingly important role in the internal market. Beyond traditional (pumped) hydro storage, which remains the main reservoir for storing electrical energy in the EU [29] , chemical storage in batteries has expanded significantly, and become a relevant market factor notably for system services such as the provision of balancing capacity. The EU strongly supports the development of energy storage technologies so they become a key technology for the success of the energy transition. The comprehensive governance framework of the Energy Union and the strategic action plan on batteries [30] , were important steps to help build a globally integrated, sustainable and competitive industrial base on batteries. The progress made was evaluated and summarised in a Commission report [31] .

In order to allow energy storage to reach its full potential as regards a range of services and variety of technologies, it is important to ensure open and competitive markets for energy storage services. The 'Clean Energy for All Europeans' Package sets out important principles for the non-discrimination of storage, demand response and distributed generation, excluding e.g. market rules which would arbitrarily favour conventional electricity generation.

One important choice made in the recast Electricity Directive was to generally exclude transmission or distribution system operators from owning and operating electricity storage systems. Requiring full unbundling of storage assets aims to address systemic advantages

of system operators which could otherwise discriminate in favour of their own assets compared to competitors, e.g. by procuring system services primarily from their own assets. This risk is even stronger than for most classical generation assets, as energy storage (due to its high flexibility but limited storage capacity) will often earn a higher share of revenues from system services rather than from the direct sale of electricity on the market. Furthermore, system operators could influence the system development and operation in a way so as to require, or reduce, the need for specific system services. Thus, creating own interests of system operators in the developing market for energy storage could become a significant barrier to developing this market and to achieving the objectives of the Energy Union.

Against the above background, Articles 36 and 54 of the recast Electricity Directive generally exclude distribution and transmission system operators from owning, developing, managing or operating energy storage facilities. However, the recast Electricity Directive recognises the possibility for derogations from this exclusion in two cases.

First, subject to regulatory approval, system operators may own and operate fully integrated network components. This derogation is aimed at system components which have been traditionally part of electricity transmission or distribution systems, such as capacitators integrated in substations.

Second, where an energy storage facility is recognised as necessary to ensure that the system operation is efficient, reliable and secure, but this facility is not used to buy or sell electricity, a tendering procedure may be conducted. If in an open, transparent and non-discriminatory tendering procedure, other parties are shown not to be willing or able to deliver those services at a reasonable cost and in a timely manner, the national regulatory authority may grant approval to the system operator to own and operate an energy storage facility. Where a derogation has been granted, the capability of the market to provide those services will be subject to regular review, with a view to phasing out the system operator's activity in that field.

This derogation option gives the NRAs a strong role, requiring them to closely assess any requests for granting derogations. It is important that derogations do not become the norm and remain limited to exceptional circumstances, in order to allow for innovative and efficient energy storage services to be developed in a competitive market. The Commission will support the regulatory authorities in this task and closely monitor implementation.

3. Gas wholesale markets

Currently, around 5000 TWh of natural gas are consumed in the EU each year, which constitutes around 95% of today's total gaseous fuel demand. It accounts for roughly 25% of total EU energy consumption, including around 20% of EU electricity production, and 39% of heat production. Gaseous fuels are a key input for industrial processes, both as energy carrier and feedstock. Gases are one source of flexibility for an energy system increasingly based on variable renewable energy systems generation, and are, together with renewables, progressively replacing both coal and oil.

Well-functioning and liquid markets for gaseous fuels play a crucial role in achieving the environmental ambitions of the European Green Deal [32] , which envisages the decarbonisation of the gas sector via a forward-looking design for competitive decarbonised gas markets. Well-functioning markets are also a prerequisite for ensuring affordable energy for consumers, competitiveness of industries, and security of supply.

3.1. Key indicators: Concentration, liquidity and convergence

Gas wholesale markets have become well developed in recent years. Traded volumes on natural gas hubs rose to an all-time high in 2019. This trend continued into 2020, with traded volumes on the European gas hubs recording a 32% year-on-year increase in Q1 2020 (up to 5 010 TWh). The increase in 2020 can be principally attributed to increasing hedging activity on the markets as prices became more volatile and contract price differences widened also as result of the COVID-19 crisis. The Dutch Title Transfer

Facility (TTF) is developing into a benchmark also for internationally traded liquified natural gas (LNG) [33] .

Connectivity and access to different sources of gas continue to improve as well. Only three markets had access to less than three sources of supply. However, two out of these (Ireland, Denmark-Sweden) are connected to a diversified hub and also score well on the market concentration index (HHI) and the residual supply index (RSI). This leaves only the Latvian-Estonian and Finnish markets below the minimum gas target model indicator.

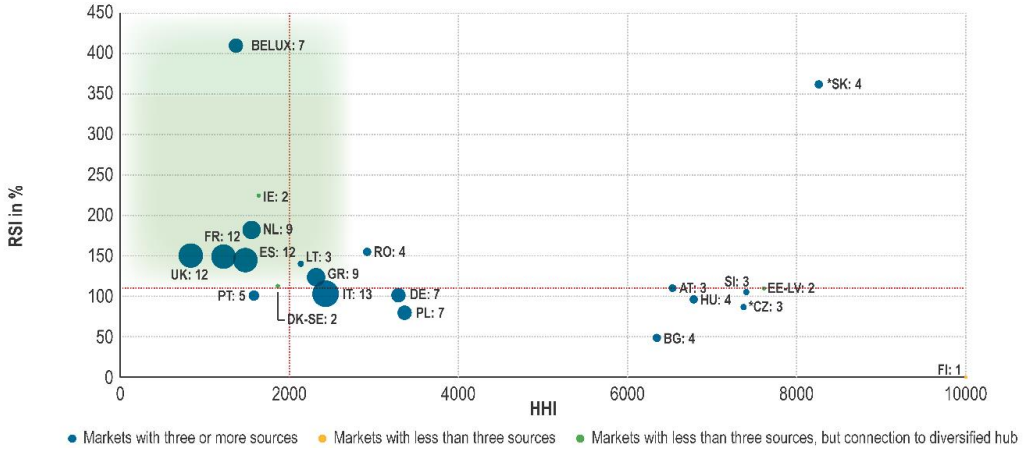

Figure 6 Overview of MSs according to AGTM market health metrics (Upstream company RSI, HHI and number of supply sources) – 2019

Source: ACER calculation based on European Network of Transmission System Operators for Gas (ENTSOG) capacity data, Eurostat and NRAs.

Price convergence had improved over recent years and was highest in north west Europe. However, on a European level it declined in 2019, showing higher price differences between markets on more days during the year. This could be attributed to overall high gas price dynamics in 2019 [34] .

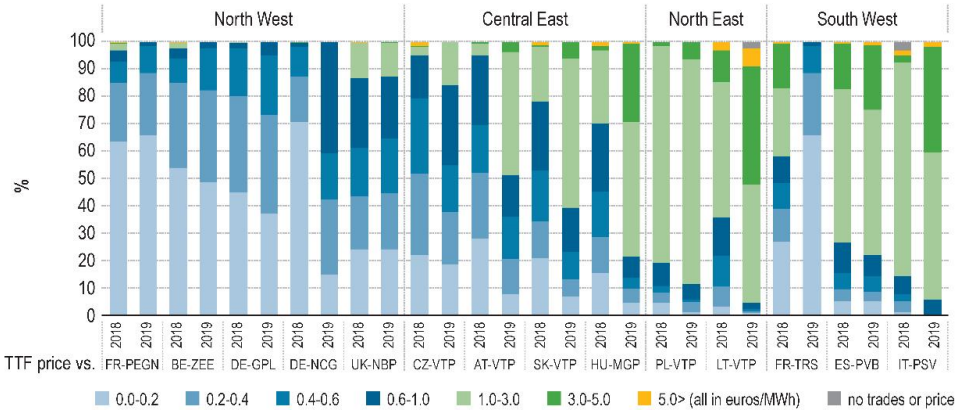

Figure 7: DA price convergence between TTF and selected EU hubs – 2017–2019 - % of trading days within given price spread range

Source: ACER calculation based on Platts and ICIS Heren prices data.

Notes: Spreads in euros/MWh are calculated as the absolute price differential between pairs of hubs, independent of discount or premium.

The sourcing costs for gas supply fell significantly in 2019 in most Member States. This resulted in a substantially lower gas import bill for the EU. Estimates for 2019 indicate an

EU gas import bill totalling EUR 69 bn, an almost 30% reduction reflecting the impact of falling import prices.

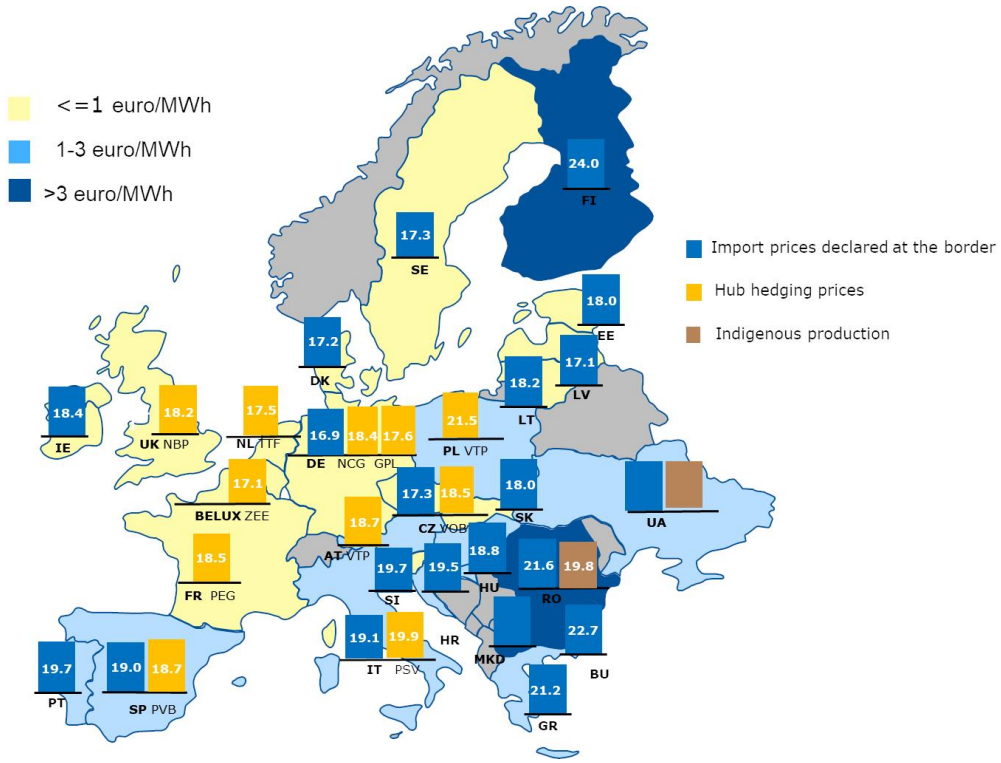

Figure 8: 2019 estimated average suppliers' gas sourcing costs by EU Member States and Energy Community contracting parties and delta with TTF hub hedging prices – euros/MWh

Source: ACER calculation based on Eurostat Comext, ICIS and NRAs from both EU MSs and EnC CPs.

Note: Import prices for AT, NL, FR and PL could not be assessed.

3.2. Key regulatory developments

3.2.1. Market mergers

The Gas Target Model proposes to overcome the segmentation of the internal market, caused, among other things, by the applied entry/exit tariffs and related pancaking [35] , by gradual, voluntary and bottom-up market area mergers. Experience shows that cross-border market mergers do not materialise easily. The deeper the integration, the higher the need to agree on a harmonized set of rules, which makes a full market merger a complex undertaking. Up until now, there is no single example of a full cross-country merger in the EU. There are, however, a few ongoing attempts. The regulatory framework for the regional cooperation and integration in the gas market is relatively weak in comparison to the electricity market. At present, there are no provisions that systematically guide or require the process of market mergers and facilitate regional market integration.

3.2.2. Gas Network codes

The Third Energy Package sets the legal basis for establishing more detailed common European rules in the form of gas Network Codes and Framework Guidelines, with the aim to harmonise and coordinate the different processes of energy markets and systems. Since the entry into force of Regulation 715/2009 [36] in 2011, five Network Codes and Guidelines have been adopted, covering capacity allocation mechanisms (CAM NC [37]), gas balancing rules (BAL NC [38]), congestion management procedures (CMP Guideline [39]),

interoperability between gas systems (IO NC [40]), and transmission tariff structures (TAR NC [41]). The harmonisation of these technical rules has both enhanced the market functioning at national level (in particular BAL NC) and further advanced the interconnection of national gas markets. Notably, CAM NC has fully harmonised the procedure and the calendar for the booking of transmission capacity, which fosters competition and accessibility of national markets. The most recently adopted TAR NC has introduced extensive publication requirements on gas tariff parameters and calculations, which provides additional transparency and tariff predictability for network users across the EU, while highlighting potential tariff outliers. Whereas the implementation of Network Codes is far advanced across Member States [42] , the continued enforcement of these rules by the Commission remains crucial for the completion of the internal energy market.

3.3. Decarbonising the gas sector

The EU Strategy for Energy System Integration [43] and the Hydrogen Strategy [44] adopted by the Commission in summer 2020 set out how the energy markets could contribute to achieving the goals of the European Green Deal, including the decarbonisation of gas production and consumption required in the transition towards climate neutrality.

To enable cost-effective decarbonisation, the Energy System Integration Strategy announces to "re-examine the gas market regulatory framework so as to facilitate the uptake of renewable gases and customer empowerment, whilst ensuring an integrated, liquid and interoperable EU internal gas market."

While renewable and low-carbon hydrogen is currently the headline topic of energy system integration, other renewable and low-carbon gases, such as biomethane, are already today playing an important role in the energy sector.

3.3.1. Integrating bio-methane and small scale producers

Currently, the most significant production of renewable gases in the EU are biogas and biomethane [45] with around 17 bcm annually. There were more than 17000 biogas installations in 2015 [46] and some 500 biomethane plants in the EU are connected to the gas grid. Biogas is mainly used for producing electricity and heat, often under support schemes [47] . Once support schemes end, existing biogas plants may decide to invest into upgrading biogas to biomethane to inject it into the gas grid. [48] Investments in new plants are expected to increase biogas and biomethane production significantly.

The vast majority of today's 500 biomethane plants are connected at the distribution level. In practice, the injection at the distribution level requires consumption by consumers connected to that local grid. In cases of over-supply at distribution level and without possibility to inject gas from the distribution to the transmission level biomethane producers are deprived from access to wholesale markets and cross-border trade. This could distort the level playing field vis-à-vis other gas producers and can be a barrier to scaling up renewable gas production in the future.

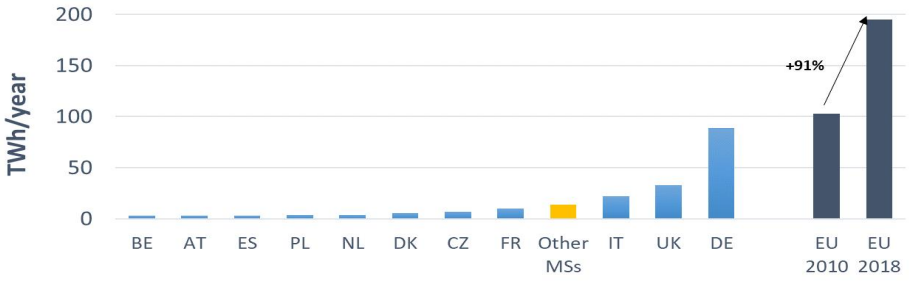

Figure 9: Evolution of biogas and biomethane production in the EU – 2010-2018 – TWh/year

Source: ACER calculation based on Eurostat.

3.3.2. Gas quality issues

The integration of growing volumes of biomethane, LNG and some interest in Member States to blend hydrogen into the natural gas grid poses new challenges for the operation of the gas networks. Issues arise regarding the gas quality, both at transmission and distribution levels, which can affect the design of gas infrastructure, end-user applications and cross-border system interoperability.

Rules on gas quality, i.e. on the chemical and physical properties of gases, ensure the integrity and safety of both the gas infrastructure and of end-appliances (e.g. gas turbines in electricity production, furnaces in industrial process). At the same time, it is essential that gas quality specifications do not hinder the production and transport of renewable and decarbonised gases to consumers. In the past, Member States developed national gas quality standards [49] based on the relatively stable quality of their historical gas sources [50] . For the case that cross-border trade issues arise due to differences in the gas quality or its specification across Member States, the Interoperability and Data Exchange Network Code [51] defines a dispute resolution procedure. This procedure is however, limited to cross-border interconnection points, and is based on general, high level principles of ACER dispute resolution. Beyond divergent national gas quality standards, a European Committee for Standardization ("CEN") standard exists for H-gas quality (EN 16726:2015 [52]) defining the acceptable bandwidth for a number of relevant parameters. However, this CEN gas quality standard is not binding and does not include the Wobbe Index, which is a key indicator of the interchangeability of different gases. To ensure that this important parameter is included in the H-gas standard the Commission invited CEN to propose an acceptable range and rate of change for the Wobbe Index in the EU [53] . This CEN process is still ongoing.

3.3.3. Preparing the market and infrastructure for hydrogen

Hydrogen is enjoying renewed and rapidly growing attention as it offers a solution to decarbonise industrial processes and economic sectors where reducing carbon emissions is both urgent and hard to achieve. Whilst the Third Energy Package applies to all gases that can safely be injected into the gas network, it does not apply to networks transporting pure hydrogen. The Hydrogen Strategy sets out the Commission's vision to support the progressive development of a more hydrogen based EU economy and, inter alia, foresees a revision of the current EU legislation for the gas markets.

Infrastructure use has increased especially for LNG Terminals. Higher utilization of LNG Terminals reflects the competitive position of LNG against pipeline gas.

Figure 6: Daily send-out utilisation rates in EU countries with operational LNG terminals[14,15, 16]

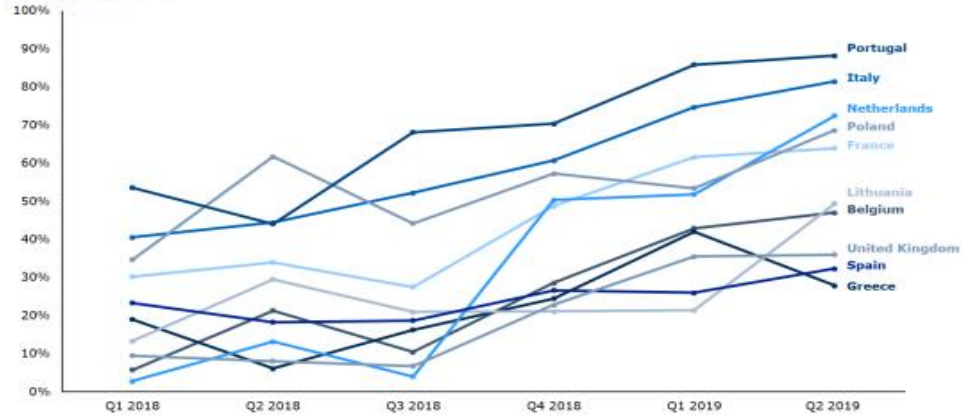

Figure 10: Daily send-out utlilisation rates in EU countries with operational LNG terminals

Source: Figure 6 of Trinomics Study on Gas market upgrading and modernisation – Regulatory framework for LNG terminals, May 2020

Regulation (EU) 347/2013 (TEN-E) [54] obliges the ENTSOs for gas and electricity to use joint scenarios for their respective Ten-Year Network Development Plans (TYNDPs). The ENTSOs have worked together to develop these scenarios jointly for the TYNDP 2020. Scenario work is not only undertaken to test future electricity and gas infrastructure needs and projects but also captures the interactions between the gas and electricity systems to assess the infrastructure of a hybrid energy system.

The Energy System Integration Strategy identified the review of the scope and governance of the TYNDP to ensure full consistency with the EU's decarbonisation objectives and cross-sectoral infrastructure planning as part of the revision of the TEN-E Regulation (2020) and other relevant legislation (2021).

4. Retail Markets

4.1. Market concentration

4.1.1. Electricity

Regarding electricity market, the main retailers across the EU have been losing market shares. In 2018, the share of the largest retailers dropped in 16 Member States in comparison to 2017. On the other hand, the number of retailers dropped in 13 Member States and increased only in nine of them, and market concentration increased in six Member States.

In Czechia, Greece, Portugal, Slovakia and Spain the number of retailers grew, while the main market players lost market shares. This is an indication for increased consumer choice and competition. On the other hand, in Belgium, Estonia, Finland, Lithuania and Sweden the number of retailers dropped and the market share of main players increased. In Cyprus, Greece and Malta, there is still only one retailer on the market. In Croatia, two main players cumulate 88 per cent of the market between them.

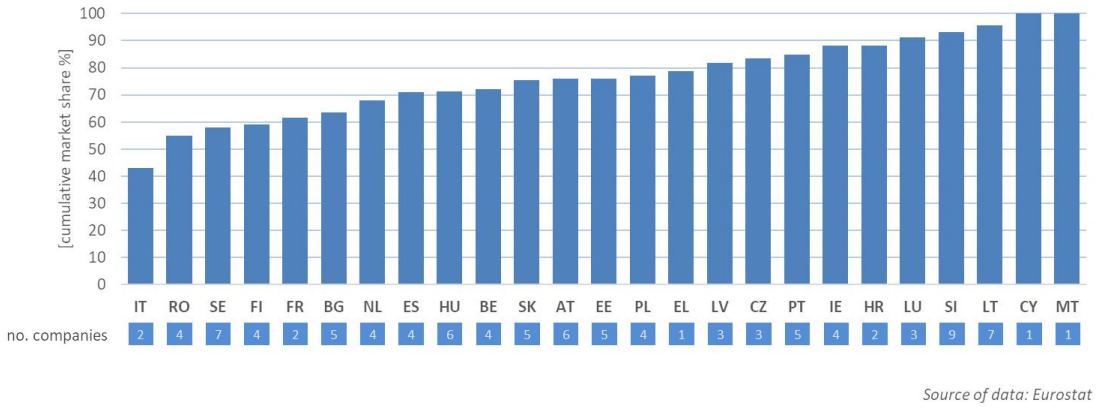

Figure 11: Main electricity retailers and their cumulative market shares in 2018

Source: DG ENER country datasheets based on Eurostat surveys on electricity markets indicators.

4.1.2. Gas

Regarding gas markets, in 2018 the main retailers have lost market shares in 13 Member States and gained ground only in nine. On the other hand, the number of retailers dropped in 14 Member States and increased only in six of them.

In Austria, Latvia and Lithuania the number of retailers grew, while the main market players lost market shares. In Hungary dominant players also lost market shares, but the number of players remained unchanged. In Estonia the main retailer still held 90 per cent of the market. In Italy, Poland and the UK the market concentration increased as the number of retailers dropped while the main players gained market shares.

In Bulgaria, Latvia, Lithuania and Poland only two companies share most of the retail market. Conversely, there are at least six main retailers in Austria, Belgium, Czechia, Greece, Ireland, Portugal, Romania and Slovenia.

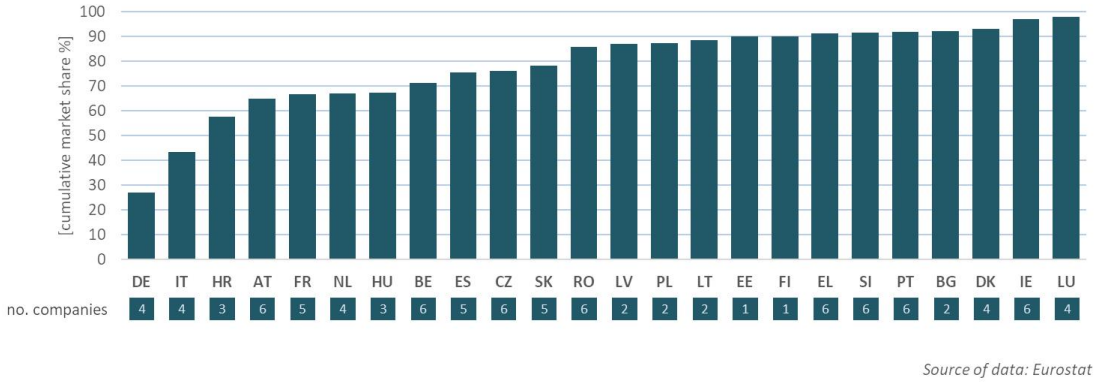

Figure 12: Main gas retailers and their cumulative market shares in 2018

Source: DG ENER country datasheets based on Eurostat surveys on natural gas markets indicators .

In Estonia and in the isolated Finnish market, there is still just one retailer dominating the market. The biggest retailers also hold majority of the market in Latvia and Lithuania. On the other hand, the biggest company does not hold more than 30 per cent of the market in Belgium, Czechia, Italy and Romania.

Figure 13: Market share of largest natural gas retailer in 2018

Source: DG ENER country datasheets based on Eurostat surveys on natural gas markets indicators .

4.2. Retail prices (including price components)

4.2.1. Electricity prices

Progress with the single energy market continued insofar as differences between energy components in individual Member States become smaller than before. They became 14% and 9% less spread out since 2010 for households and industrial consumers respectively [55] . This contributed to rising convergence in total retail prices which can be observed since 2016. The convergence however was accompanied by a long-term retail electricity price increase. Between 2017 and 2019 the average EU 27 retail price for households went up by 4 per cent continuing its upward trend since 2010 [56] .

Electricity prices for household consumers ranged from EUR 98/MWh in Bulgaria to EUR 295/ MWh in Denmark. The average price for EU28 was EUR 217/MWh [57] . Denmark and Germany reported the highest tax components of almost EUR 190 and 156/MWh respectively, which accounted for more than half of the total retail price in 2019. On average, price components which are not the result of competition but set by regulators (e.g. regulated network charges, taxes and levies) still dominate the retail price. This hampers the efforts to empower consumers to actively participate in the electricity market, e.g. by adjusting their demand or activating self-generation, benefiting from the differences in demand and supply [58] . The lowest taxes on electricity, both in absolute and relative terms, were assessed in Malta (EUR 8/MWh) [59] . Belgium recorded the highest network component of EUR 109/MWh in 2019. On the opposite side of the spectrum, Malta and Bulgaria had the lowest network charges (EUR 25/MWh) [60] . The largest energy components were reported in the island systems of Ireland (EUR 125/MWh), Cyprus (EUR 124/MWh) and Malta (EUR 97/MWh). The lowest values of the energy component were recorded in Hungary (EUR 42/MWh) and Poland (EUR 43/MWh), markets with stronger forms of price regulation [61] .

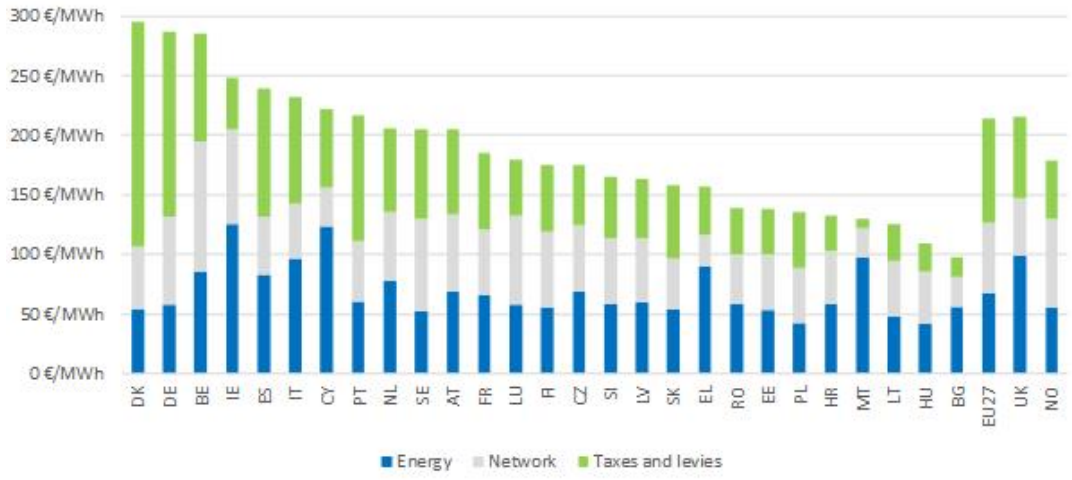

Figure 14 Household electricity prices in the EU in 2019 (DC band)

Source: Report on Energy prices and costs in Europe COM(2020)951.

4.2.2. Gas Prices

The evolution of prices in the gas market also proves there is a progress with the Internal Market implementation. Retail gas prices for household customers increased by 2.1% annually between 2010 and 2019, whereas for medium level industrial customers prices rose only slightly, by 0.1% and for large industrials prices decreased by 1.3% [62] .

Gas prices for household consumers ranged from EUR 33/MWh in Hungary to EUR 116/MWh in Sweden [63] . In Denmark the share of the energy component was the lowest (barely 26% in 2019), whereas the taxation share was the highest (EUR 41/MWh) [64] . Consumers in Luxembourg had to spend the least for taxes and levies. The highest network components for household natural gas prices were reported in Portugal in 2019 [65] .

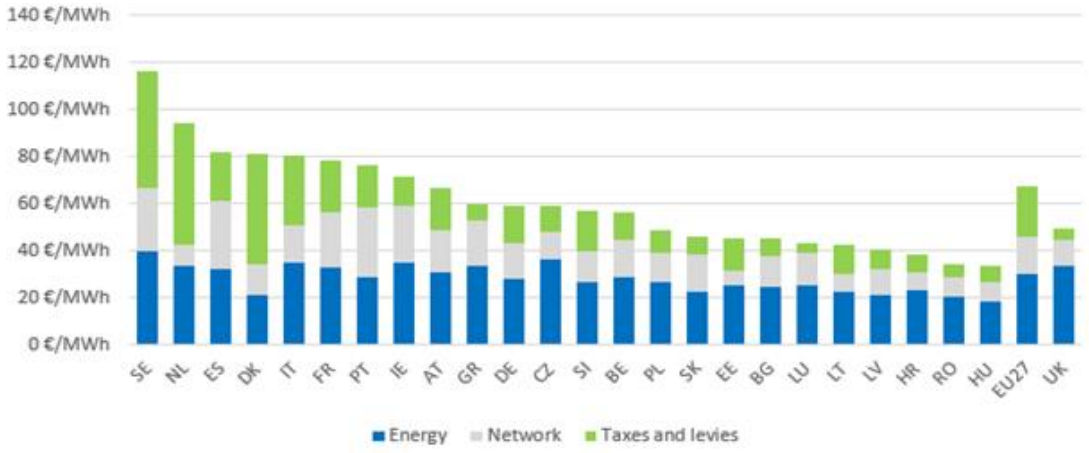

Figure 15: Household gas prices in 2019 (DC band)

Source: Report on Energy prices and costs in Europe COM(2020)951.

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4.3. State interventions in retail electricity and gas prices

In 2018, 14 countries reported a direct intervention in the retail electricity price setting mechanism in the household segment. For the non-household segment, 8 reported such mechanisms. For gas prices, 11 countries reported intervention in the household segment and 5 in the non-house segment [66] . There was clear progress in the non-household segment of the energy market, as the volume of both gas and electricity effected by regulated prices has decreased. On the other hand, progress in the household segment was very limited.

4.3.1. The household segment

End-user price regulation of electricity applied to households in nine countries (Bulgaria, Cyprus, France, Hungary, Lithuania, Malta, Spain, Poland and Portugal) [67] and of gas in eight (Bulgaria, Croatia, France, Hungary, Latvia, Poland, Portugal and Spain). In the UK and Belgium, the price intervention concerned only the special price mechanisms for vulnerable customers.

In Bulgaria, Lithuania and Malta in electricity and Bulgaria and Poland in gas, 100 per cent of the households are supplied under a price intervention mechanism. In Hungary and Poland, the percentage of households in the country affected by price intervention is above 90 per cent in electricity, and for Croatia and Hungary in gas.

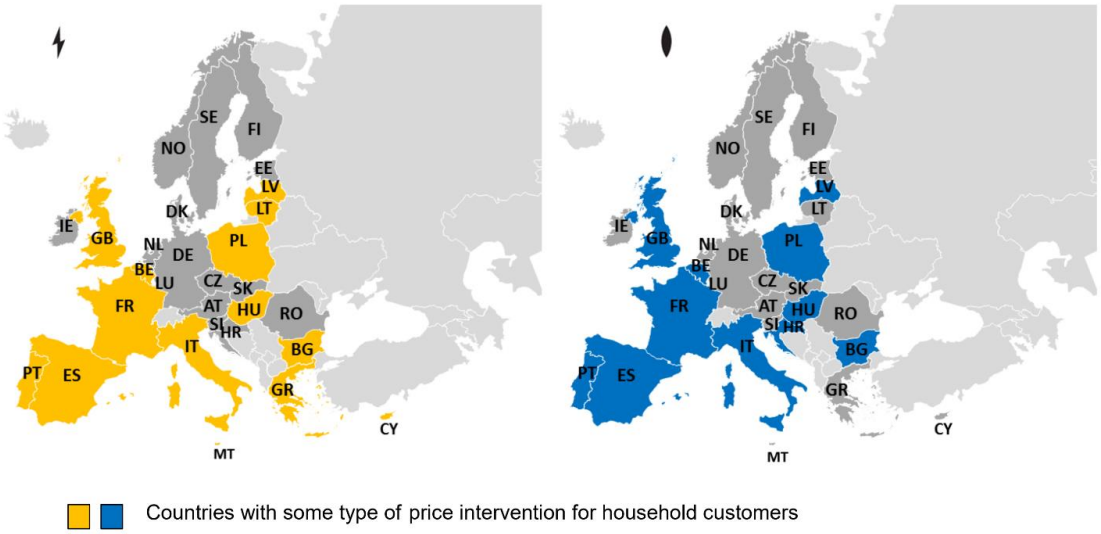

Figure 16: Existence of price intervention in electricity and gas in 2018 (household)

Source: Monitoring Report on the Performance of European Retail Markets in 2018, CEER Report.

4.3.2. The non-household segment

End-user price regulation of electricity existed in six countries (Bulgaria, Cyprus, France, Hungary, Malta and Portugal) and in four countries of gas (Bulgaria, France, Hungary and Portugal) [68] . In Cyprus and in Malta all of the non-household electricity consumers were supplied under regulated prices. In the other four countries, in terms of consumption, less than 10 per cent of non-households paid regulated prices [69] . In all countries the share of non-household customers under regulated prices has recorded a drop.

As regards gas prices, in Bulgaria, all non-household consumers were supplied under regulated prices. On the other hand, regulated consumption was negligible in Portugal and France [70] . As for electricity, the share of gas consumed under regulated prices in the non-household tariff group has decreased.

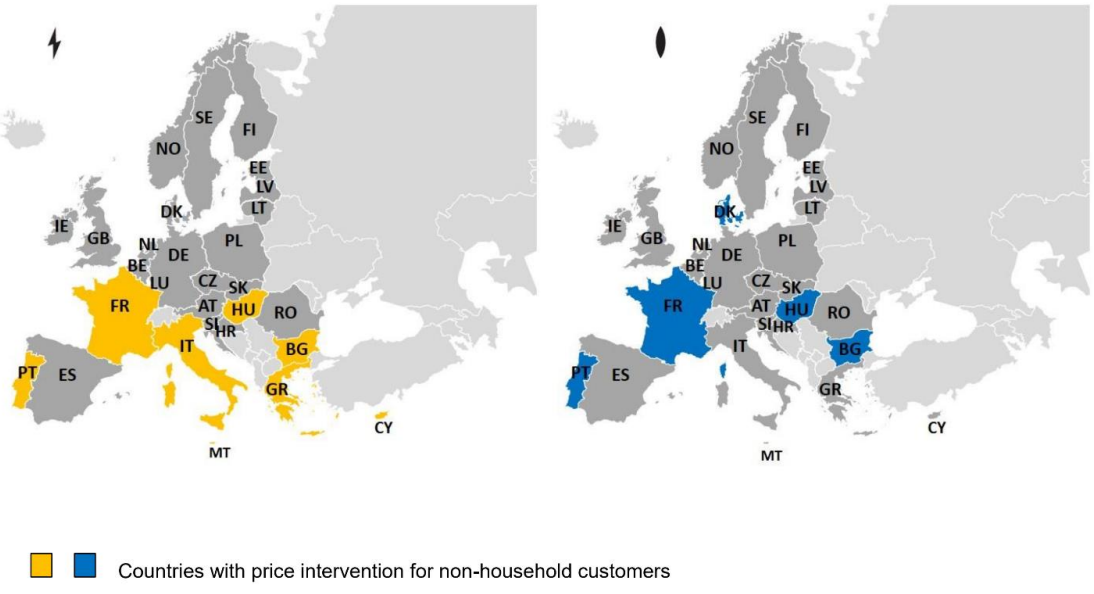

Figure 17: Existence of price intervention in electricity and gas in 2018 (non-household)

Source: Monitoring Report on the Performance of European Retail Markets in 2018, CEER Report.

4.4. Consumer protection and empowerment

The recast Electricity Directive, adopted in 2019 as part of the 'Clean Energy for all Europeans Package', aims to ensure a competitive, consumer-centred, flexible and non-discriminatory EU electricity market. It places the consumer at the centre of the clean energy transition and further strengthens consumer rights, including active participation in the energy market, shorter switching times, access to price comparison tools and smart meters, and clearer and more frequent energy bills.

The recast Electricity Directive also enables consumers to participate actively in the energy market, by producing their own energy at home and selling it. This may dramatically change the electricity system, although residential consumers who produce and consume electricity in their homes – mainly through photovoltaic (PV) panels - have already existed in some Member States [71] . However, despite the increased use of PV panels, consumer participation in the energy market remained low prior to the adoption of the recast Electricity Directive [72] .

The recast Electricity Directive aims to facilitate and speed up switching of suppliers. It enables consumers to switch electricity suppliers within three weeks. By 2026, this will be possible within 24 hours. Changing suppliers is free of charge, except for early termination of fixed-term contracts. In most Member States, the legal maximum duration of an electricity and gas switch was 3 weeks or 15/18 working days (according to data from 2018). However, actual switching times were still longer in some countries [73] . Switching within 24 hours was only possible in Italy [74] . Overall, household switching rates have increased for gas and electricity in most Member States in 2018. For electricity, no or almost no switching was reported in three countries, while two only had one supplier and switching was not possible [75] .

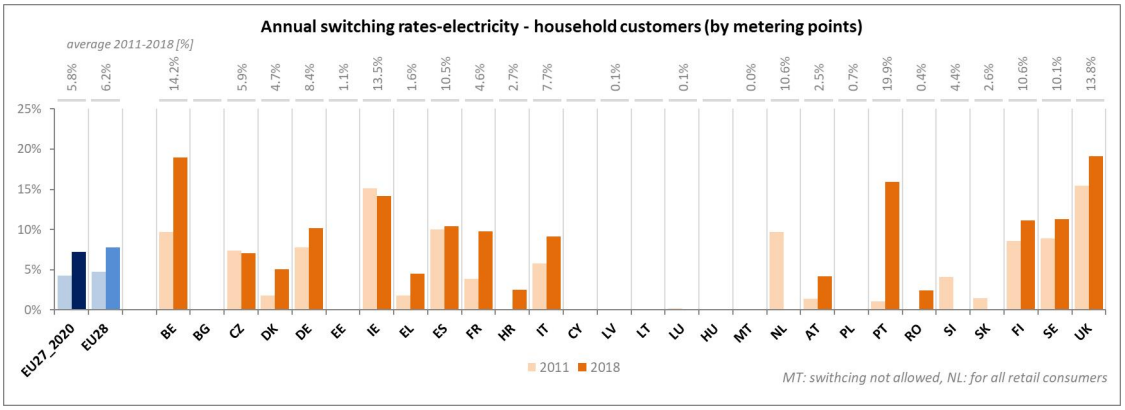

Figure 18: Annual switching rates – electricity - household customers (by metering points)

Source: CEER Monitoring Reports on the Performance of European Retail Markets [76]

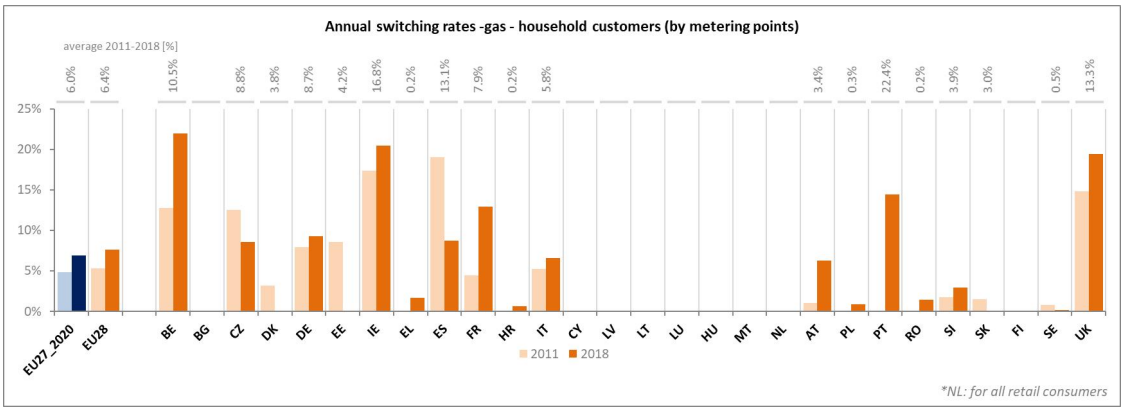

Figure 19: Annual switching rates – gas - household customers (by metering points)

Source: CEER Monitoring Reports on the Performance of European Retail Markets

According to a 2018 survey, consumers' main concerns with utility markets were choice and comparability [77] . Consumers faced difficulties with comparing gas and electricity offers, especially what regards the main features of the offer and conditions for terminating the contract [78] . When asked about options to increase comparability some customers expressed a preference for a standardised format for offers. The new rules require suppliers to present information about energy consumption and costs on every bill in a clear and easily understandable way. Information should be presented in a way to facilitate comparison by customers. In addition, the recast Electricity Directive helps consumers make more informed choices by introducing the requirement to put in place reliable comparison tools. Consumers have a right to access at least one price comparison tool that is free of charge and meets minimum quality standards.

The recast Electricity Directive grants consumers the right to request a smart meter that shows energy consumption and the cost in real time and that can be read remotely. Consumers can also opt for dynamic price contracts. Smart meters and dynamic pricing would be underpinned by the foreseen implementing acts on data interoperability. They will be instrumental in assisting customers as well as new service providers to get actively involved in the market and navigate it with more confidence.

In 2018, there were around 99 million smart electricity meters across the EU or 34 per cent of all electricity metering points, compared to around 12 million smart meters for gas [79] .

In the same year, 12 countries reached at least 50 per cent roll-out of electricity smart meters. At the same time, seven states decided not to implement the roll-out of smart meters [80] . By the end of 2019, more than 80 per cent of consumers in Luxembourg should have received electricity smart meters, followed by Denmark, Austria, France and Great Britain in 2020.

The roll-out of gas smart meters remains limited, with only 5 countries having commenced it by 2018.

Among the important issues facing some energy consumers on the internal market is energy poverty. To support Member States in their efforts to tackle it, the Commission has issued guidance on energy poverty along this document [81] . It also continues to support the European Energy Poverty Observatory that collects data, develops indicators and disseminates best practices for tackling energy poverty.

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(1)

European Council conclusions, 12-13 December 2019 EUCO 29/19.

(2)

Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity OJ L 158, 14.6.201.

Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU.

Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators OJ L 158, 14.6.2019, p. 22–53.

(3)

This report fulfils the obligations as outlined in Article 35 (2) (f) (g) and (k) of 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, OJ L 328, 21.12.2018, p. 1–77.

(4)

Article 52 (1) of Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning the common rules for the internal market in natural gas, OJL 211, 14.8.2009, pp. 94-136 (“Gas Directive”) and Article 47 (1) of Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, OJ L 211, 14.8.2009, p. 55–93 (“Electricity Directive”). Together both the Gas and Electricity Directives are also referred in the Report as the Third Energy Package. Article 47 (1) of has been recast by Article 69 (1) of Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity OJ L 158, 14.6.2019, p. 125–199 (“recast Electricity Directive”).

(5)

See previous progress reports, e.g. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘Progress towards completing the Internal Energy Market’ of 13.10.2014, COM(2014) 634 final, p.2 - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0634&qid=1558357809501&from=EN .

(6)

See also ACER/CEER Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2018, Electricity Wholesale Markets Volume, November 2019.

(7)

Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Energy prices and costs, Section trends in energy prices COM(2020)951.

(8)

In most competition decisions of the Commission, electricity wholesale markets (e.g. generation and supply of electricity, ancillary services markets) are still defined as national in scope in most cases, see e.g. COMP/M.8660 - Fortum/Uniper; see previously e.g. COMP/M.5979 – KGHM/TAURON Wytwarzanie/JV, para. 24; COMP/M.5711 – RWE/Ensys, para. 21; COMP/M.4180 – GDF/Suez, para. 726.

(9)

End-user electricity price regulation is still applied to households in nine Member States, and end-user gas price regulation in eight. In the non-household sector, end-user electricity price regulation existed in six Member States and gas price regulation in four Member States.

(10)

Of final electricity trades, market coupling contributed to an increase from 60% in 2010 to 87% in 2018 of the amount of trades going in the right direction i.e. from lower to higher priced areas. This delivers an affordable model for the energy transition ensuring that least-cost electricity can be dispatched around Europe for the benefit of consumers.

(11)

Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management, OJ L 197, 25.7.2015, p. 24–72.

Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation, OJ L 259, 27.9.2016, p. 42–68.

Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, OJ L 312, 28.11.2017, p. 6–53.

Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration, OJ L 312, 28.11.2017, p. 54–85.

Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection, OJ L 223, 18.8.2016, p. 10–54.

Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators, OJ L 112, 27.4.2016, p. 1–68.

Commission Regulation (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules, OJ L 241, 8.9.2016, p. 1–65.

Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation, OJ L 220, 25.8.2017, p. 1–120.

(12)

The network codes use speak about 'terms, conditions or methodologies' to be developed by grid operators or power exchanges.

(13)

In case of disagreement about a method, national regulators decide within with the help of ACER with a 2/3 majority.

(14)

See e.g. ACER, Monitoring report on the implementation of the CACM Regulation and the FCA Regulation of 31 January 2019, page 61 & Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2017-Electricity Wholesale Markets Volume, 18 October 2018, page 46.

(15)

Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, OJ L 158, 14.6.2019, p. 54–124 ("recast Electricity Regulation")

(16)

See references to ACER monitoring reports in the footnote 14

(17)

https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=1_39351

(18)

https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=1_40461

(19)

Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity, OJ L 211, 14.8.2009, p. 15–35.

(20)

Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management, OJ L 197, 25.7.2015, p. 24–72.

(21)

The 70% are calculated respecting so-called operational security limits (generally understood as the maximum flow on an interconnector). The most straightforward way to understand the target is to consider what the 30% covers; this is a maximum limit for the deductions that TSOs can make for loop flows, internal flows and reliability margins. The rest should be made available to the regional capacity calculator for trade and security deductions at regional level where needed (e.g. to meet the N-1 security standard in the flow-based process). It is important to note that, under this framework, TSOs always retain control of the system and have the ability to take any action needed to maintain operational security of the system.

(22)

ACER has issued a recommendation on how to monitor the new 70% target, see Recommendation 01/2019: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf ; three Member States have so far opted to implement an Action Plan to reduce internal congestion, while several more are considering a reconfiguration of their bidding zones through the current bidding zone review, see: 2019 BZR methodology and assumptions as submitted to NRAs: https://www.entsoe.eu/news/2019/10/07/bidding-zone-review-methodology-assumptions-and-configurations-submitted-to-nras/

(23)

See in more detail the Communication from the Commission 'Delivering the internal electricity market and making the most of public intervention' of 5.11.2013, C(2013) 7243 final.

(24)

Article 20 (4) recast Electricity Regulation.

(25)

Article 20 (6) recast Electricity Regulation.

(26)

Article 22 recast Electricity Regulation.

(27)

Those can be found under the following link: https://ec.europa.eu/energy/topics/markets-and-consumers/capacity-mechanisms_en#commission-opinions-and-consultations

(28)

OPINION No 22/2019 OF ACER of 17 December 2019 on the calculation of the values of CO2 emission limits referred to in the first subparagraph of Article 22(4) of Regulation (EU) 2019/943 of 5 June 2019 on the internal market for electricity (recast).

(29)

Study on energy storage – Contribution to the security of the electricity supply in Europe, see https://op.europa.eu/en/publication-detail/-/publication/a6eba083-932e-11ea-aac4-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=37085&WT.ria_f=3608&WT.ria_ev=search

(30)

Annex 2 to the Communication Europe on the move Sustainable Mobility for Europe: safe, connected, and clean

COM/2018/293 final.

(31)

Commission report on the Implementation of the Strategic Action Plan on Batteries: Building a Strategic

Battery Value Chain in Europe, COM(2019) 176 final.

(32)

Communication from the Commission – The European Green Deal, COM(2019) 640 final ("European Green Deal").

(33)

European Commission Quarterly Report on European Gas Markets Q1/2020 .

(34)

See the European Commission quarterly gas market monitoring report for more details .

(35)

Accumulation of tariffs to be paid by traders when shipping gas through several borders.

(36)

Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks, OJ L 211, 14.8.2009, p. 36–54.

(37)

Regulation 2017/459/EU establishing a network code on capacity allocation mechanisms in gas transmission systems, OJ L 72, 17.3.2017, p. 1–28.

(38)

Regulation 2014/312/EU establishing a network code on gas balancing and transmission networks, OJ L 91, 27.3.2014, p. 15–35.

(39)

Guidance on best practices for congestion management procedures in natural gas transmission networks [SWD(2014) 250].

(40)

Regulation 2015/703/EU establishing a network code on interoperability and data exchange rules, OJ L 113, 1.5.2015, p. 13–26

(41)

Regulation 2017/460/EU establishing a network code on harmonised transmission tariff structures for gas, OJ L 72, 17.3.2017, p. 29–56.

(42)

Cf. ACER Implementation Reports on individual Network Codes at https://acer.europa.eu/Official_documents/Publications/Pages/Publication.aspx .

(43)

Communication from the Commission - Powering a climate-neutral economy: An EU Strategy for Energy System Integration COM(2020) 299 final (“Energy System Integration Strategy”).

(44)

Communication from the Commission - A hydrogen strategy for a climate-neutral Europe, COM(2020) 301 final (“Hydrogen Strategy”).

(45)

Biogas is about 60% methane, 40% CO2 + some impurities. Upgrading biogas to biomethane level requires removal of CO2 and impurities. If used and, more importantly, stored the CO2 obtained in production of biomethane from biogas is sometimes argued to create ‘negative’ emissions.

(46)

In-depth analysis in support on the COM(2018) 773: A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. Chapter 4.2.

(47)

This is due to subsidy schemes as well as additional cost in case of upgrading it to biomethane for grid injection.

(48)

According to ÖSTERREICHISCHE VEREINIGUNG FÜR DAS GAS- UND WASSERFACH (2019) and its report Kostenbetrachtung der Einbindung existierender Biogasanlagen in das österreichische Gasnetz 74 out of 301 biogas plants in Austria could be connected with an expected EUR 100m investment, injecting 16.813 Nm3/h.

(49)

A gas quality specification describes acceptable limits for various characteristics of a gas in order to ensure safety and the integrity of the infrastructure, and to prevent a negative impact on particular applications. Standards imply establishing the width of boundaries of main gas quality parameters. Wide boundaries give flexibility to the sourcing of gases (i.e. from different production sites, renewable gases, hydrogen) while narrow boundaries ensure that the properties of the gas consumed by an end-user are fully defined and allow safe operation and process optimization.

(50)

The sources of natural gas are stable for each Member States but differ when comparing across the EU, including indigenous gas production (main producers are the UK, the Netherlands, Romania, Germany and Denmark), pipeline gas from Russia and Norway as well as from North Africa, LNG from Qatar, Russia and the US. The variety of different sources of gas flowing into Europe means also a corresponding variety of gas qualities. For recent detail data see DG Energy Quarterly Report on European Gas Markets, Volume 14, Q4 2019.

(51)

Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules, OJ L 113, 1.5.2015, p. 13–26.

(52)

This standard was developed based on European Commission Mandate M/400 for H-gas quality.

(53)

Via extension of the standardisation Mandate M/400.

(54)

Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure, OJ L 115, 25.4.2013, p. 39–75.

(55)

Commission Staff Working Document accompanying the document Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Energy prices and costs in Europe, SWD (2020)951(“SWD, Energy Prices and Costs in Europe”).

(56)

SWD, Energy Prices and Costs in Europe.

(57)

SWD, Energy Prices and Costs in Europe.

(58)

See in this context also recital 38 of the Electricity Directive 2019/944: “In order to maximise the benefits and effectiveness of dynamic electricity pricing, Member States should assess the potential for making more dynamic or reducing the share of fixed components in electricity bills, and where such potential exists, should take appropriate action.”

(59)

SWD, Energy Prices and Costs in Europe.

(60)

SWD, Energy Prices and Costs in Europe.

(61)

SWD, Energy Prices and Costs in Europe.

(62)

SWD, Energy Prices and Costs in Europe.

(63)

SWD, Energy Prices and Costs in Europe.

(64)

SWD, Energy Prices and Costs in Europe.

(65)

SWD, Energy Prices and Costs in Europe.

(66)

Monitoring Report on the Performance of European Retail Markets in 2018, CEER Report, Ref: C19-MRM-99-02

04 November 2019, p. 53. [CEER 2018 Monitoring Report].

(67)

CEER 2018 Monitoring Report, p. 55.

(68)

CEER 2018 Monitoring Report, p. 60.

(69)

CEER 2018 Monitoring Report, p. 60.

(70)

CEER 2018 Monitoring Report, p. 61.

(71)

ACER Market Monitoring Report 2018 – Consumer Empowerment, Volume, 2019 , p. 30.

(72)

According to a 2018 report, only 13 NRAs reported the use of PV panels among household consumers; ACER Market Monitoring Report 2018 –Consumer Empowerment, Volume, 2019, p. 31.

(73)

ACER Market Monitoring Report 2018 –Consumer Empowerment Volume, 2019, p. 28-29.

(74)

ACER Market Monitoring Report 2018 –Consumer Empowerment Volume, 2019, p. 29.

(75)

CEER 2018 Monitoring Report, p. 29-30.

(76)

Available at: https://www.ceer.eu/1765

(77)

European Commission, DG Justice and Consumers, Consumer Markets Scoreboard: Making markets work for consumers , 2018 edition, p. 38.

(78)

European Commission, DG Justice and Consumers, Consumer study on “Pre-contractual information and billing in the energy market - improved clarity and comparability ” , 2018, p. 208.

(79)

ACER Market Monitoring Report 2018 –Consumer Empowerment Volume, 2019, p. 23.

(80)

ACER Market Monitoring Report 2018 –Consumer Empowerment Volume, 2019, p. 24.

(81)

Recommendation on energy poverty C(2020)9600.

EUROPEAN COMMISSION

Brussels,
14.10.2020

COM(2020) 950 final

ANNEX
to the

REPORT TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

2020 report on the State of the Energy Union pursuant to Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action

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Annex – Energy subsidies in the EU

1. Introduction

The Regulation on the Governance of the Energy Union and Climate Action ('the Governance Regulation') requires the Commission to report each year on 'Member States' progress towards phasing out energy subsidies, in particular fossil fuel subsidies' [1] .

This Annex responds to the requirement by reporting on the EU's efforts to phase out these subsidies. This in line with the commitments in the Paris Agreement [2] , the G7 [3] and G20 [4] conclusions/commitments and as reflected in the European Green Deal communication principle of "do no harm" recalled in Next Generation EU.

Monitoring and analysing subsidies is important as the subsidy measures can influence the uptake of new technologies in the energy sector and consumption of different energy sources, and can imply a significant burden on households and businesses. Depending on how subsidies are structured, they can be a barrier to or an enabling factor for promoting energy system integration and, more broadly, the decarbonisation of the energy system. Energy prices are also affected as subsidies can impact the income of energy consumers and the supply of energy products.

Fossil fuel subsidies are costly for the public budgets and undermine the green transition. In many cases they go against incentives for investments in green technologies, and do not contribute to levelling the playing field of all energy sources, including renewable energy. In order to support efforts to phase out fossil fuel subsidies, the Commission and Member

States have stepped up the monitoring process for energy subsidies in recent years, and fossil fuel subsidies in particular. This report is therefore based on two sources. First, a comprehensive study prepared for the Commission ('the study') [5] that covers the EU Member States and all major energy sources across different economic sectors. Second, information from the Member States included in the national energy and climate plans (NECPs) to report on energy subsidies, particularly on fossil fuels and progress made on phasing them out.

This Annex looks into various types of subsidies, including measures related to energy production, demand, energy efficiency, infrastructure and R&D. It sheds light on subsidies across energy, transport, households and industries. However, the subsidies reported by Member States in their NECPs only cover a narrower range. This stems from the fact that there is currently no standard definition of energy subsidies across the EU, leaving the Member States with considerable freedom in reporting practices. In a number of NECPs, the information on subsidies is also fragmented or not included at all.

This year's report confirms that in spite of positive developments in some Member States, the overall amount of energy subsidies, especially fossil fuel subsidies, that adversely impact the attainment of climate neutrality and broader Green Deal objectives, such as air quality and health, continues to increase slightly. However, some Member States - Austria, Denmark, Estonia and Hungary - went against this overall trend reducing their fossil fuel subsidies significantly.

The COVID-19 pandemic has called for adequate measures to ensure a resilient recovery in the EU Member States. Currently, no solid evidence-based data are available to assess the impact of COVID-19 on subsidies. Initial estimations suggest however that the crisis might have led to additional energy subsidies, including those for fossil fuels.

This issue will be addressed in more details in next year's report.

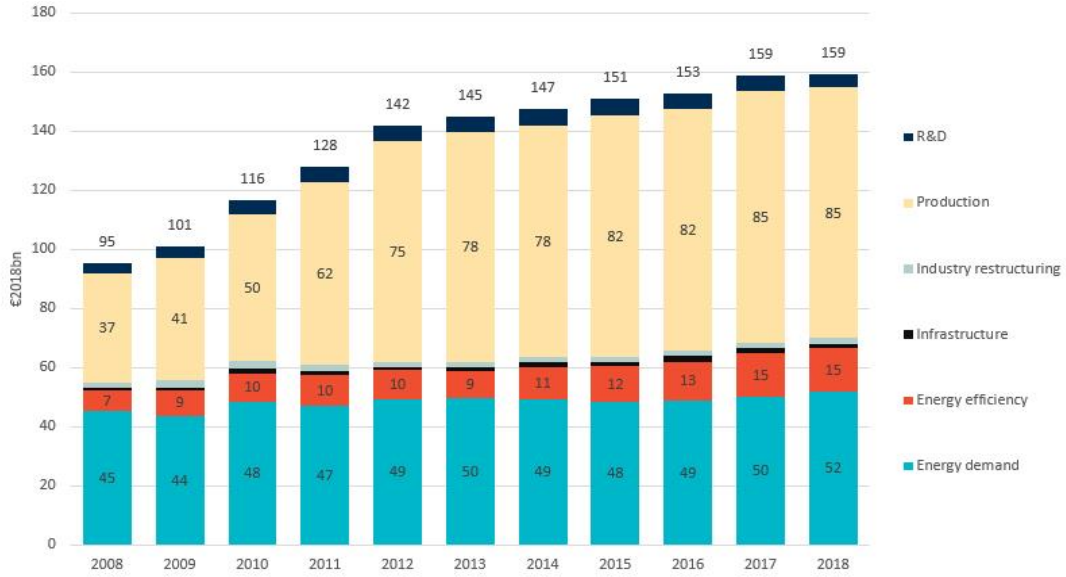
2. Energy subsidies and fossil fuel subsidies in the EU

2.1. Energy subsidies in the EU

In this report, energy subsidies are deemed to exist if there is a financial contribution by a government or any public body within the territory of a Member State [6] , following the same concept used in the Commission study. Energy subsidies can be provided in various forms, such as the direct transfer of funds (e.g. grants, loans), government revenue foregone (e.g. tax incentives and credits), the provision of goods and services, payments to funding mechanisms and income or price support.

Overall, total energy subsidies in the EU were estimated at EUR159 billion in 2018 [7] .They have been increasing in the last decade, although the increase has slowed down, growing only by 5% since 2015. Although in the last decade increase in subsidies was largely driven by support for renewable energy, this grew only by 4% since 2015. Energy efficiency subsidies have increased by 21% since 2015, contributing to investments in moderating energy demand. Energy demand subsidies, which incentivise energy consumption (e.g. in the form of tax breaks or income support), grew by 8% during the same period.

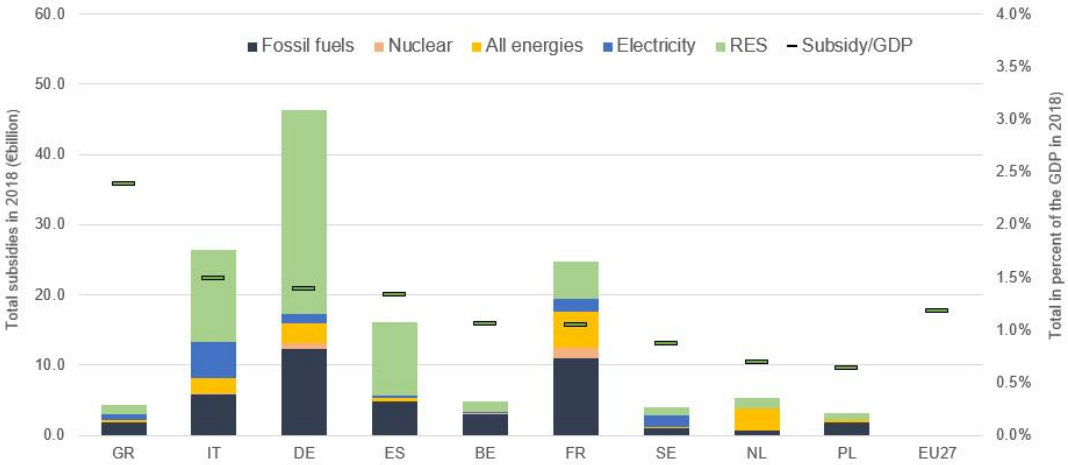
Figure 1 – Evolution of energy subsidies in the EU by purpose

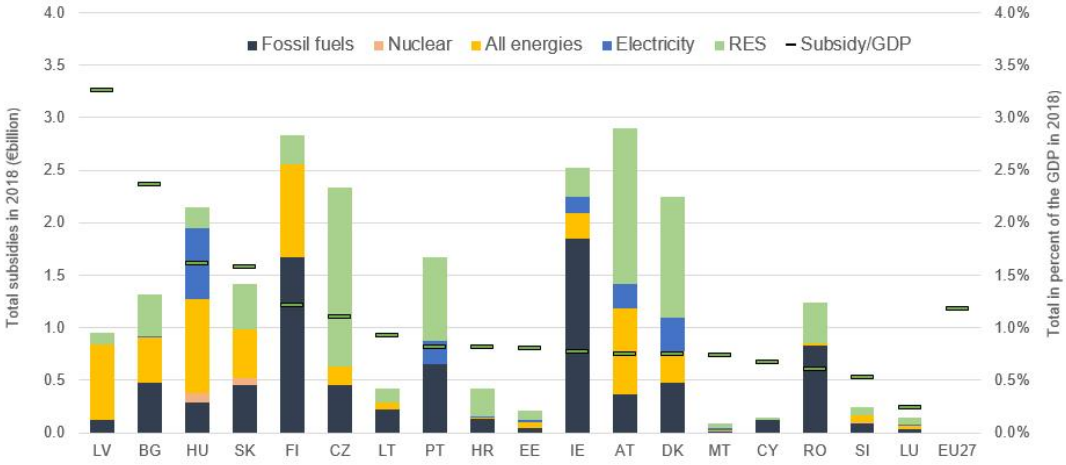


Source: Study on energy costs, taxes and the impact of government interventions on investments

In 2018, the ratio of energy subsidies to GDP varied between 3.3% in Latvia to 0.2% in Luxembourg, with the EU average was 1.2%. However, the major subsidy types also varied. For instance, in Latvia, subsidies primarily supported energy efficiency measures, while in Germany, almost two-thirds of the total volume of subsidies supported renewables. In France, Belgium, Poland, Greece, Ireland and Finland, the highest shares were spent on fossil fuels (although in absolute terms, the fossil fuel subsidies in France were slightly lower than in Germany).

Figure 2 – Energy subsidies in absolute amounts and as percentage of the GDP in the EU Member States in 2018





Source: Study on energy costs, taxes and the impact of government interventions on investments Electricity refers to general non-technology specific support for electricity, while all energies refers to measures that cannot be assigned to a single technology (or multiple technology support).

Most of the subsidies in 2018 occurred [8] in the energy sector (EUR92 billion), followed by industry (EUR20 billion), households (EUR17 billion), transport (EUR13 billion), and agriculture (EUR5 billion) in 2018.

Renewable energy received almost three-quarters of the subsidies in the energy sector, showing the continued importance of renewable subsidies in supporting their deployment in the energy sector. In recent years, the importance of subsidy instruments has decreased for new projects primarily due to the falling investment costs of wind and solar generation, leading to lower renewable subsidy growth in the EU. The three most important renewable technologies (solar, wind and biomass) received 30%, 22% and 16% of the total energy sector subsidies respectively.

The three most important subsidy instruments to promote renewable energy were feed-in tariffs (which still account for 70% of total renewable subsidies [9]), feed-in premiums and renewable quotas with tradable certificates. Besides the energy sector, renewables also play a role in transport, with around 10% of the sector's subsidies related to biofuels.

Energy efficiency received around 9% of the total EU energy subsidies in 2018 in the EU. The biggest recipients of these subsidies were households. At EU level energy efficiency subsidies amounted to only 0.1% of GDP, while in Latvia they reached 2.4% and in Hungary and Bulgaria 0.7%. Energy efficiency, especially in the residential and industrial sectors, contributes to achieving climate change objectives, as opposed to subsidising energy demand and consumption of fossil fuels.

Among specific subsidies, capacity payment mechanisms [10] received around EUR2.2 billion subsidies in 2018, and were stable at an average level around EUR2 billion over the last few years.

Looking at the key recipients of the subsidies, households received around 11% of total subsidies in 2018, mainly in the form of energy demand or energy efficiency subsidies and electricity consumption support.

The picture presented by the NECPs on subsidies is quite diverse. In eight NECPs, subsidies were not quantified and another four NECPs provided no information at all on subsidies. Four Member States provided only partial information. Only six Member States (Austria, Germany, France, Spain, Latvia and Lithuania) included a timeline to phase out (at least a part of the) existing subsidies. Four Member States (Croatia, Czechia, Finland

and Malta) explicitly stated that they have no plans to phase out subsidies which help energy transition.

Energy subsidies identified in the NECPs provided relevant information add up to EUR55 billion – a third of the amount identified by the study. The number of measures identified in the study is far higher than that suggested by the NECPs. Member States may have embraced different interpretations on how to report energy subsidies. While a few Member States reported data for 2018 or 2019, some of them referred to earlier periods, and some did not specify the reporting year.

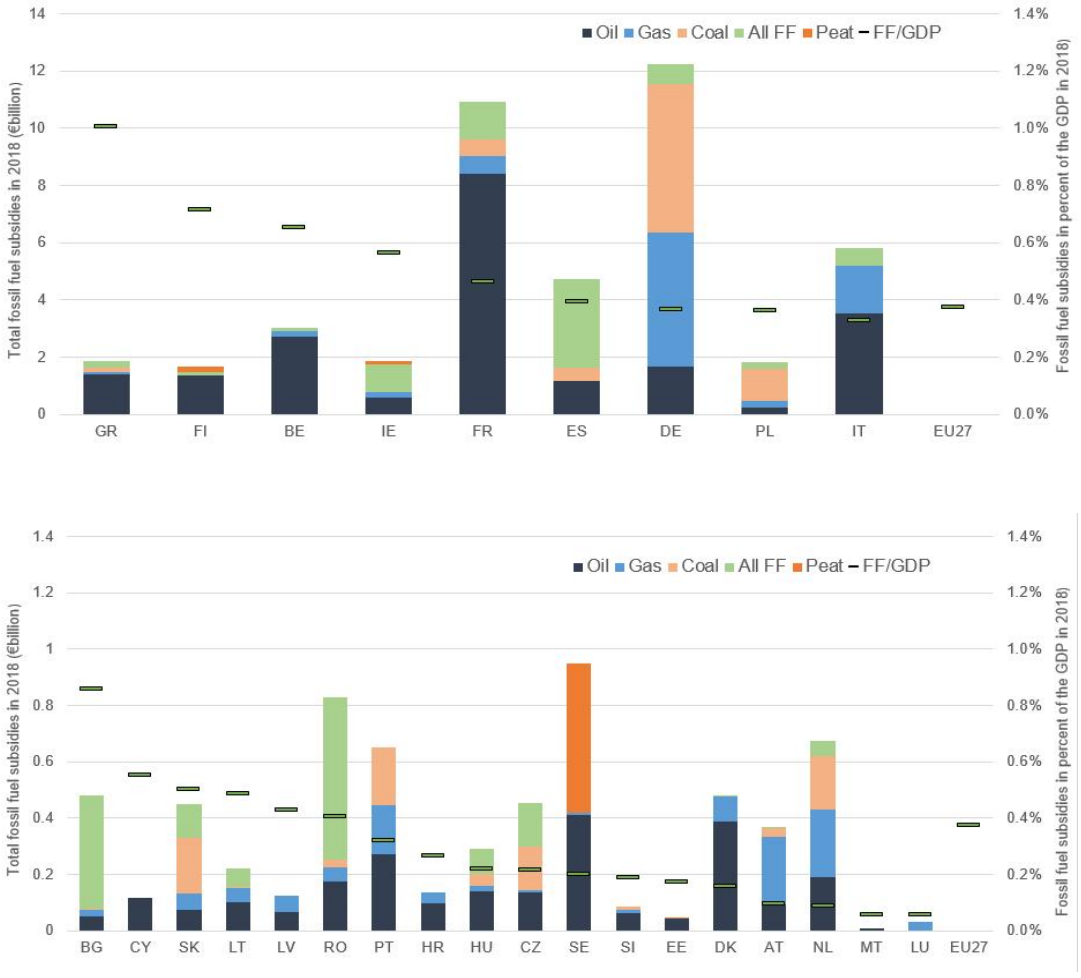
To make the reporting on progress in phasing out the energy subsidies comprehensive and meaningful, in particular those related to fossil fuels, the incompleteness and lack of coherence in the reporting practice needs to be addressed in future progress reports and updated plans, with clearer guidelines given to the Member States on how to report on subsidies.

2.2. Fossil fuel subsidies in the EU

Fossil fuel subsidies, amounting to EUR50 billion in 2018 [11] , were relatively stable over the past decade, peaking at EUR53 billion in 2012. They have started to increase again since 2015, growing by 6% until 2018.

As a share of GDP, they ranged from 1% in Greece to less than 0.1% in Luxembourg (amounting to 0.4% on average [12]). Whereas petroleum product subsidies were larger in France and Italy, in Germany coal and gas subsidies played a bigger role in Germany.

Figure 3 – Fossil fuel subsidies in total amount and as a percent of GDP in the EU Member States in 2018



Source: Study on energy costs, taxes and the impact of government interventions on investments

To put this fossil fuel subsidy amount of EUR50 billion into context, investments in new wind power generation capacities [13] amounted to EUR16 billion in 2018 in the EU, whereas investments in solar power generation were around EUR8 billion in the same period. Investments in electricity transmission and distribution systems (including new capacities and refurbishments) in the same year amounted to EUR31 billion.

Between 2015 and 2018, fossil fuel subsidies increased the most in France (adding more than EUR2 billion, or 27%, largely owing to measures supporting fuel consumption in freight transport). However, at the same time they fell slightly in some countries such as Italy (by EUR0.4 billion, or 6%, largely owing to a decrease in excise tax exemptions in transport and feed in tariff reductions in power generation) and Germany (by EUR0.3 billion, or 2%, owing among others to a reduction in subsidies to the coal sector).

More than 60% of fossil fuel subsidies could be linked to energy demand support measures in 2018, implying that this support increased the consumption of fossil fuels. Support to electricity generation from fossil fuels is also important, amounting to 30%, while only 5% was spent on industry restructuring to help reduce reliance on fossil fuels. This suggests the need to, shift measures towards the objective of decreasing consumption of fossil fuels.

Subsidies on oil and petroleum products, which accounted for almost half of the total, grew by 18% between 2015 and 2018, while other types of fossil-fuel subsidies stagnated or decreased. Rising crude oil prices in this period might also have had an impact on petroleum products subsidies.

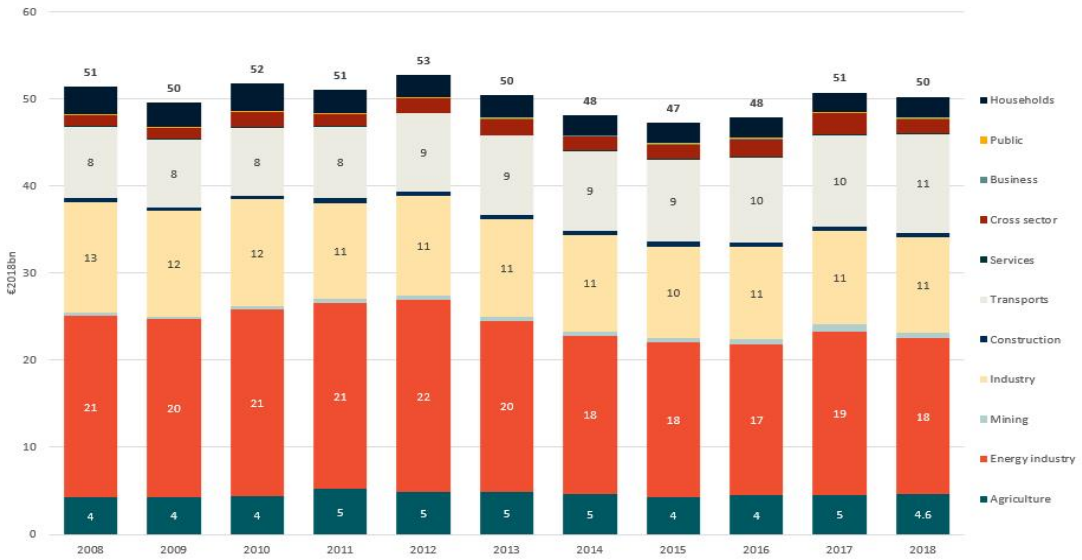
Coal, natural gas and other multiple fuel subsidies (e.g. combined heat and power generation) each accounted for around 17-18% of the total in 2018.

Compared to 2015, subsidies on coal decreased by 9%, reflecting the decreasing share of coal in power generation. At the same time, natural gas subsidies went up by 4%. These data do not reflect the shift from coal to gas in the EU power generation mix that occurred in 2019, but it can be assumed that alongside lower consumption, coal subsidies have fallen further since 2018 and gas subsidies might have risen in the energy sector.

Fossil fuel subsidies in the energy sector remained stable between 2015 and 2018, with coal subsidies amounting to 30%. The transport sector received 20% more fossil fuel subsidies in 2018 than 3 years earlier, overwhelmingly in the form of subsidies to petroleum products. Fossil fuel subsidies in agriculture went up by 6% in the same period and were almost exclusively related to petroleum product subsidies. Fossil fuel subsidies in the industrial sectors and households increased only by 3-4%. While fossil fuels received 10% of the total subsidies going to households, this share was more than half in industry.

Looking at the financing sources, fossil fuel subsidies were provided mainly in the form of tax expenditures [14] (around 70% of the total, including consumption tax and excise duty exemptions, reductions, refunds, etc.). Price and income supports were three times lower. Direct transfers, mainly in the form of grants, played a smaller role.

Figure 4 – Fossil fuel subsidies in different sectors of the economy



Source: Study on energy costs, taxes and the impact of government interventions on investments

Aggregated data from the NECPs report only on EUR30 billion of fossil fuel subsidies, which is 60% of the Commission study results. Three Member States (Croatia, Estonia and Malta) have explicitly stated that they do not plan to phase out (a number of specific) fossil fuel subsidies, referring mostly to protecting the competitiveness or economic viability of various sectors.

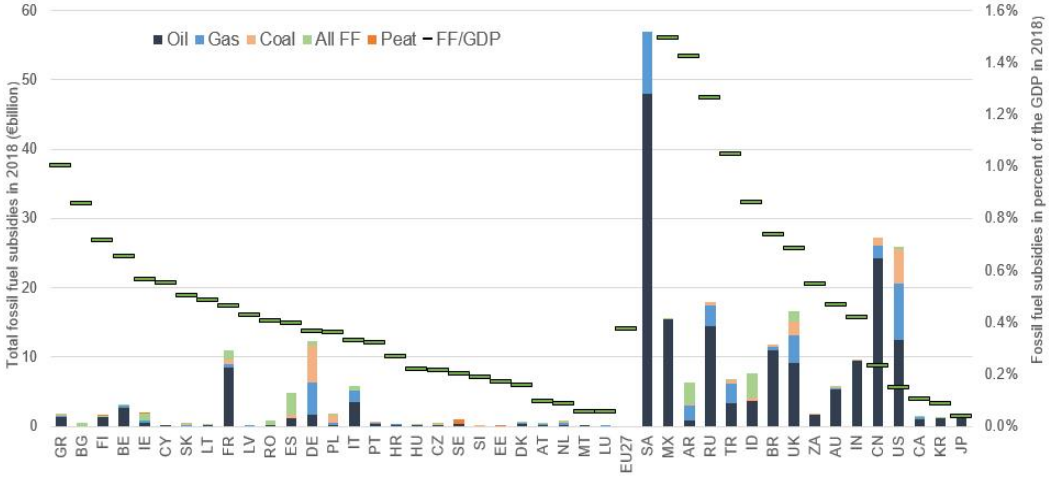
Thirteen Member States (Austria, Belgium, Bulgaria, Germany, Denmark, Greece, Finland, France, Italy, Lithuania, Latvia, Portugal and Spain) have indicated that they intend to work on setting up plans to phase out fossil fuel subsidies, although not all of them have fully developed their plans. Incomplete data does not allow us to paint a comprehensive picture of the situation and calls for significant improvement in reporting.

Member States will have to set out their national objectives on phasing out energy subsidies, in particular for fossil fuels, as part of their progress reports under the Governance Regulation.

3. International comparison of fossil fuel subsidies

G20 countries outside the EU spend more on fossil fuel subsidies compared to their GDP than the EU average of 0.4%, (with some exceptions, namely China, USA, Canada, Korea and Japan). Big fossil energy producer countries tend to spend proportionally more on related subsidies. Saudi Arabia spent more than 8% of its GDP on fossil fuel subsidies in 2018. This alone amounted to more than the total fossil fuel subsidies spent in the EU, principally supporting the domestic consumption of petroleum products. Russia has spent three times as much on fossil fuel subsidies as a percentage of GDP compared to the EU.

Figure 5 – Fossil fuel subsidies in absolute amounts and in the percent of GDP in the EU Member States and non-EU G20 countries



Source: Study on energy costs, taxes and the impact of government interventions on investments and own computations. For non- EU countries, given the limited comparability in subsidy classification and methodology, coupled with difficulties in data collection, results should be interpreted cautiously. The chart cannot show clearly, but Saudi Arabia spent more than 8% of its GDP on fossil fuel subsidies.

4. Conclusions

This findings of this report is largely based on the study on subsidies carried out for the Commission. This provides more comprehensive information on subsidies compared to the information on energy and fossil fuel subsidies provided by the NECPs.

Fossil fuel subsidies did not decrease substantially in the past decade; in some instances they even increased.

In addition, the completeness and coherence of different Member States' NECPs needs to be improved. The Comparison with the Commission study shows that the Member States, underreported subsidies in their national plans. Only a few Member States presented detailed plans on phasing out subsidies. This shows the need for further action.

Commission guidance on the definition, coverage and methodology for Member States' reporting on energy subsidies, including those on fossil fuels, in a more coherent and comparable manner could be one way to improve the situation and make future progress reports more comprehensive and accurate. The Commission will also publish the detailed results of its study on subsidies to provide a comprehensive picture of the situation [15] .

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(1) Article 35, point n of the Regulation on the Governance of the Energy Union (2018/1999/EU)

(2) https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

(3) G7 leaders declaration: https://www.mofa.go.jp/files/000160266.pdf

(4) G20 Pittsburgh summit declaration: http://www.g20.utoronto.ca/2009/2009communique0925.html#energy

(5)

Study on energy costs, taxes and the impact of government interventions on investments https://ec.europa.eu/energy/studies_main/final_studies/study-energy-costs-taxes-and-impact-government-interventions-investments_en Hereinafter referred as 'Commission study'

(6)

Following the concepts set forth by the World Trade Organization (WTO) Agreement on

Subsidies and Countervailing Measures (https://www.wto.org/english/tratop_e/scm_e/scm_e.htm)

(7)

Source: Commission study

(8)

Subsidies with different purposes have different importance across the economic sectors. Subsidies that aim to support energy production (e.g. feed-in tariffs) and energy infrastructure were almost exclusively observed in the energy sector, whereas subsidies given to consumption (energy demand, e.g.: tax exemptions for fuels) were characteristic in energy consuming sectors such as industry, transport, households and agriculture. Energy efficiency subsidies were more evenly spread across the sectors.

(9)

High subsidies in the form of feed-in tariffs reflect the legacy of previous mechanisms as this form of support is no longer applied, with the exception of small producers

(10)

A significant part of these capacity payments can be associated with fossil fuel power plants, with renewables or demand side response (DSM) representing only a smaller share

(11)

Source: Commission study

(12)

In absolute amounts, ranging from EUR10 million in Malta to EUR12.2 billion in Germany. Given the different size of the EU economies, subsidies expressed as a percentage of GDP make more sense for cross-country comparisons

(13)

Source: Commission study. Including new onshore and offshore installations, which amounted to 6.8 GW and 0.6 GW respectively in 2018. New solar installations include photovoltaics and solar thermal heating, respectively amounting to 7.1 GW and 1.4 GW in the same period.

(14)

It is important to note here that in the case of tax reliefs, only the tax rate differences within the same fuel are taken into account for calculating subsidies. Cross-fuel subsidies are not computed, as it would be extremely complicated to consistently do so in all sectors and across all fuel types. However, based on partial country data, the study gives estimates on the cross-subsidisation of diesel and petrol fuels. These numbers are not included in the total amount of subsidies in the EU as there is only partial information available. Potential fuel subsidies in the international maritime and aviation sectors are also estimated, but not included in the total EU subsidy number. For more information, seen the Study on energy costs, taxes and the impact of government interventions on investments [link].

(15)

See Study on energy costs, taxes and the impact of government interventions on investments (with country fact sheets) https://ec.europa.eu/energy/studies_main/final_studies/study-energy-costs-taxes-and-impact-government-interventions-investments_en