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CLOSING THE GAP TO CLIMATE NEUTRALITY
DESIGN PRINCIPLES FOR A CLIMATE NEUTRAL ENERGY SECTOR

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Executive Summary

2021 marks the start of a new cycle of intense legislative activity for the European Green Deal. The 'Fit for 55' package is expected to put in place delivery mechanisms to reduce emissions by at least 55% by 2030, and ultimately achieve climate neutrality by mid-century. In the energy sector, the package will adopt wide-ranging policies including amendments to the Renewable Energy Directive, the Energy Efficiency Directive, the Third Energy Package for gas, the Energy Taxation Directive, the Deployment of Alternative Fuels Infrastructure Directive and the Energy Performance of Buildings Directive. At the same time, 2021 will be a year of economic recovery efforts, with infrastructure and regulation choices determining whether the EU seizes the opportunity to 'build back better'. Given the urgent nature of delivering speedy decarbonisation and its scope, the 'Fit for 55' package has the potential to **make or break the EU's ability to deliver on climate neutrality by 2050.**

Our analysis aims to focus upcoming energy legislation on to the structural elements that are needed to decarbonise the energy sector by mid-century. We first take stock of EU progress in decarbonising the energy sector, then point towards ways in which existing forward plans and tools must be improved to accelerate the transition. Finally, we propose **six design principles for European Green Deal policies to effectively achieve climate neutrality in the energy sector**.

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Six design principles for European Green Deal policies to effectively achieve climate neutrality in the energy sector

1

Ensure a just transition that fuels the economic recovery
EU energy policy must be designed to ensure it provides a clear pathway to a just recovery. The clean energy sector provides economic value to the EU in the form of economic growth and jobs that tend to be more inclusive than jobs in the fossil energy sector.

2

Embed the Paris Agreement's objective and ambition mechanism
All legislation should be designed with the EU's 2050 climate neutrality and new 2030 emissions reductions target in mind and build in the necessary upwards flexibility in light of the Paris Agreement's requirement to submit a new and more ambitious Nationally Determined Contribution (NDC) every 5 years.

3

Manage risk and learn fast
The urgency and complex nature of the energy transition requires giving ourselves new tools to enable innovation, minimise the risk of failure and assimilate and share lessons learned to accelerate the decarbonisation of the energy sector across EU member states.

4

Demonstrate leadership on 'no regrets' solutions
Thse EU should accelerate action on solutions that are key to all decarbonisation pathways and have little associated risk, such as improving energy efficiency or ensuring energy infrastructure is resilient to climate impacts.

5

Put consumers and citizens at the heart of the transition
The energy transition offers citizens many opportunities for involvement. Barriers to participation need to be removed, and as energy policies increasingly intersect with peoples' lives and behaviours, a social agenda needs to be developed.

6

Make markets fit for a decarbonised energy sector
As the EU energy system becomes increasingly interconnected, an efficient market will be the one that increases consumer choice, allocates scarce resources effectively and allows the orderly reallocation of assets and financial flows.

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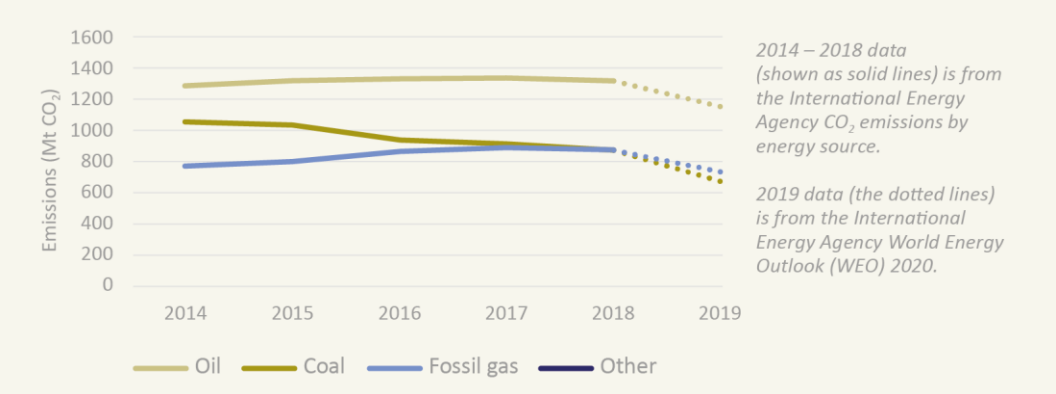
Are we on track? Identifying delivery gaps in the energy sector

Energy is a critical sector for the EU to achieve its climate neutrality objective. The energy sector is a significant source of greenhouse gas emissions (energy production and use account for more than 75% of the EU's emissions[1]). Electrification also overhauls and strengthens the connection between different energy consuming sectors such as transport, heat and industry.

Coal phase out and renewables phase in are doing the heavy lifting, but fossil gas risks remain

Coal is rapidly being phased out of the EU's energy system. Although political and social barriers to the coal phaseout continue to exist in EU countries, coal-fired electricity production dropped by 50% between 2012 and 2019 and 93 GW out of a total of 143 GW remaining coal capacity are covered by national phase-out plans.[2] On the other hand, **emissions from fossil gas continue to increase in the EU,** once viewed as the clean alternative to other fossil fuels. In fact, fossil gas has overtaken coal as the second largest fossil source of carbon dioxide emissions in the EU (see Figure 1[3]).

Figure 1: Gas causes more CO_2 emissions than coal in the European Union



Source: E3G graph based on International Energy Agency (IEA)

[1] European Commission 2020, Report from the Commission to the European Parliament and the Council, **https://ec.europa.eu/energy/sites/ener/files/report_on_clean_energy_competitiveness_com_2020_953.pdf**

[2] E3G, 2020, How (not) to phase out coal: lessons from Germany for just and timely coal exits, **https://www.e3g.org/wp-content/uploads/E3G_How-not-to-phase-out-coal.pdf**

[3] International Energy Agency (IEA), 2020, Data and Statistics, CO_2 emissions by energy source, European Union-28, 2990-2018, **https://www.iea.org/data-and-statistics?country=EU28&fuel=CO2%20emissions&indicator=CO2BySource;** International Energy Agency (IEA), 2020, World Energy Outlook, **https://www.iea.org/reports/world-energy-outlook-2020**

Despite this, the EU continues to invest in fossil gas: fossil gas subsidies in the EU have increased by 4% since 2015, and new gas infrastructure projects worth €104bn are currently underway.[4]

Renewable energy shares have increased across the EU. Renewable energy represented 20% of energy consumed in the EU-27 in 2019, and the EU is projected to surpass its 2020 renewable energy target.[5] This is however a modest target and will be revised in 2021 to align with the new 2030 emissions reductions target and the climate neutrality objective. Far greater ambition is needed: according to the International Energy Agency (IEA), **the EU must add more than 50GW of renewable energy capacity every year between 2019 and 2050, more than double the level added annually over the past 5 years, in order to achieve climate neutrality by mid-century**.[6] Such further expansion of renewable energy will require major investments in grid modernisation and flexibility, as well as rapid progress in the heating and cooling, transport, and industry sectors.

Greater effort needed to improve energy efficiency and decarbonise heating

Buildings are responsible for about 40% of the EU's total energy consumption, and for 36% of its greenhouse gas emissions from energy[7]. The EU is lagging on two of the main pathways to address these emissions: decarbonising heat and improving energy efficiency.

The EU has not made the structural changes necessary to achieve its energy efficiency targets.[8] For example, the building renovation and deep renovation rates are currently far too low to achieve European climate objectives, with around 1% of buildings in the EU being renovated every year and only 0.2% being deeply renovated.[9] At the same time, energy poverty remains a serious issue in the EU, and 34 million Europeans could not afford to adequately heat their

[4] European Commission, 2020, 2020 report on the State of the Energy Union **https://ec.europa.eu/energy/sites/ener/files/progress_on_energy_subsidies_in_particular_for_fossil_fuels.pdf**; Investigate Europe, 2020, **https://www.investigate-europe.eu/en/2020/natural-gas-trap/**

[5] Eurostat, 2020, Renewable energy statistics, **https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics**

[6] IEA, 2020, World Energy Outlook, **https://www.iea.org/reports/world-energy-outlook-2020**

[7] European Commission, 2020, A renovation wave for Europe – greening buildings, creating jobs, improving lives, **https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf**

[8] European Commission, 2020, 2020 Report on the State of the Energy Union, **https://eur-lex.europa.eu/resource.html?uri=cellar:c006a13f-0e04-11eb-bc07-01aa75ed71a1.0001.02/DOC_1&format=PDF**

[9] European Commission, 2020, A renovation wave for Europe – greening buildings, creating jobs, improving lives, **https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf**

homes in 2018.[10] The European Commission has underlined the importance of this issue in its recently released 'Renovation Wave' strategy, but it will be this year's actions and legislation that need to be designed in a way to address energy poverty.

Residential heating needs in the EU are still largely met by fossil gas. In European households, space and water heating represent over 78% of final energy consumption, respectively 38% and 40% fuelled by fossil gas.[11] Clean heating alternatives meet a small share of current heating needs. Nevertheless, key technologies have experienced rapid growth. For example, heat pumps are currently heating under 10% of all EU buildings, but the market increased 12% in 2019, the 4th year in a row that it experienced double-digit growth.[12] Such direct electrification solutions, combined with extensive energy efficiency measures, constitute the most readily available pathway to decarbonise the heating system, and should be prioritised.[13]

With only one, maximum two boiler replacement cycles left, and pipeline lifetimes stretching several decades, **the need to devise plans for a phase out from fossil gas in heating is urgent**. Slowly, momentum is gathering behind policies that drive the phaseout of gas from the heating sector, with cities and regions strongly voicing the urgency of action[12]. While much of the detail can be worked out at subnational level, national and European policies will be necessary complements to ensure a coherent energy infrastructure, increase competition from zero emissions solutions and a fair distribution of costs. Solutions include opening gas markets for competition from non-gaseous, zero emissions solutions to provide residential heat, giving guidance over what solutions are in line with long term climate targets, or ensuring that infrastructure planning takes into account all energy solutions, including on the demand side.

[10] European Commission, 2020, 2020 Report on the State of the Energy Union, **https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1602743359876&uri=COM:2020:950:FIN**

[11] Eurostat, 2020, Share of fuels in the final energy consumption in the residential sector by type of end-use, 2018 (%), **https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Share_of_fuels_in_the_final_energy_consumption_in_the_residential_sector_by_type_of_end-use,_2018_(%25).png**

[12] European Heat Pump Association, 2019, Market Overview, **https://www.ehpa.org/market-data/market-overview/**

[13] EUASE, 2021, Open letter – decarbonising the EU building stock with available solutions and no direct use of hydrogen, **https://euase.net/wp-content/uploads/2021/01/210120_Open-letter_Timmermans_hydrogen.pdf**

Table 1: Selection of innovative heat decarbonisation policies across Europe

Place	Approach
The Netherlands	Legislation to disconnect all households from gas by 2050.[14]
Denmark	The government provides citizens with free advice to convert to heat pumps.[15]
Lithuania	Compensation payments for the conversion to efficient biomass boilers or heat pumps.[16]
France	No new gas boilers in new buildings from 2021.[17]
Austria	No new gas boilers in new buildings from 2025.[18]
Germany	Rebalancing financial incentives away from heating systems with a pure fossil basis.[19]
Sub-national level	The city of Vienna announced a ban on oil and fossil gas heaters for 80% of new homes beginning in 2020. [20] The region of Baden-Württemberg in Germany introduced compulsory municipal heat decarbonisation planning for its biggest cities.[21]

Transport and industry: challenges in achieving climate neutrality

A key challenge lies in decarbonising the transport and industry sectors. Transport is the only sector where greenhouse gas emissions continue to rise, largely due to increased air travel and increased use and size of private cars.[22]

[14] Rijksoverheid, 2016, Energieagenda, **https://www.rijksoverheid.nl/documenten/rapporten/2016/12/07/ea**

[15] European Commission, 2017, Denmark's National Energy Efficiency Action Plan (NEEAP), **https://ec.europa.eu/energy/sites/ener/files/dk_neeap_2017_en.pdf**

[16] REN21, 2020, Global Status Report, **https://www.ren21.net/gsr-2020/chapters/chapter_02/chapter_02/#sub_4**

[17] Metiers du batiment, 2020, Le chauffement au gaz proscrit pour le neuf des l'ete 2021, **https://metiersdubatiment.fr/actus/logement-le-chauffage-au-gaz-proscrit-pour-le-neuf-des-l-ete-2021/57**

[18] Gruene, 2020, Regierungsuebereinkommen Tuerkis-Gruen, **https://www.gruene.at/themen/demokratie-verfassung/regierungsuebereinkommen-tuerkis-gruen**

[19] Eckpunkte Dutscher Klimaschutzplan, 2019, **https://www.bundesregierung.de/resource/blob/975232/1673502/768b67ba939c098c994b71c0b7d6e636/2019-09-20-klimaschutzprogramm-data.pdf**

[20] REN21, 2020, Global Status Report, **https://www.ren21.net/gsr-2020/chapters/chapter_02/chapter_02/#sub_4**

[21] DBDH, 2020, Large and growing markets, p. 16, **https://www.e-pages.dk/dbdh/78/**

[22] Eurostat, How are emissions of greenhouse gases evolving in the EU, **https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-4a.html#:~:text=In%202017%2C%20the%20energy%20producing,1990%20to%2023.8%20%25%20in%202017**

The greatest challenges in decarbonising the transport sector are aviation, shipping and heavy transport, where climate neutral alternatives remain unviable or difficult to implement**. In addition, the energy system is not currently set up to accommodate the required level of renewable energy generation, low carbon fuel production and electric vehicle charging for the areas of transport decarbonisation where carbon neutral alternatives exist**.[23] A modal shift away from low-cost air travel may have begun to take place due to the COVID-19 pandemic, but it is key for attractive and affordable alternatives to be available to sustain this behavioural change.

Energy-intensive sectors steel, cement, aluminium, paper and chemicals, account for roughly 17% of EU emissions and have seen stagnating emissions reductions since 2012.[24] The two major challenges in decarbonising industry lie in the high temperature heat processes involved and in the process emissions generated, emissions that are a by-product of the chemical reaction needed to produce the material. Mitigation options used in other sectors, such as energy efficiency, material efficiency and fuel switching cannot fully decarbonise industry, and **it will ultimately be necessary to transform the chemical composition of the materials that are being produced or to capture and store the process emissions generated**.[25] Hydrogen produced from renewable energy can provide a clean alternative in energy-intensive industrial sectors that require high temperature heat, where direct electrification is not an option. At the same time however, deployable options already exist today to accelerate industrial decarbonisation, where not enough is being done on a regulatory level.

[23] E3G, 2020, Innovation priorities to deliver climate neutrality, **https://www.e3g.org/wp-content/uploads/28_4_20_Innovation-priorities-to-deliver-climate-neutrality.pdf**

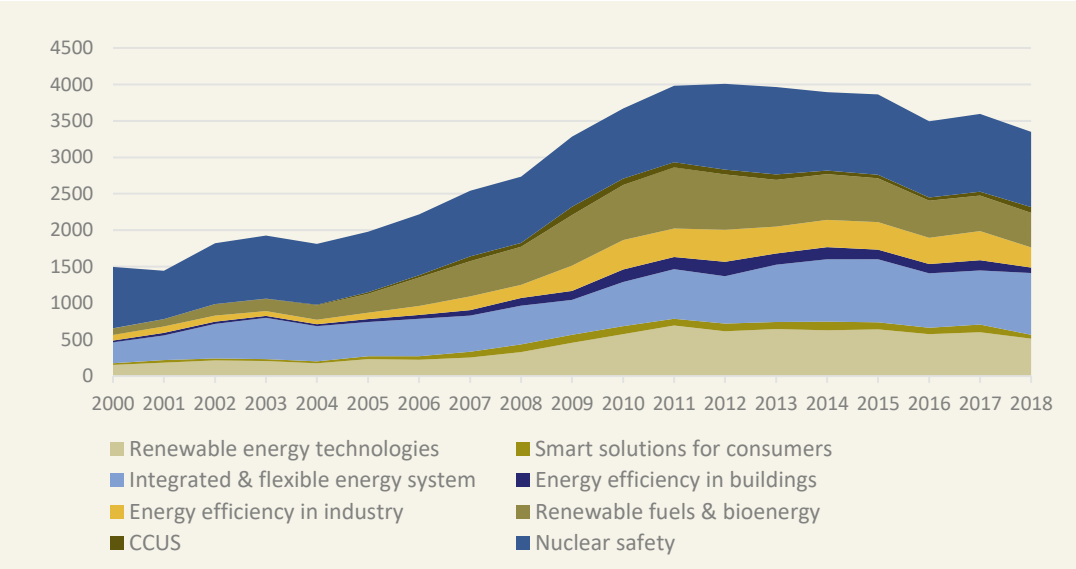
[24] Carbon Market Watch, 2019, Cracking Europe's Hardest Nut, **https://carbonmarketwatch.org/publications/cracking-europes-hardest-climate-nut/**

[25] E3G, 2020, Innovation priorities to deliver climate neutrality, **https://www.e3g.org/wp-content/uploads/28_4_20_Innovation-priorities-to-deliver-climate-neutrality.pdf**

The EU risks falling behind on clean energy innovation

The rapid decarbonisation of the EU energy **system will require incremental and breakthrough innovation.**[26] However, public spending in EU member states is going in the wrong direction: absolute clean energy research and innovation (R&I) spending decreased between 2010 and 2018, and the EU continues to lag behind its major competitors in terms of R&I spending as a share of GDP, including the US, Japan, China and Korea. [27] Although EU and member state funding account for a relatively minor proportion of R&I spending in the continent (6% and 17% respectively[28]), public investment can play a major role in leveraging private funding towards clean energy. Private R&I spending on EU clean energy priorities has followed a similar pattern.[29] Figures 2 and 3 below illustrate the evolution of public and private R&I investment in energy technologies in EU-27 countries.[30]

Figure 2: Public R&I investment in energy technologies in EU-27 (millions of euros)



Source: European Commission, 2020, SETIS Research & Innovation Data

[26] E3G, 2020, Innovation priorities to deliver climate neutrality, **https://9tj4025ol53byww26jdkao0x-wpengine.netdna-ssl.com/wp-content/uploads/28_4_20_Innovation-priorities-to-deliver-climate-neutrality.pdf**

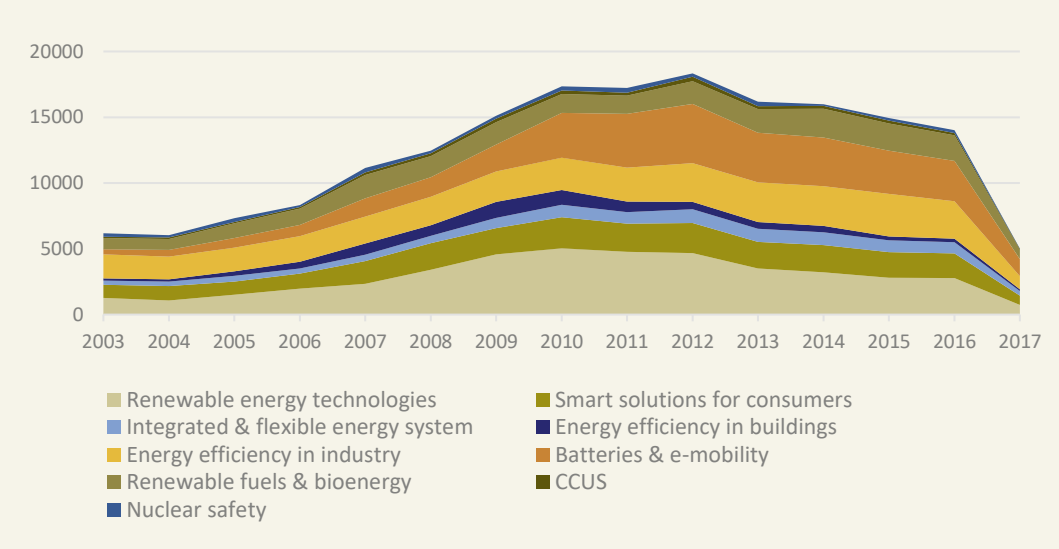
[27] European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[28] European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[29] European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[30] Note: the public total only includes investments by member states, not EU funds, and data for public R&I investment in e-mobility and batteries is not available. The EU total for 2018 is not complete. Source: European Commission 2020, SETIS data, **https://setis.ec.europa.eu/publications/setis-research-innovation-data**

Figure 3: Private R&I investment in energy technologies in EU-27 (millions of euros)



Source: European Commission, 2020, SETIS Research & Innovation Data

Lack of targeted investment has translated into the EU **lagging its competitors in both intellectual ownership and production capacity of many key innovative clean energy technologies.** Although the EU remains a global leader in high-value clean energy technology patents, patenting activity peaked in 2012, and has been in decline since. [31] Moreover, production capacity of several key clean energy technologies in the EU is low. The geographic distribution of key clean energy technology production has energy security implications, and would need to be addressed for the EU to ensure its competitiveness and build expertise in critical clean technologies.

One example is lithium ion batteries, the global demand for which is expected to increase tenfold by 2030. The EU started late and lost ground to its competitors, resulting in only 3% of global production capacity today being in the EU today.[32] For comparison, China has approximately 66% of global production capacity.[33] Nevertheless, the EU is now endeavouring to catch up and boosting domestic production through initiatives such as the European Battery Alliance.

[31] European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[32] European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[33]European Commission, 2020, Report on progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

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Existing plans and tools are insufficient

Existing plans and tools to achieve climate neutrality in the EU are insufficient.

Recovery plans may provide a boost, but this currently does not seem to be enough to close the gap. Based on current draft plans from a limited number of EU countries, about a third of recovery funding is expected to have a clear positive impact on climate action.[34] These are still being refined and will need to catch up with an EU target of 37% of funds to be allocated for climate action[35]. This is a boost compared to the 25% funding allocation in the EU budget, but may not prove sufficient for several reasons:

1. It is possible that some of this funding will displace Member State funding for green activities, which are then redirected towards more polluting activities. This comes as Member State subsidies to fossil fuels have been increasing again since 2015[36] and to date there is, despite international commitments such as by the G7 and the Foreign Affairs Council[37], no EU trajectory to phase them out in line with the climate objectives.
2. 37% of the €672.5 billion assigned to the Recovery and Resilience Facility over the next three years are about €82.9 billion per annum, but the new EU target of 55% by 2030 would require additional annual investments of over €300 billion per annum over the whole of the current decade.[38] The gap will need to be filled by public investment in member states and by leveraging private investments.
3. The remainder of activities are required to 'do no significant harm' to the EU's climate objectives.[39] Yet EU guidelines on this risk opening the door to fossil gas investments.

[34] Green Recovery Tracker, 2021, **Greenrecoverytracker.org**

[35] Council of the European Union, 2020, Proposal for a Regulation of the European Parliament and of the Council establishing a Recovery and Resilience Facility, **https://data.consilium.europa.eu/doc/document/ST-14310-2020-INIT/en/pdf**

[36] European Commission, 2020, 2020 Report on the State of the Energy Union, **https://ec.europa.eu/energy/sites/ener/files/progress_on_energy_subsidies_in_particular_for_fossil_fuels.pdf**

[37] Foreign Affairs Council, 2021, **https://www.consilium.europa.eu/media/48057/st05263-en21.pdf**

[38] European Commission, 2020, Impact Assessment accompanying the document 'Stepping up Europe's 2030 climate ambition – investing in a climate neutral future for the benefit of our people', Table 28 **https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/impact_en.pdf**

[39] Council of the European Union, 2020, Proposal for a Regulation of the European Parliament and of the Council establishing a Recovery and Resilience Facility, **https://data.consilium.europa.eu/doc/document/ST-14310-2020-INIT/en/pdf**

Member State planning: trailing increased ambition

Current member state plans (National Energy and Climate Plans – NECPs) to reduce greenhouse gas emissions are insufficient to meet the climate targets agreed in 2014 – falling short in particular on action on energy efficiency. With the revision of the EU 2030 greenhouse gas emissions reductions target to at least 55% relative to 1990 levels, **this gap widens further**.[40] In addition, the Paris Agreement would require a revised climate target reaching beyond 2030 to be submitted to the UN by 2025.[41]

The next generation of delivery tools is yet to be developed

In order to facilitate increased ambition and accelerate the energy transition, the EU and its member states need to tackle the new delivery and operational challenges of deep decarbonisation.

This is needed to establish resilient infrastructure and markets that can accommodate and respond to an increasingly connected and multi-directional energy system. Specifically, this includes the **integration of previously distinct 'sectors'** (gas, electricity, heat, transport) **and a much more active management of demand through the deployment of smart electrification across heat and transport**.

To facilitate investments at scale, it is necessary to develop tools to identify investment needs and financing models for building new, zero-emissions infrastructure, as well as retiring high-emissions infrastructure and establish a fair way of allocating infrastructure costs.

Outdated network planning and market design

Soon, renewables will begin to dominate the electricity system, regularly providing more than half of the electricity produced. In 2020, renewables rose to generate 38% of Europe's electricity, overtaking fossil-fired generation for the first time.[42] The EU's long-term climate strategy expects the share of renewables installed capacity to be at 57% in 2030 (including hydropower), and the

[40] European Commission, 2020, An EU-wide assessment of the National Energy and Climate Plans, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0564&from=EN**

[41] UNFCCC, The Paris Agreement, **https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement**

[42] Ember, 2021, EU Power Sector in 2020, **https://ember-climate.org/project/eu-power-sector-2020/**

association of electricity transmission system operators (ENTSO-E) expects the generation mix in 2030 to be at more than 60% across all scenarios.[43]

Only a few transmission system operators (TSOs) have clear targets and plans in place to work towards accommodating such high shares of renewables. Some of the frontrunners include those in Table 2 below.

Table 2: Selection of transmission system operator (TSO) frontrunners in Europe

TSO	Target
SONI (Northern Ireland)	95% share by 2024/5[44]
Energinet (Denmark)	100% share by 2030[45]
Eirgrid (Ireland)	95% share by 2030[46]
50 Hertz (Germany)	100% share in Germany's east by 2032[47]
National Grid (United Kingdom)	100% renewables by 2025[48]

In this transition, TSOs face a key investment dilemma in accommodating upcoming demand for renewables. **They need to build out the grid fast enough to avoid becoming the bottleneck for renewables deployment but usually have a mandate to minimise network costs**.[49]

Maximising the demand side response potential, interconnection and high market integration can help reduce the amount of investments into grid

[43] European Commission, 2020, Long term strategy, Figure 23 **https://ec.europa.eu/clima/policies/strategies/2050_en#:~:text=The%20EU%20aims%20to%20be,net%2Dzero%20greenhouse%20gas%20emissions.&text=All%20parts%20of%20society%20and,%2C%20buildings%2C%20agriculture%20and%20forestry**

[44] PV Magazine, 2019, Northern Ireland grid aims to be ready for 95% renewables, **https://www.pv-magazine.com/2019/09/27/northern-ireland-grid-aims-to-be-ready-for-95-renewables/**

[45] Energinet, 2020, Winds of change, **https://en.energinet.dk/-/media/7C641A497F7A44439E591937AA027A4C.pdf**

[46] Irish Times, 2019, National grid operator outlines 20-year vision for electricity, **https://www.irishtimes.com/business/energy-and-resources/national-grid-operator-outlines-20-year-vision-for-electricity-1.4066284**

[47] ReCharge, 2020, TSO 50 Hertz plans for 100% renewable power in Eastern Germany by 2032, **https://www.rechargenews.com/transition/tso-50hertz-plans-for-100-renewable-power-in-eastern-germany-by-2032/2-1-837255**

[48] National Grid ESO, 2019, Zero carbon operation of Britain's electricity system, **https://www.nationalgrideso.com/news/zero-carbon-operation-great-britains-electricity-system-2025**

[49] Energinet, 2020, Strategy: Winds of Change, p.22, **https://en.energinet.dk/About-us/Strategy**

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expansion for individual member states. The EU has successfully increased interconnections and improved market rules to create a more liquid electricity market. Yet there is a lot more potential to harness, as eight member states have not yet met the 10% interconnection target for 2020[50]. Even where the interconnection target is met, capacities physically available at interconnectors are regularly limited in certain regions because of grid congestion.[51] **The correct and swift implementation of the latest electricity market design legislation will be key to removing this bottleneck.**

Smart electrification can make a major contribution to a more efficient and less infrastructure-heavy energy system. It can reduce the need for thermal backup capacities by over half and renewables curtailment by 70%.[52] Currently, maximising the demand side response potential is in part constrained by the negligible price incentive, as charges and levies account for two-thirds of household tariffs and just above half of industrial tariffs.[53]

While we need investment across the board, **there will also be infrastructure that faces decreasing utilisation.** Consumers reducing their gas demand through efficiency measures or stopping it altogether as a result of electrification will be a driving force. The 2030 targets alone, supported by the EU's Renovation Wave, could reduce gas demand for heating in residential buildings by 45%[54]. In the medium term, those pipelines not converted for hydrogen use will see declining utilisation and by 2050 some gas pipelines will show use rates below 1%.[55]

As this happens, it is important that **the costs to the consumer from low utilisation infrastructure is minimised.** This has been pointed out by regulators, and in 2019 the Spanish regulator reduced network charges out of fear of

[50] Ireland, Spain, France, Italy, Cyprus, Poland, Portugal and Romania

[51] European Commission, 2020, Progress report on the Internal Energy Market, **https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1602743359876&uri=COM%3A2020%3A950%3AFIN#document2n**

[52] Cambridge Econometrics, Element Energy, 2019, Towards fossil-free energy in 2050, **https://europeanclimate.org/wp-content/uploads/2019/11/14-03-2019-towards-fossil-free-energy-in-2050-executive-summary.pdf**

[53] European Commission, 2020 , Energy Prices and costs in Europe, Table 1 **https://eur-lex.europa.eu/resource.html?uri=cellar:8a32875d-0e03-11eb-bc07-01aa75ed71a1.0001.02/DOC_1&format=PDF**

[54] European Commission, 2020, EU 2030 55% Impact Assessment, Figure 55 on energy demand in residential buildings could drop from 76mtoe in 2015 to 42mtoe in 2030 (MIX scenario), **https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/impact_part2_en.pdf**

[55] Artelys, 2020, Energy Infrastructure Needs, **https://www.artelys.com/wp-content/uploads/2020/11/Artelys-2050EnergyInfrastructureNeeds.pdf**

negative impacts on the competitiveness for its industry.[56] **At European level however, the conversation over when to retire infrastructure, who should decide and on what basis as well as what mechanisms are needed to deliver cross-border decommissioning and protect consumers is still underdeveloped**.[57]

Network planning at European level is currently carried out by a sub-set of relevant actors, notably the electricity and gas TSOs. While progress has been made to integrate models for infrastructure planning between them, they do not yet allow for cross-sector optimisation. In addition the necessary expertise to reflect new energy solutions – in particular on the demand side – is missing from the process. Fortunately, the need for a new institutional approach is beginning to be recognised across Europe and beyond.[58]

The decarbonisation of heat networks and the electrification of heat and transport bear many opportunities, including massive demand-side potential to provide an alternative to additional thermal generation and supply-side infrastructure. The proposed revised regulation for cross-border energy infrastructure (the Trans-European Networks for Energy, TEN-E) points the finger at this problem, but to offer fast learning and planning for 2050 climate neutrality this regulation would need to ensure **more competition between different energy solutions and a science-based footing**.[59] A similar lack of integration is visible across markets, where emerging clean energy solutions offer the opportunity for strengthened competition, if sectoral boundaries and supply-side focus are overcome.

[56] Expansion, 2019, La CNMC fija la retribucion financiera del transporte y distribucion e la electricidad y el gas, **https://www.expansion.com/empresas/energia/2019/11/20/5dd4fedae5fdea6c5e8b460b.html** and Euractiv, 2019, Spain's 'luxurious' gas infrastructure under the spotlight, **https://www.euractiv.com/section/climate-environment/news/spains-luxurious-gas-infrastructure-under-the-spotlight/**

[57] ACER and CEER, 2019, The Bridge beyond 2025, **https://nra.acer.europa.eu/Official_documents/Acts_of_the_Agency/SD_The%20Bridge%20beyond%202025/The%20Bridge%20Beyond%202025_Conclusion%20Paper.pdf** + The recently porpsed revised TEN-E regulation for the expansion of cross-border infrastructure does not include a mechanism to retire infrastructure.

[58] E3G, 2021, Institutions fit for delivering climate neutrality, **https://www.e3g.org/news/institutions-fit-for-delivering-climate-neutrality/**

[59] Energy Post, 2021, a new EU geas market must expose it to all clean energy solutions, not just gas-on-gas, **https://energypost.eu/a-new-eu-gas-market-must-expose-it-to-all-clean-energy-solutions-not-just-gas-on-gas/**

Closing the shortfall in project pipelines and investment

In 2018, the EU's spending on climate mitigation as a percentage of GDP was about half that of China and also below that of the US (approximately 1.2% for the EU, 1.3% for the US and 3.3% in China).[60] Over 3% of the EU's GDP will have to be invested solely in the energy sector and related infrastructure to achieve decarbonisation by 2050. [61] The current figure is around 2%.[62]

Building a project pipeline to leverage investment requires policies that give consistent long-term signals. The EU has a strong framework on targets, yet national energy and climate plans still fall short of being 'investable plans' (see above). For example, they do not give information on when or how governments will auction new wind farms or advance the necessary permit reforms.[63] While many clean energy projects are 'shovel-ready'[64], **grid bottlenecks keep emerging as limiting factors.** Yet progress on deploying electricity grids is sluggish, and power grid net additions have decreased since 2015[65].

Networks represent about half of Europe's investment need in the power sector to 2040[66]. The bulk of the investment need will be for distribution lines. A renewed focus on the EU's process for cross-border energy infrastructure is needed to vastly expedite the process. Taxpayer funding should be deployed for grid development, for example through the Connecting Europe Facility, to keep the share of network charges in consumer bills low and thus increase potential and effectiveness of demand-side response measures.

[60] European Investment Bank, 2019, Key Findings – accelerating Europe's transformation, **https://www.eib.org/attachments/efs/economic_investment_report_2019_key_findings_en.pdf**

[61] EIB, 2019, Investment report – accelerating Europe's transformation, **https://www.eib.org/attachments/efs/economic_investment_report_2019_key_findings_en.pdf**

[62] EIB, 2019, Investment report – accelerating Europe's transformation, **https://www.eib.org/attachments/efs/economic_investment_report_2019_key_findings_en.pdf**

[63] Wind Europe, 2019,**Wind energy and economic recovery in Europe, https://windeurope.org/data-and-analysis/product/wind-energy-and-economic-recovery-in-europe/**

[64] Euractiv, 2020, 1000 'shovel-ready' projects identified in support of EU's green recovery, **https://www.euractiv.com/section/energy-environment/news/1000-shovel-ready-projects-identified-in-support-of-eus-green-recovery/**

[65] IEA World Energy Investment report, 2020, **https://www.iea.org/reports/world-energy-investment-2020/power-sector#abstract**

[66] IEA 2020 World Energy Outlook, 2020, Table A.5 Energy Investment

On hydrogen, the EU has recently identified a target of 40GW electrolysers to 2020, but so **far less than half of these projects have been announced** amounting to a project value of €11bn.[67]

On **energy efficiency**, major obstacles lie in both knowledge and in financing.

> For firms, surveys reveal that energy audits play an important role in supporting energy efficiency investment decisions, but numbers on energy audits in the EU lag behind those of the US. [68] Large firms are much more likely to invest in energy efficiency measures, indicating a certain economy of scale.[69] It is therefore key for the EU to develop plans to support the decarbonisation of SMEs.

> For households, a recent study on efficiency in Flanders showed that whilst beneficial for households in the long run, the financing constraints of individual households needs to be addressed in order to achieve the scale of renovation needed. In this (geographically constrained) study, 47% of households face a financing gap to achieve a future proof level of insulation.[70]

Innovation is needed in financing models for energy efficiency. Areas to make progress include the aggregation of projects to offer financeable projects at scale and ensuring eligibility at par with other infrastructure. The TEN-E could become a driver for innovation in improving access to finance for demand-side solutions. Overhauling Regulated Asset Base models to ensure energy efficiency enjoys the same secure financing as supply side infrastructure could be a next step for national regulators.

[67] Hydrogen Europe, 2020, Market and industry ambitions, **https://hydrogeneurope.eu/sites/default/files/Map_%20MARKET%20AND%20INDUSTRY%20AMBITIONS.pdf**

[68] EIB investment survey, 2020, Going green – who is investing in energy efficiency and why it matters, **https://www.eib.org/en/publications/who-is-investing-in-energy-efficiency.htm**

[69] EIB investment survey, 2020, Going green – who is investing in energy efficiency and why it matters, **https://www.eib.org/en/publications/who-is-investing-in-energy-efficiency.htm**

[70] Agoria, 2020, Die financiele barriere voor klimaat-en comfortrenovaties, **https://www.agoria.be/nl/Agoria-Elke-Vlaamse-woning-kan-tegen-2050-klimaatneutraal-zijn**

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Bridging the gap: design principles for a faster and more resilient transition

A just transition that fuels the economic recovery

In the context of the recovery from the COVID-19 induced economic recession, the clean energy sector provides a just transition to fuel the economic recovery while simultaneously addressing the urgent need to achieve a climate neutral energy system.

The clean energy sector **provides economic value to the EU in the form of economic growth and jobs.** In fact, the value added of the clean energy sector to EU GDP was more than double that of the fossil fuels sector in 2018. Annual growth in the value added of renewable energy and energy efficiency activities between 2000 and 2017 averaged 9.4% and 22.3% respectively, far outpacing the rest of the economy, which grew at an annual rate of 1.6% (see Figure 4 below).[71]

Both renewable energy and energy efficiency are also job powerhouses: over the period 2000-2017, jobs in renewable energy had an annual growth rate of 3.1%, while jobs in energy efficiency grew by 17.4% annually, almost quadrupling over the period. [72] Jobs in the rest of the economy had an average annual growth rate of 0.5% in the same time (see Figure 5 below).[73] This trend is expected to continue. For example, if EU member states fully implement their National Energy and Climate Plans, the wind energy industry will provide 450,000 jobs in the EU, a 50% increase relative to 2019.[74]

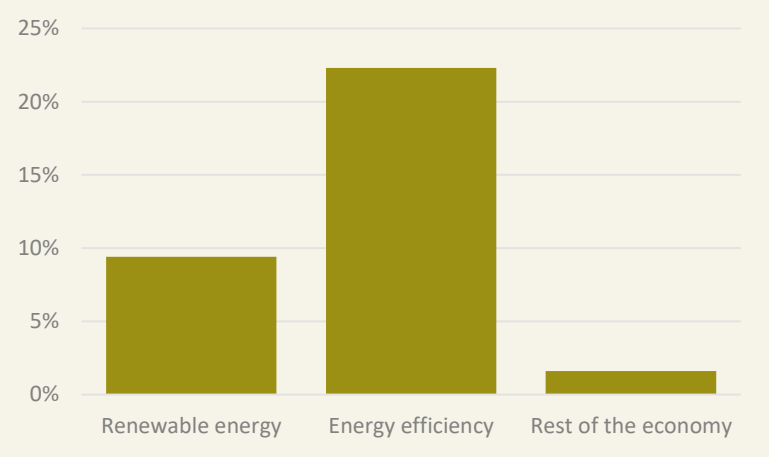
[71] European Commission, 2020, On progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[72] European Commission, 2020, On progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[73] European Commission, 2020, On progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

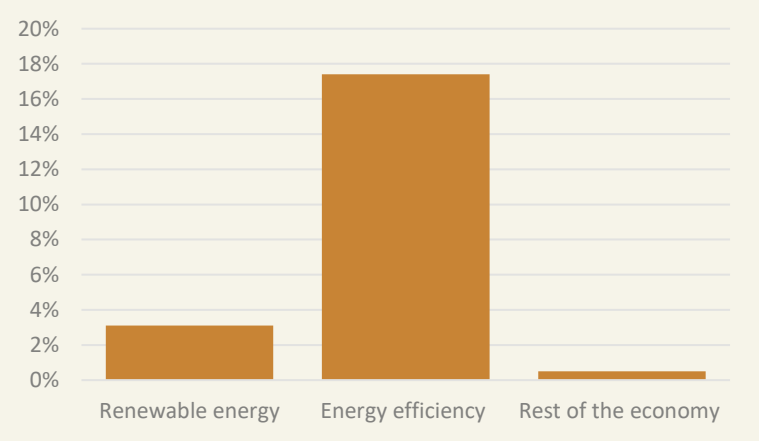
[74] Wind Europe, 2020, Wind energy and economic recovery in Europe, **https://windeurope.org/data-and-analysis/product/wind-energy-and-economic-recovery-in-europe/**

Figure 4: Average annual growth in value added of activities, 2000-2017



Source: European Commission, 2020[75]

Figure 5: Average annual job growth rate, 2000-2017



Source: European Commission, 2020

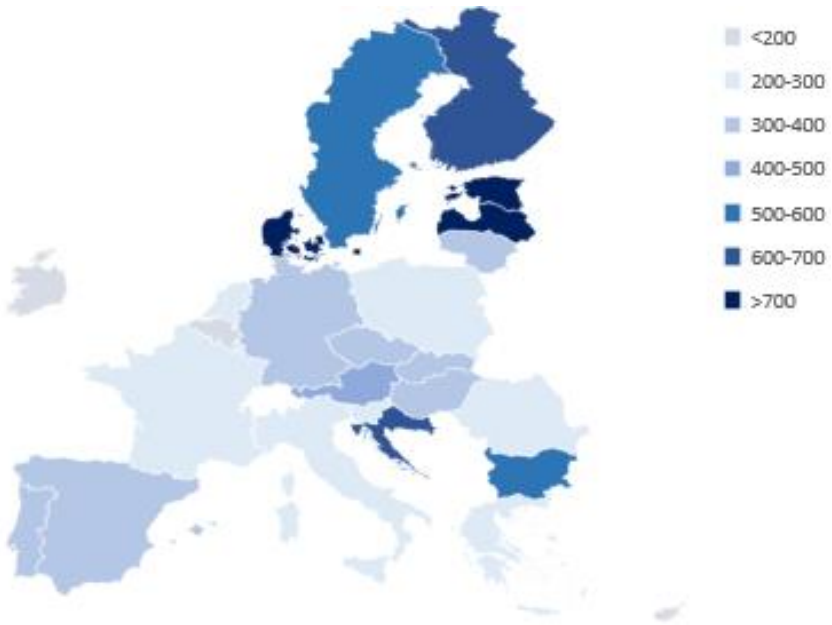
Jobs in clean energy are often more inclusive than jobs in the traditional energy sector. For example, although there is still a long way to go, the renewable energy work force has a better representation of women (32% women) than the traditional energy work force (22% women).[76] From a geographic perspective, jobs in renewable energy are relatively well-distributed across EU member states per capita (see Figure 6 below). Jobs in fossil fuel sectors on the other hand depend on natural resource endowment and are

[75] European Commission, 2020, On progress of clean energy competitiveness, **https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0953&from=EN**

[76] Global Women's Netowrk, 2020, Women for sustainable energy, **https://www.globalwomennet.org/wp-content/uploads/2020/02/Gwnet-Executive-Summary-NEU.pdf**

therefore more concentrated.[77] Jobs in coal mining were concentrated in Poland, the Czech Republic, Germany and Bulgaria, while Romania and Italy had the highest number of jobs in the extraction of oil and natural gas in 2017.[78]

Figure 6: Renewable energy jobs in the EU-27 per 100,000 inhabitants



Source: E3G graph based on EurObserv'ER data[79]

Clean energy solutions support local economies and governments, which often are critical for the provision of essential services like transport, care and education. In 2017, over 40% of EU-28 sub-national expenditure went to education, public services and housing while grants and subsidies were the largest source of income, making those services vulnerable to public cuts after an economic crisis.[80] **Creating new revenue streams at local level is thus essential for a socially just recovery.**

[77] European Commission, 2020, Employment in the energy sector, **https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120302/employment_energy_status_report_2020.pdf**

[78] European Commission, 2020, Employment in the energy sector, **https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120302/employment_energy_status_report_2020.pdf**

[79] EurObservER online database, 2018, Employment & turnover – all renewable energy sources, **https://www.eurobserv-er.org/online-database/**; Eurostat, Population on 1 January, 2020, **https://ec.europa.eu/eurostat/databrowser/view/tps00001/default/table?lang=en**

[80] OECD, 2018, Key data on Local and Regional Governments in the European Union, **http://www.oecd.org/regional/EU-Local-government-key-data.pdf**

Clean energy projects are particularly relevant in providing local revenue. For example, 20% of wind energy industry taxes are paid locally.[81] Mayors in Brandenburg (Germany) have supported the deployment of renewable energy projects because of the additional business tax income to local budgets.[82] Energy efficiency measures are likely to create local supply chains and recovery programmes in the US after the 2008 financial crises have been successful in creating a high number of jobs at local level.[83] Further economic advantages of clean energy projects at the local level include energy cost reduction and reduced vulnerability to energy price volatility.[84]

Although clean and efficient energy provides more economic value and more inclusive job opportunities than fossil fuel sectors, EU policy must be designed to ensure it provides a **clear pathway to a just recovery**. In particular, this would include prioritising sufficient innovation and investment in social and economic transition processes, spreading employment and economic benefits across all EU member states, and avoiding a second transition process, for example from coal to gas.

Embed the Paris Agreement's objective and ambition mechanism

The 2050 climate neutrality target and the new 2030 emissions reductions target of at least 55% give the EU a framework for climate ambition. It is important to **design all legislation with these targets in mind, but also build in the necessary upwards flexibility,** particularly in light of the requirement under the Paris Agreement for countries to submit a new and more ambitious Nationally Determined Contribution (NDC) every 5 years. For example, an updated EU NDC to go beyond 2030 will be expected shortly after the end of this Parliament, in 2025.

[81] Wind Europe, 2020, Wind energy and economic recovery in Europe, **https://windeurope.org/data-and-analysis/product/wind-energy-and-economic-recovery-in-europe/**

[82] REN21, 2019, Renewables in Cities Global Status Report, **https://www.ren21.net/renewables-in-cities-2019-gsr/#:~:text=This%20latest%20REN21%20report%20(REC,markets%2C%20finance%20and%20citizen%20participation**.

[83] Climate Bonds, 2020, A green, fair and resilient recovery : the role of energy efficiency and domestic renewables home retrofits, **https://www.climatebonds.net/system/tdf/reports/building_a_recovery_from_covid_22052020.pdf?file=1&type=node&id=47261**

[84] Climate Bonds, 2020, A green, fair and resilient recovery : the role of energy efficiency and domestic renewables home retrofits, **https://www.climatebonds.net/system/tdf/reports/building_a_recovery_from_covid_22052020.pdf?file=1&type=node&id=47261**

Beyond international obligations, **new economic realities** may drive this upwards trend, as the new Biden administration in the US has begun to greatly accelerate national clean energy ambitions and major Asian economies have recently pledged carbon neutrality goals (Japan, South Korea, China). To date, the countries that have announced a climate or carbon neutrality target by 2030-2060 account for 75% of global GDP.[85] If followed by meaningful action, this could massively transform markets and costs of climate neutral energy solutions.

Manage risk and learn fast

The challenge of achieving a decarbonised energy sector entails a transformational change in a short timeframe, requiring technological as well as social innovation. In addition, the energy transition requires switching to cleaner sources, but also to an approach that is more integrated across sectors, creating options where uncertainty prevails and taking pathway decisions where speed of delivery is essential. To do this, the EU needs better tools to **mitigate and manage the risk of failure and faster assimilate and share lessons learned** in the development of new and improved technologies, business models, and financing schemes to accelerate the decarbonisation of the energy sector across EU member states (and beyond).

This function would be best performed by establishing a **centre of independent technical expertise** – such as the European Climate Change Council proposed in the European Climate Law – that also maintains latest knowledge of technological and social innovation and monitors progress to quickly advance critical technologies and solutions, while also reducing dependence on high-risk options.[86]

Leadership on 'no regrets' solutions

Certain decarbonisation solutions can be classified as 'no regrets' in the sense that they have little risk associated with them or that they are essential across all decarbonisation pathways, such as the development of grids, renewable energy or energy efficiency. **The EU should accelerate action on these solutions.**

For example, **energy infrastructure needs should be planned taking climate impact projections into account**; and energy infrastructure should be designed

[85] This includes Biden's planned target for the USA and Xi Jingping's carbon neutrality target - Jacques Delores institute, 2020, 5 years after the Paris Agreement, **https://institutdelors.eu/en/publications/5-years-after-the-paris-agreement-the-largest-global-economies-are-engaging-in-the-race-towards-climate-neutrality/**

[86] E3G, 2020, Innovation priorities to deliver climate neutrality, **https://9tj4025ol53byww26jdkao0x-wpengine.netdna-ssl.com/wp-content/uploads/28_4_20_Innovation-priorities-to-deliver-climate-neutrality.pdf**

to cope with extreme weather. Climate impacts are increasingly affecting all parts of the EU energy system. Extreme weather events, sea level rise, and temperature variations will affect energy demand as well as all components of the energy supply chain, including the availability and geographic distribution of energy sources, transformation, transmission, distribution and storage.[87] These impacts are forecast to be predominantly negative across the EU's energy systems, and Southern Europe in particular is expected to experience the most adverse impacts.[88] Without appropriate adaptation measures, direct damage to EU energy systems from a changing climate will be in the order of billions of euros per year by the end of the century. [89]

Currently, European Network of Transmission System Operators (ENTSO) scenarios use climatic patterns from the past as extreme scenarios rather than using forward looking projections under different climatic scenarios. Such planning would open the opportunity to combine climate change adaptation and mitigation objectives, for example replacing coal-fired power plants with renewable energy capacity to reduce water consumption as well as greenhouse gas emissions.[90]

Another example of 'no regrets' solutions is adopting measures **to decrease EU dependence on fossil fuel imports.** Such measures include the greater deployment of clean energy, interconnectivity and market integration inside the EU and demand-side solutions. This transition should nevertheless avoid creating a new supply risk in the form of raw material access through the implementation of circular economy approaches.

Put consumers and citizens at the heart of the transition

The energy transition offers many opportunities to citizens, including access to cleaner air, reduced energy bills or more participation in the energy system.The Clean Energy Package for All Europeans goes a long way in putting some of the conditions in place in the electricity sector. **With higher ambition and an integration of sectors beyond electricity, new challenges and new opportunities arise.**

[87] European Environment Agency, 2019, Adaptation challenges and opportunities for the European energy system, **https://www.eea.europa.eu/publications/adaptation-in-energy-system**

[88] European Environment Agency, 2019, Adaptation challenges and opportunities for the European energy system, **https://www.eea.europa.eu/publications/adaptation-in-energy-system**

[89] European Environment Agency, 2019, Adaptation challenges and opportunities for the European energy system, **https://www.eea.europa.eu/publications/adaptation-in-energy-system**

[90] European Environment Agency, 2019, Adaptation challenges and opportunities for the European energy system, **https://www.eea.europa.eu/publications/adaptation-in-energy-system**

Electrification in heat and mobility offers **more participation and appropriate dynamic pricing enables consumers to participate more actively in the markets.** The price signal makes a significant difference to energy bills, and is thus able to reduce the share of network costs, particularly by putting energy efficiency as a true alternative to energy infrastructure and stopping the build out of gas infrastructure with a built-in expiry date. Nevertheless, the citizen can only access these if fossil fuel subsidies are removed as distorting signals and instead used to ensure access for all citizens to clean energy solutions. This continues to be an issue in the EU – for example, a majority of EU governments still incentivise the purchase and installation of new gas boilers through tax reductions, loans and grants.[91] Both the reform of the EU's energy taxation and the delivery and financing agenda attached to the EU Renovation Wave can play a key role in eliminating fossil fuel subsidies and incentivising the adoption of clean energy alternatives.

However, engaging citizens goes beyond consumer price signals. Policy restrictions may not enable citizens to feed into the grid, or access to electrification of heat or electric vehicles may be constrained by initial financial hurdles, rental arrangements or locational constraints. They may not be able to 'choose' to come off the gas grid and become a 'prosumer', and thus end up last on a grid with fewer and fewer consumers left to fund it. Tackling this requires the EU to mandate citizen and climate interests to be at the heart of infrastructure planning at national and EU level. **As energy policies increasingly intersect with peoples' lives and behaviours, a social agenda needs to be jointly developed** between decision makers on energy, climate, social policy, innovation and the economy.

Another area to enable the greater involvement of citizens and consumers is through encouraging localised energy planning. Some of these approaches are already emerging. For example in the Netherlands, local heat decarbonisation plans are designed at municipal level with citizen involvement. The EU can accelerate these developments in a number of ways, ranging from mandating the development of local energy transition plans as a precursor to national infrastructure plans to establishing a technical capacity support centre and creating direct access funding for regions wishing to develop transition plans that go beyond national ambition.

[91] Cool Products, 2020, Mapping Europe's subsidies for fossil fuel heating systems, **https://www.coolproducts.eu/failing-rules/mapping-europes-subsidies-for-fossil-fuel-heating-systems/**

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Make markets fit for a decarbonised energy sector

As the EU heads towards an increasingly interconnected energy system via electrification of heating and transport, power-to-gas and more active demand side management and consumer involvement, **an efficient market will be the one that brings those solutions together instead of introducing artificial boundaries**. For example, to achieve the phase out of fossil gas, a host of different solutions can be deployed. Markets need to be designed to optimise this competition where possible and allocate scarce resources, such as hydrogen, to where they add most value. **This also means markets are no longer segregated by energy vector, but by service they provide.**

As a result, existing indicators for measuring energy security focused on a single vector and measured by supply infrastructure[92], are no longer adequate and need updating.

Economies will also need to prepare for the economic and social disruption resulting from an increasingly deep penetration of low carbon technologies. These impacts stretch beyond energy markets and individual companies and, given the significance of the energy industry to national and local economies, quickly become a macroecomic risk. For example, the increasing penetration of renewable energy is eroding the economic advantages of existing utility business models.[93] This is leading to adjustments of company strategies and complicated asset swaps (German utilities, Polish PGE aiming for 100% RES by 2050)[94]. Energy utilities are already seeing their ratings decrease and access to capital markets made more difficult in light of falling utilisation rates and regulated returns.[95]

The emerging consensus on sustainable finance helps steer investments into more resilient business strategies. Evidence from mandatory disclosure in France shows a 40% drop in fossil fuel asset holding[96]. It is important in this context that

[92] The "N-1 formula" set out in Regulation (EU) No. 994/2010 on security of gas supply requires Member States to ensure it can deal with the event of disruption of the single largest gas infrastructure during a day of exceptionally high gas demand occurring with a statistical probability of once in 20 years.

[93] BNP Paribas, 2019, German Energy policy is making headlines, but the real news happened in 2007, **https://investors-corner.bnpparibas-am.com/investing/german-energy-policy-real-news-2007/**

[94] Climate Home News, 2020, Poland's largest utility announces pivot from coal to renewables, **https://www.climatechangenews.com/2020/10/20/polands-largest-utility-announces-pivot-coal-renewables/**

[95] Fitch Rating Action Commentary, 2020, **Fitch Downgrades Madrilena's IDR to 'BB+' and SU to 'BBB-'; off RWN, https://www.fitchratings.com/research/corporate-finance/fitch-downgrades-madrilena-idr-to-bb-su-to-bbb-off-rwn-14-09-2020**

[96] Banque de France, 2021, Showing off cleaner hands: mandatory climate-related disclosure by financial institutions and the financing of fossil energy, **https://publications.banque-france.fr/en/showing-cleaner-hands-mandatory-climate-related-disclosure-financial-institutions-and-financing**

the **risk associated with high carbon assets is not exclusively transferred to the state or worse, the consumer, without being managed**. Instead financing models for early retirement of fossil fuel assets linked to fostering new productive sectors should be developed[97].

Conclusion

In the context of recovery efforts and the challenge of achieving climate neutrality, the upcoming 'Fit for 55' package will be critical in putting the European Union on the right track to achieve its economic, social and environmental objectives. The six design principles set out in this briefing are essential to guide a socially, economically and environmentally successful energy policy in the 'Fit for 55 package'.

About E3G

E3G is an independent climate change think tank accelerating the transition to a climate-safe world. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

More information is available at **www.e3g.org**

[97] Foresight, 2020, New finance model swaps coal for renewables, **https://foresightdk.com/new-finance-model-swaps-coal-for-renewables/**