EUI FLORENCE SCHOOL OF REGULATION

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POLICY BRIEF

The Commission's proposal of a 'Fit for 55' legislative package – what impact could it have?

1. Introduction

The purpose of this article is to review the Commission's 'Fit for 55' package.[1] It first summarises the Commission's proposals as succinctly as possible. It then analyses what is likely to be the collective impact of the package as a whole on specific sectors, and particularly on citizens and industry, as consideration of each proposal in isolation will not enable this. It finally draws some conclusions, identifies where and why some elements may be difficult for the Council and Parliament to agree to and suggests some possible areas of compromise.

2. Overview of the content of the various legislative proposals

2.1. Reform of the ETS

The EU's ETS covers companies in a wide variety of (mostly industrial) sectors, including (i) power generation, (ii) heat generation, (iii) energy-intensive industries – such as oil refineries and steel, iron, chemical, cement, etc. production – and (iv) commercial aviation. Sectors not covered by the ETS are currently covered by another EU GHG reduction policy: the Effort Sharing Regulation (ESR, see below).

1 https://www.consilium.europa.eu/en/policies/green-deal/eu-plan-for-a-green-transition/

Issue 2021/56
November 2021

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The 'supply' of allowances is created by allocating them to EU companies through two main mechanisms: an auction system, which is the default way for EU companies to obtain allowances (about 57% of all allowances must be auctioned); and free allowances, which many EU companies (outside the power sector) also receive. Companies in sectors on the 'carbon leakage' list receive all the allowances that they would need if they used the best available technology (BAT) for their industry. In sectors less prone to carbon leakage, free allowances are currently foreseen to be phased out after 2026 from a maximum of 30% of what companies would need with BAT to 0% in 2030. Aviation also receives free allowances for most of its emissions.

As part of the Fit for 55 Package, the Commission tabled the following main reforms of the existing ETS:

A reduction of the GHG emissions cap commensurate with a 61% GHG cut by 2030 compared to 2005. To achieve this, (i) the number of allowances is reduced annually by 4.2% (compared to 2.2% under the 2018 reform) and (ii) a one-off adjustment will apply from 2021 so that this reduction level and emissions from the maritime transport sector (see below) are taken into account.

Inclusion of the maritime transport sector in the ETS. This concerns (i) emissions from intra-EU voyages, (ii) half the emissions from extra-EU voyages, and (iii) emissions occurring at berth in an EU port. ETS obligations will be gradually phased in: ship operators will only have to surrender allowances for 20% of their verified emissions reported for 2023, 45% for 2024, 70% for 2025 and 100% for 2026.

A tightening of the free allocation of allowances. First, free allocation will be phased out in the aviation sector: removing 25% of allowances in 2024, 50% in 2025, 75% in 2026 and 100% in 2027. Second, in industrial sectors covered by the ETS, the free allocation of allowances will be made conditional on companies implementing the recommendations of a regular energy efficiency audit (or demonstrating the implementation of equivalent GHG reduction measures). Failure to do this will be penalised with a 25% reduction of their free allocation. Third, since a carbon border adjustment mechanism (CBAM) is introduced as an alternative measure to mitigate carbon leakage risks (see below), the sectors it covers will no longer receive free allocations after a transitional period, with a 10% reduction in free allocations a year from 2026 to 2035.

Carbon capture and storage (CCS) is already recognised in the ETS as a valid way to reduce emissions. Carbon capture utilisation and storage (CCUS) was previously excluded but can now be used by companies in ETS declarations to demonstrate that they have saved emissions, provided that the CO2 captured and utilised to become permanently chemically bound in a product so that they do not enter the atmosphere under normal use." This may apply, for example, to using CO2 captured to produce chemicals that will not later re-emit the CO2. However, the use of CCUS for producing (synthetic) fuels – even carbon neutral ones – would most likely not meet these criteria.[2]

Member States will now be required to use all their ETS revenue for defined climate-related purposes (compared to only 50% under the current law).

The ETS Innovation Fund will be increased by a minimum of €2.5 billion at current ETS prices and the scope of projects that can be supported is expanded to cover projects using competitive tendering mechanisms, such as carbon contracts for difference, and to include projects in the maritime, fuel consumption, building and road transport sectors. The Modernisation Fund (supporting transition in poorer EU countries) is more than doubled in size and can no longer support any investment in fossil fuels (previously only coal was excluded).

A new ETS for the road transport and buildings sectors is introduced from 2025. The main elements in this new system are (i) that it applies to fuel suppliers (covered by excise duties) rather than consumers, (ii) it is based on an emissions cap and a linear reduction factor to reduce emissions by 43% by 2030, and (iii) 25% of the revenue from the new system will be put in a 'Social Climate Fund' to help vulnerable households, micro-enterprises and transport users invest in energy efficiency and clean transport to address the possible social impact of this new system.

2.2. The introduction of a Carbon Border Adjustment Mechanism

The Commission proposes to establish a Carbon Border Adjustment Mechanism (CBAM). Importers of a specified group of goods, particularly cement,

2 See draft Recital 40, which states "Where recycled carbon fuels and renewable liquid and gaseous fuels of non-biological origin are produced from captured carbon dioxide under an activity covered by this Directive, the emissions should be accounted under that activity."

iron and steel, aluminium, fertilisers (including ammonia) and electricity, will need to pay a charge at the border equivalent to the prevailing ETS price, based on GHG emissions embedded in the imported goods.

Importers may claim a reduction if they are subject to carbon taxes or emissions trading schemes paid in the country of origin and not subject to an export rebate or similar compensation. No other form of environmental charges in the country of origin are recognised by the CBAM. Adjustments will be made to reflect the extent to which free allowances are allocated to EU manufacturers covered by the CBAM (see the transition periods foreseen for the ETS, above).

A phase-in period in which no charges are imposed from 1 January 2023 to 31 December 2025 (3 years) to collect data and raise importers' awareness is proposed.

No export rebates are proposed for exporters of products made in the EU and covered by the ETS.

2.3. Reform of the Effort Sharing Regulation

The Effort Sharing Regulation (ESR) provides legally binding targets for Member States to reduce emissions in sectors not covered by the ETS. They are differentiated according to Member State GDP/capita. The Commission's proposal increases the targets in line with a 40% EU GHG reduction. It is notable that this proposed reform does not exclude the building and road transport sectors from the scope of the ESR.

2.4. Reform of the Renewable Energy Directive

The Commission proposes to increase both the scale and scope of current Renewable Energy Directive (RED II) targets, as well as to increase their binding nature:

- The overall EU 'binding' target for the share of renewable energy sources (RES) in the overall EU energy mix is increased from 32% to 40%;
- Buildings: the Commission proposes to significantly reinforce the ambition compared to the RED II Directive, which contains an indicative RES target for the increase in renewable energy systems (RES) in the heating and cooling sector of 1.3% p.a. In particular, the Commission proposes (i) a new indicative target of 49% for the share of RES used in the building sector by 2030, (ii) a binding (instead of indicative) target of 1.1% RES increase in the heating and cooling sector in all Member States (subject to specific exceptions), and (iii) an indicative target of 2.1% (instead of 1.1%) for the annual 5-year average increase in the share of RES or waste heat/cold in district heating and cooling.
- Industry: two new targets are proposed for industry.[3] First, the Commission proposes a new indicative 1.1% annual increase in the share of RES used in industry. Second, a binding 2030 target for Member States for renewable fuels of non-biological origin (essentially renewable hydrogen) is proposed for 50% of the hydrogen used as feedstock or as an energy vector in industry.
- Transport: a reformed, more ambitious and still binding target is proposed. The RED II Directive includes a 14% binding target for the share of RES in transport fuel for 2030, with several sub-targets for the shares of specific fuels. This has now changed, and it is proposed that Member States be obliged to reduce the greenhouse gas intensity of fuels by 13% by 2030. The methodology to calculate this target is not technology-neutral – only the use of renewable fuels or electricity will count. The use of low-carbon fuels based on blue hydrogen[4] (except 'recycled carbon fuels') would not therefore count towards this 13% target. Sub-targets for the share of specific transport fuels are increased for advanced biofuels (to 2.2% by 2030) and a new sub-target for renewable fuel of non-biological origin (essentially renewable hydrogen) is established (2.6% by 2030). The limits regarding which fuels produced from food and feed crops (i.e. first generation biofuels) can count are not modified.

A number of supporting measures are proposed, in particular:

(i) a requirement for Member States to establish a framework enabling the deployment of renewable electricity at a level that is consistent with the Member State's national contribution laid down in its NCEP.

3 Defined as covering mining and quarrying, all manufacturing activities (including chemicals, steel, cement, refined petroleum products, etc.), construction and IT activities (such as data centres).

4 https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum

(ii) An obligation to phase out, with some exceptions, support for electricity production from biomass in electricity-only plants from 2027 unless they use CCS or are located in one of the EU's coal regions.

(iii) Improved transparency and guarantees of origin, in particular Member States will be obliged to issue guarantees of origin to a producer of renewable energy even if the latter receives an alternative form of support.

(iv) Additionality. This concerns the question of how to ensure that fuel produced from renewable electricity is really 'renewable.' If the fuel (particularly hydrogen) is simply produced from electricity purchased from the existing market backed up by renewable guarantees of origin it will not necessarily result in the production of additional renewable electricity. It will instead shift the use of the existing production of renewable electricity from direct electrification to fuel use via hydrogen. Without additional measures, such an approach would therefore simply shift the demand curve for electricity upwards, resulting in incremental generation from the marginal supplier – usually natural gas. Thus, in reality the 'renewable' fuel would be produced from electricity generated from natural gas. Given the energy lost in converting gas to hydrogen and back to electricity (via a fuel cell), it would be better to use fossil fuels directly rather than the renewable fuel in such circumstances.

Therefore, when certifying a renewable fuel such as hydrogen produced from electrolysis, it is essential for the renewable electricity used to be really incremental to existing production, and investments that are intended for direct electrification (which from a climate perspective should be prioritised over use in fuel generation) are used for this purpose rather than being 'diverted' to hydrogen production. Otherwise, labelling renewable fuels that are in fact indirectly produced from gas (or even coal) is just a form of 'greenwashing'.

The existing rules in RED II provide additionality requirements – requiring certification of the proportion that may be considered to be 'renewable' of any renewable fuel of non-biological origin produced from electricity. These rules, which are evidently applicable to the production of renewable hydrogen, are that the RES share of the electricity-based fuel produced is (i) based on the share of renewably sourced electricity (RES-E) in the country of production two years before the production of the fuel if the electricity is simply taken from the grid, (ii) 100% if a direct line between a RES installation is used and if it comes into operation before or at the same time as the installation producing renewable fuel, or (iii) 100% if the electricity is simply taken from the grid but the way the electricity is used complies with the requirements of a delegated act that is expected to be adopted by the Commission following consultation expected to commence before the end of the year. This will be important. On the one hand, setting out objectively strict requirements may restrict the amount of RES available for hydrogen production; on the other, a loose approach will result in inaccurate GHG accounting and even higher levels of GHG emissions than the status quo (i.e. using grey hydrogen) would produce.

2.5. Reform of the Energy Efficiency Directive

The Commission proposes a very significant strengthening of the existing Directive: increasing targets; making them more directly and easily measurable; and making them more mandatory. The main provisions are as follows:

'Energy Efficiency First' becomes a legal principle (Art. 3): The proposed Article 3 states the following:

"Article 3 Energy efficiency first principle

1. In conformity with the energy efficiency first principle, Member States shall ensure that energy efficiency solutions are taken into account in the planning, policy and major investment decisions related to the following sectors:

a. energy systems, and

b. non-energy sectors, where those sectors have an impact on energy consumption and energy efficiency.

2. Member States shall ensure that the application of the energy efficiency first principle is verified by the relevant entities where policy, planning and investment decisions are subject to approval and monitoring requirements.

3. In applying the energy efficiency first principle, Member States shall:

a. promote and, where cost-benefit assessments are required, ensure the application of cost-benefit methodologies that allow proper assessment of wider benefits of energy efficiency solutions from the societal perspective;

b. identify an entity responsible for monitoring the application of the energy efficiency first

principle and the impacts of planning, policy and investment decisions on energy consumption and energy efficiency;

c. report to the Commission, as part of the integrated national energy and climate progress reports in accordance with Article 17 of Regulation (EU) 2018/1999 on how the principle was taken into account in the national and regional planning, policy and major investment decisions related to the national and regional energy systems."

While this is not an absolute obligation for Member States to ensure that optimal energy efficient solutions are used in all circumstances – Article 3(1) requires that it is "*taken into account"* rather than *respected* – it is likely to have a very important effect. In particular, Article 3(2), which requires that *"Member States shall ensure that the application of the energy efficiency first principle is verified by the relevant entities where policy, planning and investment decisions are subject to approval and monitoring requirements,"* should logically mean that when granting subsidies (for hydrogen, RES or RFNBOs, for example), the relevant government body must verify that the energy efficiency first principle is respected.

The Commission states that it will issue a recommendation to Member States including guidance on how the principle should be interpreted and applied in various contexts.

A new energy efficiency target is binding at the EU level (Art. 4): The revised directive proposes a higher target and changes the manner in which it is measured: it proposes that Member States should collectively ensure a reduction of energy consumption of at least 9% in 2030 compared to the projections in the Commission's 2020 reference scenario. This would mean that the EU's final energy consumption may amount to no more than 787 Mtoe (primary energy consumption 2023 Mtoe) by 2030. This means that the equivalent target expressed under the existing Directive would have been 36% for final energy consumption, compared to 32.5% at present.

Member States are obliged to set new national energy efficiency objectives and policies as part of the updates of their NECPs. It is proposed that if insufficient progress is made towards meeting the energy efficiency contributions Member States shall ensure that additional measures or voluntary financial contributions to the EU's National Energy Efficiency Fund are implemented a year after the date of reception of the Commission's assessment.

Energy savings obligation for Member States (Art. 8, 9 and 10): The binding annual energy savings obligation for Member States is increased to 1.5% a year from 2024, (remaining at 0.8% until then) and includes specific requirements for the alleviation of energy poverty. The proposal tightens up how this energy saving obligation must be measured: Annex V excludes (from 2024) energy savings related to the use of fossil fuel, for example a coal to gas switch, or replacing oil-fired boilers with natural gas/ hybrid ones.

Obligations for the public sector (Art. 5): The Commission proposes two legally binding objectives regarding all public bodies (no longer only central administration buildings). First, it proposes that Member States must ensure that the total final energy consumption of all public services and buildings is reduced by at least 1.7% p.a. Second, 3% of all public buildings must be renovated to nearly net-zero standard p.a. Conditionality with regard to cost effectiveness and technical and economic feasibility is removed.

2.6. Reform of the Energy Tax Directive

The proposed revision aims to 'green' the Directive, first by ensuring that fossil fuel generation is taxed higher than renewables, and second by broadening the scope of the Directive to cover kerosene for aviation and heavy oil used in maritime transport.

Unlike the 2003 Energy Tax Directive, where taxes are expressed in terms of volume, the reform proposes that taxes are expressed in energy terms (€/GJ) in order to allow a direct comparison between the different fuels covered and with electricity. The draft directive identifies categories of fuels, ranks them and sets minimum taxes/GJ for each category. It does not take an objective technology-neutral approach based on GHG/GJ but instead uses general categories based on GHG savings combined with political objectives. This enables the tax rates to favour specific energy sources/vectors that are considered particularly beneficial for the transition (electricity) or to reflect social objectives (to protect citizens from increased heating bills). Therefore, the method proposed is far from objective, which would require that fuels were taxed simply on the basis of GHG/GJ instead of favouring specific policy choices.

Six minimum tax bands are specified, with the numbers subject to an automatic indexation procedure:

- Rank 1: Conventional fossil fuels and non-sustainable biofuels/bioliquids:[5] minimum tax €10.75/GJ when used as motor fuels and €0.9/GJ when used for heating.
- Rank 2: Natural gas, LPG, non-sustainable biogas and non-renewable fuels of non-biological origin (e.g. grey hydrogen or non-taxonomy-aligned blue hydrogen): minimum tax 66% of the rate applicable to 'conventional fossil fuel' for a 10 year 'transitional period.' During this transitional period, this rate increases linearly each year to reach the same rate as conventional fossil fuels (rank 1) after ten years.
- Rank 3: Sustainable food and feed crop biofuels, bioliquids and biogas – minimum tax 50% of the conventional fossil fuels (rank 1) rate for a 10 year 'transitional period.' During this transitional period, this rate increases linearly each year to reach the same rate as conventional fossil fuels (rank 1) after ten years.
- Rank 4: 'Sustainable (but not advanced) biofuels' – minimum tax 50% the rate for conventional fossil fuels (rank 1).
- Rank 5: Low carbon fuels (i.e. taxonomy-aligned hydrogen or hydrogen-based fuels) – taxed at slightly more than 10% of the 'conventional fossil fuel' rate for a 10 year 'transitional period,' after which they would be taxed at 50% the rate for 'conventional fossil fuels.'
- Rank 6: Electricity (renewable or not, regardless of its end use), advanced sustainable biofuels and biogas, and renewable fuels of non-biological origin (such as renewable hydrogen) taxed at EUR 0.15 (both for motor and heating fuel use). Therefore, they are taxed 6 times less than 'conventional fossil fuels' when used for heating and more than 70 times less when used as motor fuels.

The above classification reveals a politically driven tax choice. Electricity receives the lowest tax rate irrespective of whether it is renewable, in order to promote the electrification of the EU energy system. Sustainable food and feed crop biofuels, bioliquids and biogas are taxed at 50% of the fossil fuel rate for 10 years and then at 100%. Low carbon hydrogen will be taxed at 50% of the standard fossil fuel rate after 10 years, even though blue hydrogen can be very low carbon with the right technological choices, and certainly not 50% of unabated fossil fuel.

Kerosene used as fuel in the aviation industry and heavy oil used in the maritime industry (including fishing) will no longer be exempt from energy taxation for intra-EU voyages. Shipping fuels will be taxed at a low level (like agriculture) to avoid vessels simply refuelling outside the EU for intra-EU shipping. For aviation, the minimum tax will be gradually increased over 10 years to reach €10.75/GJ (the same as petrol used for road transport, see above). For a 10-year transition period a zero-rate shall apply to "sustainable biofuels and biogas, low-carbon fuels, renewable fuels of non-biological origin, advanced sustainable biofuels and biogas, and electricity" used for both aviation and shipping (after which the general tax levels per category set out above apply).

Article 16 provides the possibility of exempting certain fuels/vectors from taxes to meet energy efficiency/renewable objectives. This applies particularly to electricity from renewable sources, electricity produced from environmentally friendly combined heat and power generation, renewable fuels of non-biological origin, advanced sustainable biofuels, bio-liquids, biogas and advanced sustainable products. Member States may provide vulnerable households with time-limited reductions (for heating fuel and electricity), which must be eliminated over a 10-year period.

It should be noted that the Energy Tax Directive must be unanimously adopted by the Member States in the Council.

2.7. Reform of the Regulation setting CO2 emissions for cars and vans

The fixed maximum levels for car and van fleets for 2020-2030 are significantly tightened. Under the proposed reform, for new cars manufacturers must achieve a -55% improvement by 2030 compared to 2021 and a -100% improvement by 2035. For new vans, manufacturers must achieve -50% by 2030 and -100% by 2035. From 2030, the 'multiplier' for very low emission vehicles and the small manufacturers' exemption are removed.

5 Gasoil, petrol and kerosene, and non-sustainable biofuels.

2.8. Reform of the Alternative Fuels Infrastructure Regulation.

The existing 2014 Directive essentially required Member States to develop national policy frameworks for the development of alternative fuel infrastructure and ensure an appropriate number of publicly accessible recharging and refuelling points. The new proposal puts very concrete obligations on Member States, in particular (i) for each new battery electric car registered in a Member State, 1 kW of new charging capacity must be installed, (ii) a minimum number of specified electric charging points (with increased capacity) must be installed every 60 km of the EU's' major roads/motorways by 2030, (iii) one hydrogen refuelling station must be installed every 150 km on major motorways and at every urban node by 2030, and (iii) gaps in the LNG refuelling infrastructure for trucks and maritime transport on the TEN-T core network must be filled by 2025.

2.9. The ReFuelEU Aviation Regulation and Maritime Regulation

These proposed regulations will require the aviation and maritime sectors to use increasing amounts of low and zero-carbon fuels. Rather than simply requiring the sectors to progressively lower GHG intensity, which would be a technology-neutral approach, the Commission proposes to strongly push certain technological solutions.

Regarding aviation, an obligation is placed on fuel suppliers (and thus indirectly on aviation companies) to use 'sustainable aviation fuels' in increasing amounts: 2% by 2025, 5% by 2030, 20% by 2035, 32% by 2040, 38% by 2045 and 63% by 2050. "Synthetic aviation fuels" must account for 0% of this by 2025, 0.7% by 2030, 5% by 2035, 8% by 2040, 11% by 2045 and 28% by 2050. Sustainable aviation fuels are essentially advanced and sustainable biofuels (but not first-generation food and feed crop-based biofuels) and synthetic fuels produced from renewable electricity Therefore, kerosene produced using blue hydrogen or CCS is excluded.

Regarding maritime transport, a slightly different approach is proposed based on GHG intensity. Operators of ships entering and leaving EU ports are required to progressively reduce the greenhouse gas intensity of the fuels used on board compared to a 2020 reference value. The targets for decarbonisation are -2% by 2025, -6% by 2030, -13% by 2035, -26% by 2040, -59% by 2045 and -75% by 2050. While in the memorandum accompanying the proposal the Commission argues that this ensures technology neutrality, the way in which the contribution of various types of low-carbon fuels is integrated in the calculation of these targets is unclear and could well exclude recognition of the low-carbon nature of, for example, blue hydrogen.[6] This therefore requires additional clarification. Excluding fuel/hydrogen based on blue hydrogen production/CCS is likely in the medium term to result in more expensive fuel, so the proposal needs to be clear regarding its effects in practice.

3. The collective impact on citizens and industry

Achieving the Green Deal targets is an obligation in the EU, not an option, as is made legally clear in the Climate Act. Achieving them will require energy prices to rise at least for a period, reflecting the massive investments needed to transform the energy system in a single generation, for example the new hydrogen grid and the fit-for-purpose electricity system. It will require additional tax revenue to pay for refurbishing (all) public buildings and to catalyse the refurbishment of private buildings.

Increased costs, price rises, regulatory obligations on citizens and businesses (obliging renovation, prohibiting the sale of polluting cars…) and new taxes are an inevitable consequence of achieving the Green Deal, unpopular though this reality may be.

However, it is important to adopt a policy framework with as much transparency as possible and objective facts and modelling regarding the costs and effects on prices of the different options available to achieve the Green Deal objectives. Recent gas and electricity price rises have demonstrated the price sensitivity of citizens and business to increasing energy costs, and in adopting specific legislative choices the EU needs to be fully aware of the likely consequences of the different options.

6 The proposal's requirement that "the performance of fossil fuels should however only be assessed through the use of default emission factors as provided for by this Regulation" combined with the proposal's default values for hydrogen or methanol produced from natural gas that only refer to grey hydrogen/methanol (i.e. that do not take into account the use of carbon capture and storage) raises questions about the actual technology neutrality of the proposal.

The legislative approach of combining a number of different legal and policy instruments to achieve the Green Deal makes such transparency difficult, and this section seeks to consider the cumulative effect of the proposals on four areas that are likely to affect citizens and companies: buildings, industry, transport and hydrogen.

3.1. Buildings

The cumulative effect on citizens of the different measures proposed in the FF55 package is likely to be very significant, in terms of costs and of the level of government revenue needed to meet the obligations:

- Extending the ETS to buildings is likely to significantly raise the cost of gas and oil used to heat them. The Commission proposes that the speed of withdrawal of available allowances will be cut by 2030 commensurate with a 43% GHG cut by 2030 compared to 2005 levels. This means that by 2030 suppliers will have to incorporate a great deal of low- and zero-carbon fuels in their fuels by that date.

  This gives rise to the questions of whether sufficient low- and zero-carbon fuels will be available by that date and how expensive this obligation will be. Given that there are significant limits on the use of non-renewable electricity-based hydrogen and biofuels throughout the package of proposals, this question is particularly important.

  An FSR study[7] has raised important questions concerning whether there will be sufficient renewable electricity over the coming years to meet the demands of electrification, industry, transport and hydrogen production (which uses a great deal of electricity).

  The Impact Assessment does not go into detail on the expected cost of these measures for citizens and business, instead proposing that 25% of the revenue from the new ETS be put in a 'Social Climate Fund' to help vulnerable households and micro-enterprises. However, we suggest that careful modelling of expected costs is required.

- Reform of the Energy Tax Directive will add additional costs for homes and businesses using fossil fuels for heating, especially after 2033, particularly because natural gas will then be taxed at the same level as oil, and about 6 times higher than electricity.

- The Energy Efficiency Directive will also have a significant impact. The legally binding obligation on Member States to renovate at least 3% of all government-owned buildings a year to nearly zero standard, and to reduce energy consumption by 1.7% p.a. in all buildings will require massive funding from Member States. With the use of European Recovery Fund revenue this should not present a problem in the very short term, but thereafter it is likely to be an important cost in national tax budgets. The same applies to the overall binding obligation on Member States to meet an energy saving target of 1.1% per year – doing this will require massive subsidies (to persuade people to refurbish/install heat pumps etc.) or new regulatory frameworks limiting citizens'/business's choice (obligations to refurbish when selling property…).

  The fact that energy savings resulting from fossil fuel investment (coal to gas in CHP, for example) will not count towards energy efficiency targets will be likely to further increase this cost, particularly in regions still relying on coal. Converting such installations to move from coal will need to be straight to renewable solutions, which are relatively very expensive (while offering a permanent solution).

- Finally, the Renewable Energy Directive with its proposed binding (instead of indicative) target of 1.1% RES increase in the heating and cooling sector a year will again require massive subsidies to ensure the installation of heat pumps and/or the use of renewable hydrogen (very unlikely in the short to medium term). While the targets of 49% for the share of RES used in the building sector by 2030 and the 2.1% annual increase in the share of RES in district heating are indicative, achieving them would again require massive subsidies and/or increased costs for citizens/business.

Taken cumulatively, it is clear that these measures are likely to have a very significant impact in terms of cost for industry and above all citizens. Given that increased heating costs disproportionately impact poorer citizens, possibly living in poorly insulated buildings without funds to refurbish and invest in new (renewable) heating equipment, this needs to

7 https://cadmus.eui.eu/handle/1814/71402

be considered carefully. It obviously also disproportionately impacts cold regions of the EU, and the measures will therefore be a challenge for central and eastern European and Baltic countries. Transparency is needed regarding the likely cumulative cost of the proposals for citizens. The EU needs to go into this with its eyes open. Whether the proposed Social Fund financed by part of the ETS revenue will be adequate to help all vulnerable customers will also be important.

3.2. Industry

Again, taken cumulatively the proposed measures are likely to significantly increase costs for industry, leading to concerns regarding competitiveness and jobs, and/or require important subsidies, with implications for tax revenue:

- The most important proposal is obviously the revision of the ETS, anticipation of which has already caused ETS prices to rise to around €60. As and when the Commission's proposals are endorsed, they are likely to rise further. The increase in the reduction of allowances per year from 2.2% to 4.2% plus the retroactive adjustment to 2021 when adopted can logically be expected to raise ETS prices further and significantly (uncertainty whether the proposal will be accepted in its ambitious form will be priced into a lower current price).
- Removing protection for many industries (steel, cement, fertilisers) in combination with the CBAM is likely to significantly increase their costs after the transition period from 2026 onwards (they are energy-intensive industries), and therefore EU prices for these products. The CBAM should protect them from unfair import competition within the EU, but it does not offer export support to compensate for these extra costs, meaning that they are unlikely to be competitive on global markets in the short to medium term (until the EU's competitors also have domestic and equivalent carbon pricing schemes or until EU industry decarbonises).
- For companies in sectors remaining on the carbon leakage list, the stronger incentive to use BAT and to implement the findings of energy efficiency audits – or lose 25% of free allocations – may require additional significant investment that their international competitors are not required to make. It is unclear what will be the level of the required investment and cost for each industry (this is not considered in real detail in the Impact Assessment), and whether it will simply require some existing EU industrial plants to close.
- Revision of the Renewable Electricity Directive, providing an indicative target of a 1.1% increase in RES for a large part of energy-intensive industries, depending on how it is implemented in practice, may require significant investment by companies and/or huge subsidies. If accepted it would need chemicals, steel, cement etc. to use at least 11% RES after 10 years, which is challenging given the production processes for energy-intensive industries – many such companies cannot simply use renewable electricity, for example, but would need to completely change the production process.
- The proposed legally binding obligation on Member States that by 2030 50% of all hydrogen used must be renewable is likely to require significant costs.
- The 'headline' objectives regarding renewable energy, particularly the increasing targets, will require a very rapid increase in renewable electricity use (see below). It is impossible to predict the resulting effect on electricity prices, but achieving the targets will require significant investment.

3.3 Electricity

The Commission's RES proposal increases the headline target (the minimum share of RES in the total EU energy mix by 2030) from 32% to 40%. In order to achieve this, the Commission's modelling estimates that the share of RES in the total electricity mix will need to increase from 34% in 2009 to around 68% in 2030. The manner in which this is to be achieved is unchanged since the Commission's 2018 'Clean Energy' package: Member States set their own targets and actions in the context of their draft National Energy and Climate Plans (NECPs), the Commission gives an opinion on the draft plans, but Member States are free to adopt their own conclusions and targets. The Commission's role is therefore to review, monitor and apply ‘peer pressure’, but it cannot oblige countries to adopt targets and measures they disagree with. If, overall, national plans or progress are insufficient, the Commission can only propose new legislation (for example, proposing legally binding targets for Member States).

This gives rise to two questions: is it actually realistic, and how much will it cost?

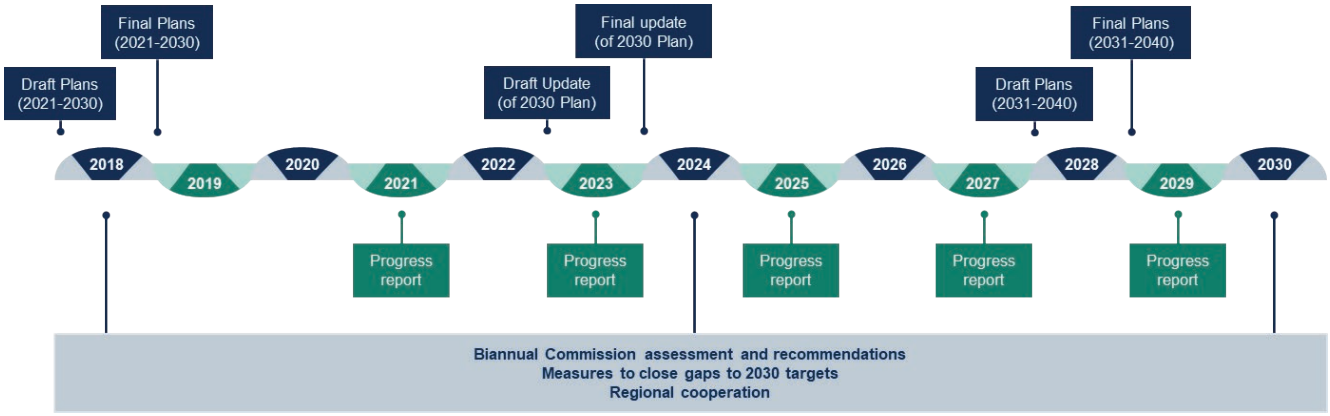
The previous EU 2030 GHG reduction target translated into a need for 55% of the EU's electricity system to be renewable by that date. The existing NECPs adopted by the Member States to achieve this were considered to be just sufficient. In fact, this was achieved because a number of major Member States adopted very ambitious RES-E targets:[8] Denmark 100%, Finland 53%, France 40% (ambitious considering the existing share of nuclear), Germany 65%, Greece 61-64%, Ireland 70%, Italy 55%, Netherlands 70-73%, Portugal 80% and Spain 74%. Given the short timescale to achieve them, these were considered to be very ambitious at the time.

Meeting the new target will require these targets to be increased very significantly, and the Member States with lower current ambitions (Bulgaria 30%, Czech Republic 17%, Hungary 21%, Luxembourg 33%, Poland 32%) to increase their objectives (although this may be socially and politically difficult for coal-dominated countries in CE Europe that have agreed coal phase-out programmes, which would need to be significantly accelerated). The next date for revision of NECPs is 2023:

mid-2025. Unless Member States 'voluntarily' upscale existing RES-E targets and actions in 2023 and immediately set about tendering for increased RES capacity, it will not be possible to reach these objectives. Even if they do increase their targets in 2023, it only leaves seven years to make this huge change. On the other hand, investment flowing from the European Recovery Plan may provide a kick-start.

It is clear that the potential to achieve the target in terms of available natural resources, both in terms of PV and wind, particularly offshore, is there. But to have any chance of success, determined action is needed now, not in 2025.

In addition, the issue of grid readiness requires consideration. In 2019, Germany incurred €1.2bn in curtailment costs for renewable energy production.[9] This occurred when RES-E represented around 40% of the German electricity mix, a 65% share is targeted for 2030. Curtailment costs have been dropping in Germany, but nevertheless, large investments, in storage and grid infrastructure will be necessary in the coming years to accommodate a growing share of intermittent electricity generation.[10] This is illustrative of the likely system costs and difficulties that flow from the speed of the change.



The Directive will probably take until the end of 2023 (at best) to be agreed at the political level, with entry into force in early 2024, and at least a year will be required for the legislation to be transposed into national law, probably by

The Impact Assessment[11] does not go into detail on how much the new target will cost, the effect on electricity prices and which grid investments need to be made. The recent electricity price rises and consumer/government reactions demonstrate the

8 https://windeurope.org/2030plans/

9 https://www.cleanenergywire.org/news/costs-stabilising-german-power-grid-fall-again-2019#:~:text=Costs%20of%20stabilising%20the%20German,Federal%20Network%20Agency%20(BNetzA).

10 https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Berichte/2020/Quartalszahlen_Gesamtjahr_2019.pdf?__blob=publicationFile&v=5

11 SWD(2020) 176final

price sensitivity of this issue.

This is not to say the target is wrong. It is compatible with the 55% GHG cut and is needed to put the EU on the path to full decarbonisation by 2050. If a lower ambition is adopted for RES (and therefore RES-E), greater savings will be needed elsewhere, which will at best be difficult. However, if the EU has a chance to achieve it, and at electricity prices that citizens are willing to pay and maintain their support for the Green Deal, a far more coherent plan at the EU and national levels is needed to achieve it than exists today.

3.4. Hydrogen

The cumulative effect of the proposals is likely to create a huge demand for renewable hydrogen. The Commission has made a deliberate and systematic technology choice in favour of only renewable hydrogen. This is likely to make the development of blue hydrogen – and, depending on the definition of 'renewable', possibly pyrolysis ('turquoise') hydrogen – a difficult business proposition, meaning that these industries and technologies will develop outside the EU, particularly in the UK, the US and China (which are now investing significantly in these technologies):

- In the Renewable Energy Directive, a binding obligation is proposed on Member States to achieve a 50% share of renewable hydrogen in all hydrogen sales by 2030. This is a *de facto* legally binding EU target for renewable hydrogen. Studies[12] show that renewable hydrogen is at present significantly more expensive than low-carbon hydrogen produced from natural gas using CCS and it is likely to remain so at least until 2030 (and probably beyond). The Commission's proposal requires a minimum of 50% of the existing 8 Mt of feedstock hydrogen to be replaced with renewable by 2030. If one makes an assumption that in 2030 renewable hydrogen will cost 2 €/Kg more than hydrogen produced from fossil fuel, and that renewable hydrogen will cost 1 €/Kg more than the hydrogen produced from natural gas using CCS, this would require subsidies of €8 Bn p.a. to achieve and would need to be imposed on an industry that is generally considered to be at risk of carbon leakage.
- The transport target in the Renewable Energy Directive (a reduction of GHG intensity of 13% by 2030) can only be met using renewable fuels (i.e. qualifying biofuels and qualifying renewable fuels of non-biological origin) or electricity. Other low-carbon fuels such as blue hydrogen and synthetic fuels based on blue hydrogen would not count. In addition, there is a new sub-target for renewable fuel of non-biological origin (essentially renewable hydrogen): 2.6% by 2030.
- Member States are required to provide guarantees of origin for the production of renewable hydrogen under the Renewable Energy Directive. However, this is only optional for low-carbon hydrogen, which in any event is not defined.
- The Energy Taxation Directive puts a disproportionally high tax level on low carbon hydrogen compared to renewable, compared to the GHG emitted per unit of energy. Electricity is taxed between 6 and 70 times lower than the fossil fuel standard, and renewable electricity may be exempted. If it is taxonomy-aligned, low carbon hydrogen will be taxed the same as electricity for 10 years, and then at 50% the rate of 'conventional fossil fuels,' despite the fact that it saves far more than 50% GHG compared to fossil fuels (80-90% being industry expectations).
- The ReFuelEU Aviation Regulation requires fuel suppliers to rapidly decarbonise the fuel they supply (2% by 2025, 5% by 2030, 20% by 2035, 32% by 2040, 38% by 2045 and 63% by 2050) and requires minimum percentages of synthetic aviation fuels (essentially based on renewable hydrogen): 0% in 2025, 0.7% by 2030, 5% by 2035, 8% by 2040, 11% by 2045 and 28% by 2050. This will create a strong demand for renewable hydrogen but excludes the use of blue or yellow hydrogen.
- The FuelEU Maritime Regulation will similarly catalyse a strong demand for qualifying biofuels and hydrogen. While the Commission argues that technology neutrality applies, further consideration of the 'fine print' is required before this conclusion can be reached.

It is difficult to calculate the total demand for (renewable) hydrogen that would result from these proposals when seen collectively. Certainly, the binding obligation on Member States would

12 https://fsr.eui.eu/publications/?handle=1814/68977

result in fast and strong growth. Given that 2.6% of transport fuels would need to come from renewable hydrogen by 2030, this would add a massive additional demand. While the use of renewable hydrogen-based fuels in aviation and potentially maritime transport ramps up more slowly, by 2030 they would add very important additional sources of demand.

This gives rise to two questions. First, will there be sufficient supply of renewable hydrogen at reasonable cost to meet this level of demand? Second, does the technology-specific approach make sense?

On the first question, a recent FSR paper questions whether there will be sufficient renewable electricity by 2030 and beyond to meet all the EU's Green Deal needs – electrification, transport, buildings, industry and hydrogen.[13] It seems likely that at the very minimum there will not be over-supply. As recent events have demonstrated, electricity prices are set by the marginal unit; renewable hydrogen production will need to pay the market price for electricity (or a PPA which in turn will be significantly determined by expectations regarding the future electricity price), not a notional price based on the lowest cost RES produced (why would a RES producer sell electricity cheaply for hydrogen production if it can sell it more profitably on the electricity market?).

This gives rise to questions of whether it will be possible to scale up the renewable hydrogen market quickly enough to meet these legally binding obligations on companies. If RES is not in abundance and is priced at the marginal electricity price which maintains current levels (or higher), renewable hydrogen will remain an expensive option, and this will drive up the cost for transport and industry.

Regarding technology neutrality, it should be noted that the literature currently sees blue hydrogen as significantly cheaper than renewable – the competitiveness of 'green' hydrogen being dependent on plentiful low-cost renewable electricity (see above). The gas price on the spot market can fluctuate hugely, as it has done since this summer, but it can have a much more regular profile when contracted long-term. In this way blue hydrogen producers could master its feedstock price risk.

An additional question concerns pyrolysis-based hydrogen.[14] Like renewable hydrogen, it can use renewable energy to power the reaction that produces the H2. The difference is in the feedstock used, not the energy source – green hydrogen uses water as a feedstock (splitting it into hydrogen and oxygen), pyrolysis uses natural gas (splitting it into solid carbon that can be used in industry or as a soil improver – in turn reducing HG emissions in agriculture). When biomethane is used in all or part of the pyrolysis feedstock, it can be a negative GHG form of hydrogen production. Pyrolysis also typically uses less than 25% of renewable electricity to produce 1 kg of hydrogen compared to electrolysis, which is important if RES-E is indeed a scarce resource in the EU.[15] This technology is emerging at commercial scale, with the first industrial plant recently beginning operations in the US.[16] The definition of renewable hydrogen in the proposed RES Directive may be interpreted to include pyrolysis powered by renewable electricity. This should be confirmed. Indeed, the definition should be open to including any technology using renewable energy that can be demonstrated to be equally climate-friendly to electrolysis, as technology in this area is evolving rapidly.

The above-mentioned factors – cost, availability of RES, technology development – make the technology-specific nature of these proposals questionable. They close the door to the development of a future hydrogen market where the 'best technology wins'. At the very least, it needs to be clear that pyrolysis-based hydrogen can qualify on an objective basis for quotas and obligations, given its potential benefits, even over electrolysis-based hydrogen. Of course, the issue of the need to avoid stranded assets and ensure technology maturity of zero-carbon hydrogen options in time is important. However, given the many unknowns it appears questionable whether it makes sense for the EU to 'put all its eggs in one basket' at this early stage of market development.

One option to be considered may be to simply legislate already today that by 2050 only zero-GHG forms of hydrogen production will be possible in the EU. The market can then decide if and when to

13 https://fsr.eui.eu/publications/?handle=1814/71439

14 https://fsr.eui.eu/publications/?handle=1814/72003

15 https://cadmus.eui.eu/handle/1814/72003

16 https://monolith-corp.com/methane-pyrolysis

invest in low-carbon hydrogen rather than it being based on regulatory decisions. It may well be that, given the need to amortise any investment in blue hydrogen by 2050, companies may choose not to invest in this technology. But to take a regulatory decision now to close the door on this technology requires careful consideration.

4. Conclusion

The 'Fit for 55' package is a game changer. If adopted in its current form, it is the most ambitious and coherent decarbonisation package ever seen. It is honest, because it addresses all sectors in a manner that would put them on a path to meet the 55% GHG cut.

It is ambitious, not least because many of the proposals will require a step-change in the level of action and determination by Member States – far greater than we have seen until now, and immediately. In particular, achieving the RES targets will require fast and determined action across the EU. The EU has missed its 2020 energy efficiency target of a 20% improvement[17] – the current objective will require far more ambitious action if there is any chance to achieve it. The above analysis makes it clear that achieving the 2030 aims will require sacrifices by EU citizens, in terms of personal cost and industrial competitiveness. This also shows political ambition and bravery in terms of maintaining public support for the measures.

For industry, the proposal raises major challenges. The ETS price will continue to rise (this is its foundation, and this shows it is working), and this increases costs on industry that our competitors largely do not need to bear (see the US's continued refusal to implement a federal carbon tax/ETS). The CBAM will help, but the problem of export competitiveness remains, as does the effect of increased steel, cement, fertiliser, etc. prices on downstream industry. Few sectors are on the carbon leakage list – it only covers energy-intensive industry subject to intense international competition. But the ETS affects the costs and competitiveness of a far wider range of companies, not only those on the carbon leakage list. It is difficult to conclude otherwise than that achieving the RES targets will increase electricity prices, and that heating costs (ETS) and transport costs (ETS, tax…) will increase for industry.

For citizens, again, it is very difficult to conclude otherwise than that the proposals will lead to increased costs: for electricity (RES), heating (RES) and transport (RES, fuel standards). Again, this does not suggest that the proposals are wrong – on the contrary they are fully in line with the -55% objective and better or cheaper and alternatives are very thin on the ground, if they exist at all.

However, the EU and Member States need to be transparent regarding the likely effect of the proposals. This is not covered in depth in the Impact Assessment, on the basis of which it is not possible to give any intelligent answer to the question of how much the totality of these measures will cost industry and citizens. Until now, EU climate and energy policy has avoided properly addressing these questions when proposing legislation, but the early decarbonisation stage measures adopted until now have been the 'low hanging fruit,' unlikely to cause substantial price increases.

The proposals in this package are of an entirely different nature, and rightly so, but failing to fully address the cost at the outset, possibly because it is an 'inconvenient truth,' may backfire in future in terms of popular support. This is an important issue that needs to be fully and openly addressed during the legislative scrutiny of the proposals.

17 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_saving_statistics#Final_energy_consumption_and_distance_to_2020_and_2030_targets

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The Florence School of Regulation (FSR) was founded in 2004 as a partnership between the Council of the European Energy Regulators (CEER) and the European University Institute (EUI), and it works closely with the European Commission. The Florence School of Regulation, dealing with the main network industries, has developed a strong core of general regulatory topics and concepts as well as inter-sectoral discussion of regulatory practices and policies.
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Co-funded by the
Erasmus+ Programme
of the European Union

Published by
European University Institute (EUI)
Via dei Roccettini 9, I-50014
San Domenico di Fiesole (FI)
Italy

doi:xxxxx
ISBN:xxxxxxx
ISSN:xxxxxxx
QM-AX-21-056-EN-N