The Commission proposal for a Fit for 55 legislative package - what impact will it make?

1. Introduction.

The purpose of this article is to review the Commission's 'Fit for 55' package. First it aims to summarise the Commission's proposals as succinctly as possible. Second it seeks to analyse what is likely to be the collective impact of the package as a whole on specific sectors, and notably on citizens and industry, as consideration of each proposal in isolation will not enable this. In doing so, it attempts to draw some conclusions, identifying where and why some elements may be difficult to agree by the Council and Parliament, and what might be some areas of compromise.

2. Overview of the content of the different legislative proposals

2.1. The 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 production of steel, iron, chemicals, cement, etc, 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).

The "supply" of allowances is created by allocating these allowances to EU companies according to two main mechanisms. First, an auction system, which is the default way for EU companies to obtain allowances (about 57% of all allowances must be auctioned). Second, many EU companies (outside the power sector) also receive free allowances. In sectors listed on a 'carbon leakage' list, companies receive all the allowances that they would need if they used Best Available Technology ("BAT") for their industry. In sectors less exposed to carbon leakage, free allowance is currently foreseen to be phased out after 2026, from a maximum of 30% of what companies would need under BAT to 0% in 2030. Aviation also receives free allowances for the major part of their 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 would take so that this reduction level would in fact apply from 2021 and emissions from the maritime transport sector (see below) are taken into account.

The inclusion of the maritime transport sector into the ETS. This concerns (i) emissions from intra-EU voyages, (ii) half of 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, and 70% for 2025, 100% for 2026.

The tightening of free allocation of allowances. First, free allocation is 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, free allocation of allowances is made conditional on companies implementing the recommendations of a regular energy efficiency audit (or demonstrating the implementation of equivalent GHG reduction measures), on penalty of seeing their free allocation reduced by 25%. Third, since a carbon border adjustment mechanism ("CBAM") is introduced as an alternative measure to mitigate carbon leakage risks (see below), the sectors covered by the CBAM will

no longer receive free allocations after a transitional period, with a 10% reduction in free allocation per year from 2026 to 2035.

Carbon capture and storage is already recognised in the ETS as a valid manner to reduce emissions. Carbon capture and use was previously excluded, but can now be used by companies in ETS declarations, to demonstrate that they have saved emissions provided that the "greenhouse gases (…) are ..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 CCU for producing (synthetic) fuels – even carbon neutral ones – would most likely not meet these criteria[1].

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

The ETS Innovation Fund is 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, buildings and road transport sectors. The Modernisation Fund (supported 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 of 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 linear reduction factor to reduce emissions by 43% by 2030, (iii) 25% of the revenues 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.

3. 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, notably cement, 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 imported goods.

Importers may claim a reduction if they are subject to carbon taxes or emission 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 in the ETS, above).

A phase-in period from 1 January 2023 to 31 December 2025 (3 years) is proposed where no charges are imposed, aimed at collecting data and raising awareness for importers.

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

3.3. The reform of the Effort Sharing Regulation

The Effort Sharing Regulation ("ESR") provides for legally binding targets on Member States to reduce emissions in sectors not covered by the ETS. They are differentiated according notably the GDP/Capita of Member States. The Commission's proposal increases the targets in line with a 40% EU GHG

[1] 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"

reduction. It is notable that the buildings and road transport sectors are not excluded from the scope of the ESR by this proposed reform.

3.4. The reform of the Renewable Energy Directive

Targets. The Commission proposes to increase the targets in the REDII in scale and scope, and to increase their binding nature:

- Increasing the overall EU 'binding' target for the share of RES in the overall EU energy mix 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 of 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 of the share of RES, or waste heat/cold, in district heating or cooling.

- Industry: Two new targets are proposed for industry[2]. Firstly, the Commission proposes a new indicative 1.1% annual increase in the share of RES used in industry. Second, a binding 2030 target for renewable fuels of non-biological origin (essentially renewable hydrogen) is proposed on Member States 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 fuels for 2030, with several sub-targets for the share 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 (excepting '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 (at 2.2% by 2030), and a new sub-target for renewable fuel of non-biological origin (essentially renewable hydrogen) is established (at 2.6% for 2030). The limits established 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, notably:

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

(ii) an obligation to phase out, with some exceptions, support for electricity production from biomass in electricity-only plants from 2027, unless the latter uses CCS or is located in one of the EU's coal regions,

(iii) Improving transparency and guarantees of origin - notably 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 how to ensure that fuel produced from renewable electricity really is 'renewable'. If the fuel (notably hydrogen) is simply produced from electricity purchased from the exiting market backed up by renewable guarantees of origin, it will not necessarily result in the production of additional renewable electricity. It will rather shift the use of the existing

[2] Defined to cover mining and quarrying, all manufacturing activities (including chemicals, steels, cement, refined petroleum products, etc.), construction, and IT activities (such as data centres).

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 on 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.

Thus, when certifying a renewable fuel, such as hydrogen produced from electrolysis, it is essential that the renewable electricity used is really incremental to existing production, and the investments that are intended for direct electrification (which from a climate perspective should be prioritised over use in fuel generation) are used for such 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 to ensure that any renewable fuel of non-biological origin produced from electricity specifies the proportion that may be considered to be 'renewable'. These rules, which are evidently applicable to the production of renewable hydrogen are that the RES share of the electricity-based fuel produced is based on (i) the share of 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 fuels, 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.

3.5. The reform of the Energy Efficiency Directive

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

The "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."

Whilst this is not an absolute obligation on 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 *"'respect'*", it is likely to have a very important effect. In particular, Article 3(2), requiring 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 a guidance how the principle should be interpreted and applied in various contexts.

A new energy efficiency target binding at 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 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% in the existing Directive.

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 has been 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 within one year following 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% per year as 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 (as from 2024) energy saving related to the use of fossil fuel, for example a coal to gas switch, or the replacement of oil fired boilers by natural gas/hybrid ones.

Obligations for the Public Sector (Art. 5): The Commission proposes two legally binding objectives regarding all public bodies (no longer being limited to central administration buildings. First, it is proposed 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 are removed.

3.6. The reform of the Energy Tax Directive

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

Unlike in the 2003 Energy Tax Directive, where taxes are expressed in terms of volume, the reform proposes that taxes are expressed in energy terms: €/GJ, with the aim of allowing 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 per category. It does not take an objective, technology neutral approach based on GHG/GJ, rather using general categories based on GHG savings combined with political objectives. This enables the tax rates to favour specific sources/vectors of energy that are considered particularly beneficial for the transition (electricity) or to reflect social objectives (protecting citizens from increased heating bills). Thus, the method proposed is far from objective, which would require that fuels were taxed simply on the basis of GHG/GJ, instead favouring specific policy choices.

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

- Rank 1: Conventional fossil fuels and non-sustainable biofuels/bioliquids[3]: taxed at minimum €10.75/GJ when used as a motor fuel 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): taxed at minimum 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, after ten years, the same rate as conventional fossil fuels (rank 1).

- Rank 3: Sustainable food and feed crop biofuels, bioliquids and biogas – taxed at minimum 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, after ten years, the same rate as conventional fossil fuels (rank 1).

- Rank 4: 'Sustainable (but not advanced) biofuels' – taxed at minimum 50% the rate of 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 of '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 (for both uses as motor and heating fuel). Hence, they taxed 6 times less than 'conventional fossil fuels' when used for heating and more than 70 times less when used as a motor fuel.

The above classification illustrates the politically driven tax choice. Electricity receives the lowest tax rate, irrespective of whether it is actually 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, notwithstanding that blue hydrogen can be very low carbon under 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 in the EU. Shipping fuels

[3] Gasoil, petrol and kerosene, and non-sustainable biofuels

will be taxed at a low level (as agriculture) to avoid that vessels simply refuel outside the EU for intra-EU shipping. For aviation, the minimum tax will be increased gradually over 10 years to reach €10.75/GJ (see above, the same as petrol used in road transport). 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 in both aviation and maritime (after which the general tax levels per category set out above apply).

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

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

3.7. The reform of the Regulation setting CO2 emissions for cars and vans .

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

8. The 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 fuels infrastructure and ensure an appropriate number of publicly accessible recharging and refuelling points. The new proposal puts forward very concrete obligations on Member States, notably (i) for each new battery electric car registered in a Member State, 1 kW of new charging capacity must be installed, (ii) minimum specified electric charging points (in terms of increased capacity) must be installed per 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 in every urban node by 2030, and (iii) gaps in LNG refuelling infrastructure for trucks and maritime transport on the TEN-T core network must be filled by 2025.

3.9. The new FuelEU 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 take a technology neutral approach, the Commission proposes to strongly push certain technology 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% in 2025, 5% by 2030, 20% by 2035, 32% by 2040, 38% by 2045 and 63% by 2050. Of this 'synthetic aviation fuels' must account for 0% in 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 Thus, kerosene produced using blue hydrogen or CCS is excluded.

Regarding maritime, a slightly different approach is proposed, based on GHG intensity. Operators of ships coming and going to and from 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 as follows: -2% by 2025, -6% by 2030, -13% by 2035, -26% by 2040, -59% by 2045 and -75% by 2050. Whilst in the accompanying memorandum to 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 the recognition of the low-carbon nature of, for example, blue hydrogen[4]. 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.

4. The collective impact on citizens and industry.

Achieving the Green Deal targets is an obligation on the EU, not an option, as made legally clear in the Climate Act. Achieving them will require energy prices to rise at least for a period for 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 revenues to pay for refurbishing (every) public building and to catalyse refurbishment of private buildings. The Commission estimates that x billion of new investment will be needed by x in its x to achieve the Green deal 2030 and 2050 targets.

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

However, it is important to adopt a policy framework with as much transparency and objective facts and modelling regarding the cost and effect on prices of the different options available to achieve the Green Deal objectives as possible. Recent price rises for gas and electricity 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.

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 effect citizens and companies: buildings, industry, transport, and hydrogen.

4.1. Buildings

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

- Extending the ETS to buildings is likely to place a significant cost on the price 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 into their fuels by that date.

  This gives rise to the question 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

[4] Notably, 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 refers 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.

on the use of non-renewable electricity-based hydrogen and biofuels throughout the package of proposals, this question is particularly important.

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

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

- The reform of the Energy tax Directive will add additional costs on homes and businesses using fossil fuels for heating, especially after 2033, notably because natural gas will be then 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 per year to nearly zero standard, and to reduce energy consumption by 1.7% p.a. across all buildings will require massive funding by Member States. With the use of European Recovery Fund revenues this should not present a problem in the very short term, but thereafter is likely to place an important charge on 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 - to do so will require massive subsidies (to persuade people to refurbish/install heat pumps etc.), or new regulatory frameworks limiting citizens/business choice (obligations to refurbish on selling property…).

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

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

Taken cumulatively, it is clear that these measures are likely to have a very significant impact in terms of cost on industry, and above all on citizens. Given that increased heating costs impact disproportionately poorer citizens - possibly living in poorly insulated buildings without funds to refurbish and invest in new (renewable) heating equipment, this needs to be considered carefully. Obviously it also impacts disproportionately cold regions of the EU, and these measures will therefore be a challenge for Central and Eastern European and Baltic countries. Transparency is needed regarding the likely cumulative cost of these proposals on citizens - the EU needs to go into this with its eyes open. The question whether the proposed Social Fund financed by part of ETS revenues will be adequate to help all vulnerable customers will also be important.

4.2. 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 revenues:

- The most important proposal is obviously the revision of the ETS, the anticipation of which has already caused ETS prices to rise to around €60. As and when the Commission's proposals are endorsed, this is likely to raise further. The increase in 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 (the 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 combinaition with the CBAM is likely to significantly increase their costs after the transition period, from 2026 onwards (they are energy intensive industries), and thus EU prices for these products. The CBAM should protect them from unfair import competition within the EU, but 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 investments that their international competitors are not required to make. It is unclear what will be the level of the required investments and cost per 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.

- The revision of the Renewable Electricity Directive, providing an indicative target of a 1.1% increase of RES for a large part of energy intensive industry, depending on how it is implemented in practice, may require significant investments 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 - for many such companies one 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 in nature is likely to require significant costs.

- The 'headline' objectives regarding renewable energy, notably the increasing targets, will require a very rapid increase in renewable electricity (see below). It is impossible to predict the resultant effect on electricity prices, but achieving the targets would require significant investments.

4.3 Electricity

The Commission's RES proposal increases the headline target (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 RES share in the total electricity mix will need to increase from 34% in 2009 to around 68% in 2030. This makes sense, as it is very difficult to push renewable electricity into buildings, transport and industrial processes in the short term. Electricity will have to do the 'heavy lifting'.

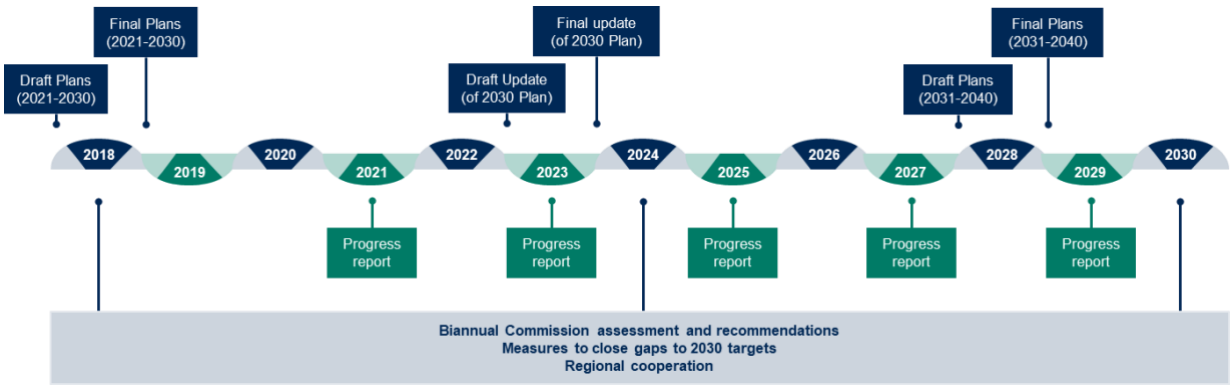
The manner in which is this is to be achieved is unchanged since the Commission's 2018 'Clean Energy' package - Member States set their own targets and actions in the context of their draft National Energy and Climate Plan ('NECP'), the Commission gives an opinion on the draft Plans, but Member States 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 is insufficient, the Commission can only propose new legislation (for example, proposing legally binding targets per Member State).

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

The previous 2030 GHG reduction target of the EU translated into the need that 55% of the EU's electricity system would be renewable by that date. 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[5]: 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 time-scale to achieve them, these were considered to be very ambitious at the time.

To meet the new target will require these targets to be increased very significantly, and for 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 the revision of NECPs is 2023:



The Directive will probably take (at best) until the end of 2023 to be agreed at 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 to 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 targets in 2023, it only gives 7 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 2018, Germany paid over €1Bn in payments to curtailed RES production, when RES represented around 38% of their electricity mix because the power could not reach demand in the South. The congestion problems remain. Germany's existing RES-E target for 2030 is 65%; this will require large grid investments, important investments in expensive hydrogen storage, and/or even larger curtailment payments. This is illustrative of the likely

[5] https://windeurope.org/2030plans/

system costs and difficulties - not least in resolving congestion in time - that flow from the speed of this change.

The Impact Assessment 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 reaction demonstrates the price sensitivity on 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 meet full decarbonisation by 2050. If a lower ambition is adopted for RES (and thus RES-E), greater savings will be needed elsewhere, which will be at best difficult. However, if the EU has a chance to achieve it, and at electricity prices that citizens are willing to pay and maintain support for the Green deal, a far more coherent plan at EU and national level is needed to achieve it than exists today.

4.4. Hydrogen

The cumulative effect of the proposals is likely to deliver a huge demand for renewable hydrogen. The Commission takes a deliberate and systematic technology choice in favour of renewable hydrogen only. 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, notably in the UK, 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 on all hydrogen sales by 2030. This is a *de facto* legally binding EU target for renewable hydrogen. Studies[6] show that renewable hydrogen is at present significantly more expensive than low carbon hydrogen, produced from natural gas using CCS and is likely to remain so at least until 2030 (and probably beyond). The Commission's proposal requires at minimum 50% of the existing 8 Mt of feedstock hydrogen to be replaced by renewable by 2030. If one makes an assumption that in 2030 renewable hydrogen will cost 2 €/Kg more than the hydrogen produced from fossil fuel, and that renewable hydrogen will cost 1 €/Kg more than the hydrogen produced from natural gas using CCS (these are by definition an illustrative estimate, but are roughly in line with literature[7]), 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 from carbon leakage.

- The transport target in the Renewable target Energy Directive (reduction of GHG intensity by 13% by 2030) can only be met using renewable fuels (i.e. qualifying biofuels and qualifying renewable fuels or non-biological origin) or electricity. Other low-carbon fuels such as blue hydrogen or 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) at 2.6% for 2030.

[6] https://fsr.eui.eu/publications/?handle=1814/68977
[7] file:///C:/Users/Brucxj/Downloads/QM-04-20-535-EN-N%20(7).pdf

- Member States are required to grant guarantees of origin for the production of renewable hydrogen under the Renewable Energy Directive. However, this is only optional for low-carbon hydrogen, which is in any event not defined.

- The Energy tax Directive places 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 is 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 GHG than 50% compared to fossil fuels (80-90% being industry expectations).

- The FuelEU Aviation Regulation, requires fuel suppliers to rapidly decarbonise the fuel they supply (2% in 2025, 5% by 2030, 20% by 2035, 32% by 2040, 38% by 2045 and 63% by 2050), and requiring 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 strong demand for qualifying biofuels and hydrogen. Whilst 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 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 additional massive demand. Whilst the use of renewable hydrogen based fuels in aviation and potentially maritime ramps up more slowly, by 2030 they would add additional very important sources of demand.

Thus 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 casts doubt whether there would be sufficient renewable electricity by 2030 and beyond to meet all the EU's Green Deal needs - electrification, transport, buildings and industry, as well as hydrogen[8]. 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 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,

[8] https://fsr.eui.eu/publications/?handle=1814/71439

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 of transport and industry.

Regarding technology neutrality, it should be noted that literature currently places blue hydrogen significant cheaper than renewable - the competitiveness of 'green' hydrogen being dependent on plentiful low-cost renewable electricity (see above).

An additional question concerns pyrolysis-based hydrogen[9]. 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 whole or part of the pyrolysis feedstock, it can be a negative GHG form of hydrogen production. Pyrolysis also uses less than 25% of the renewable electricity to produce 1 kg of hydrogen compared to electrolysis, important if RES is indeed a scarce resource in the EU. This technology is at present at demonstration scale, with a large demonstration plant currently under construction in the US[10]. 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 include any technology using renewable energy that can be demonstrated to be equally climate-friendly as electrolysis, as technology is evolving rapidly in this area.

The above-mentioned factors - cost, availability of RES, technology development - make the renewable hydrogen only 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 invest in low-carbon hydrogen, rather than this be based on regulatory decisions. It may well be that, given the need to amortise any investment in blue hydrogen by 2050, companies may chose not to invest in this technology. But to take a regulatory decision now to close the door on this technology requires careful consideration.

5. 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 the 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 probably missed its 2020 energy efficiency target of a 20% improvement[11] - the current objective will require far more ambitious action if there is any chance to achieve it.

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[9] https://fsr.eui.eu/publications/?handle=1814/72003

[10] https://monolith-corp.com/methane-pyrolysis

[11] https://www.euractiv.com/section/energy/news/europe-on-track-to-smash-its-2020-climate-goal-eea-says/

It is also ambitious because the above analysis makes it clear that to achieve it will require sacrifices by EU citizens, in terms of personal cost and industrial competitiveness.

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 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, fertilisers, etc. 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 the carbon leakage list. It is difficult to conclude otherwise than 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 the proposals will lead to increased costs; for electricity (RES), heating (RES), and for 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, 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: 'how much will the totality of these measures cost to 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 huge 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.

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