Overview and analysis of the key policy announcements made by the EU for the **Fit for 55 Package**

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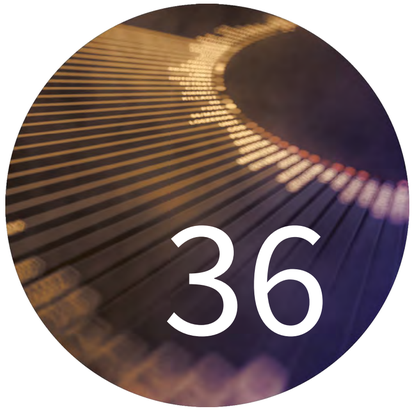
Fit for 55



The European Commission released seventeen policy proposals known as Fit for 55 in July 2021, looking at the pathways for decarbonization in the EU. The objective of the policies is to ensure that the European Union (EU) is fit for reducing its greenhouse gas (GHG) emissions by 55 percent from its 1990 levels by 2030.

The documents include proposals to amend regulations, directives, revisions and amendments to existing directives and communications.

Each of these proposals, if adopted, would create different legal requirements.

This report is split into four sections:

Part 1 – Executive summary

Part 2 – Background to the EU and Fit for 55 policies

Part 3 – Policy walk through

Part 4 – Analysis

As with many government agencies, the EU relies heavily on acronyms. To aid reading, please refer to the acronym list at the end of this report.

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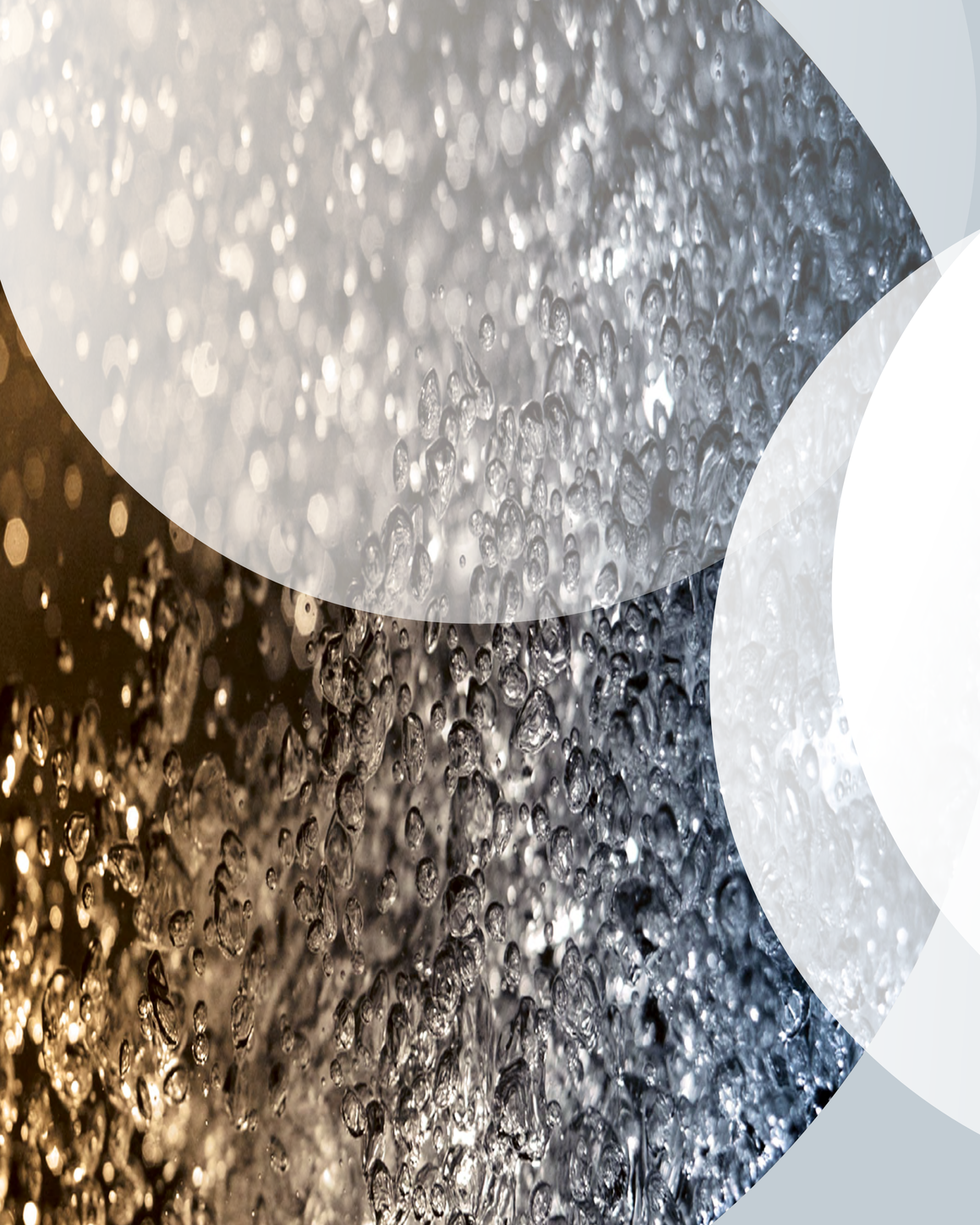


Part 1

Executive summary

1.1 Key takeaways from the Fit for 55 package

Opportunities

There are many explicit and implicit opportunities unpacked in the Fit for 55 packages. These include developing and running:

- secure monitoring, reporting and verification systems for the expanded data needs
- High volume SAF production
- Networks for alternative fuels in the transport sector such as liquid hydrogen refueling stations
- Carbon accounting systems
- Implementation of the carbon border adjustment mechanism (CABM).

Innovation needs

Increased focus on innovation, but directed towards a handful of technologies that include:

- Liquid hydrogen
- Battery technologies
- CCS
- Zero carbon trucking
- Carbon accounting.

Timing

Most of the policy changes under Fit for 55 put increased pressure on adoption of innovative technology and new fuels, which include:

- Deployment of publicly accessible liquid hydrogen refueling stations by 2030.
- Land use to be carbon neutral by 2035.
- 63% SAF available at airports by 2050.
- Shore side power for 90% of shipping demand by 2030
- From 2035 the EU fleet wide CO_2 target for new cars is set at 0 g CO_2/km.

Enablers

The suite of policy documents focus on removing barriers to adoption and deployment of technologies for decarbonization. They include:

- Deployment of a critical mass of publicly accessible recharging and hydrogen refueling points across Europe by 2030.
- Increased taxation on fossil fuels focused on transport with lower taxes on heating.
- The CBAM levels the playing field with importers.
- Roll out of the low and zero carbon fuels.
- Aim to plant millions of new trees.

Threats and penalties for inaction

The key policy threats outlined in the documents are:

- For the ETS scheme there will be a 25% allowance penalty if energy efficiency measures are not enacted.
- The automotive fine remains that if the average CO_2 emissions of a manufacturer's vehicle fleet exceed its specific emission targets each year, the manufacturer has to pay-for each of its vehicles newly registered that year – an excess emissions premium of € 95 per g CO_2/km exceeded.

Limitations

For most of the policies there is a lack of clear penalties for noncompliance. Whilst these may be developed during the development of national policy, timing of new regulations remains unclear.

1.2 Summary comments from each sector covered in report

1.2.1 Road transport

The policy documents provide enablers and policy pull for adopting zero-emission vehicles.

Enabler

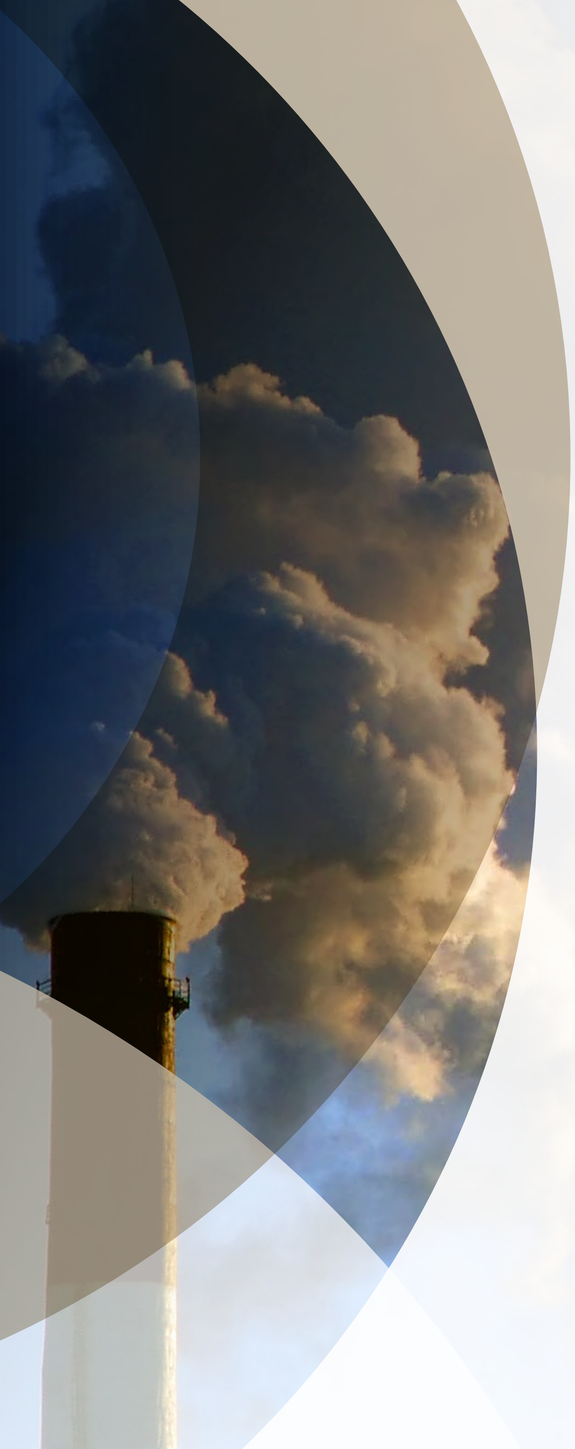
- Detailed roll out requirements across the TEN-T (Trans European Network – Transport) network, for publicly accessible infrastructure, initially by 2030. As these requirements come through via a Directive, expect to see a duration of two-plus years to translate into national plans, then a ramp up and roll out in the remaining years of this decade.

Policy pull

- For newly registered passenger cars, the 2021 EU fleet-wide average GHG emissions target of 95 g CO_2/km will be gradually reduced. By 2030 the target GHG emissions of the EU passenger car fleet-wide average will be 37.5 percent lower than the 2021 limit. For newly registered vans, the EU fleet-wide average emission target by 2030 is 147 g CO_2 /km from 2021 onward, which will be reduced by 31 percent. By 2030, light duty trucks must reduce GHG emissions by 30 percent from the 2019-2020 fleet average. Further reduction of GHG emissions for new cars, vans and light duty trucks will be to a vehicle fleet average of 0 g CO_2/km by 2035.

- Increased targets for the adoption of renewable energy into transport via the updated Renewable Energy Directive II (REDII).
- Change in taxation rates for transport fuels so that fossil energy, such as diesel, pay the highest minimum reference tax rate and low carbon emission fuels, such as electricity and green hydrogen, pay the minimum tax rate. Blue hydrogen will receive the lowest tax rate for a transition period of 10 years.
- Creation of a second Emission Trading Scheme (ETS) that will cover road transport and shipping.

Note that road transport policies apply to passenger cars, vans, and light duty trucks. For heavy duty trucks the focus remains on the need to innovate in terms of products that are fully fit for purpose..



1.2.2 Maritime

The documents include new policies and regulations targeting the regulation of emissions from shipping.

Enabler

Shore side power in ports and inland waterways. Ports will need to provide 90 percent of the required power for the port from shore-side power by 2030. As this requirement comes through a Directive, expect to see at least two years for the this to be translated into national plans and an expected ramp up in the remaining five years of this decade to comply with the Fit for 55 policies.

This will require ports to provide tens of megawatts (MW) of power per berth by the end of the decade, opening new business opportunities across Europe.

Policy pull

The fleet average greenhouse gas intensity of the energy used on-board ships is to be reduced by six percent by 2030 followed by a step change of 75 percent reduction by 2050. These reductions are measured against the 2020 levels.

A second ETS scheme will be created which will cover road transport and shipping. Unlike in the original ETS, all unused allowances will be cancelled ensuring shipping companies do not bank and trade any excess allowances. Any ships with a shipping flag outside of the EU will be assigned an EU 'home' that will be the country it berths in most often.

1.2.3 Refining

The key takeaways from the Fit for 55 proposals for the refining industry are a mix of opportunities and potential penalties for non-compliance.

Potential penalty

As part of the EU ETS program of changes, if a refinery does not enact proposed decarbonization activities that have a payback of less than five years, the refinery will lose 25 percent of its free allowances. Independent audits to evaluate decarbonization activities will be completed every year.

Threat/opportunity to BAU

Production of sustainable aviation fuel (SAF).

ReFuelEU calls for four to eight percent use of SAF by 2030, and 63 to 68 percent use by 2050, with SAF to be available at every airport across Europe. This could be an opportunity for refineries that are able to produce SAF. However, many refineries do not have the appropriate process unit configuration, especially if feeds are limited to non-crop-based feeds and renewable liquid and gaseous fuels of non-biological origin (RFNBO).

Threat to BAU

Decarbonizing new light-duty vehicle fleets by 2035 and the rising demand for SAF means there will be falling demand for hydrocarbon-based fuels. This policy together with the potential penalty under the EU ETS for not investing in projects to reduce GHG emissions, may lead to further rationalization of the EU refining industry and plant closures. Demand for hydrocarbon fuels may be increasingly met by imports during the transition to the low-carbon future envisaged in Fit for 55.

Although the refining industry is not part of the first tranche of the Carbon Border Adjustment Mechanism (CBAM), the door is open for the industry to be part of the second tranche.

1.2.4 Ammonia

As with other sectors there are potential penalties and opportunities affecting the ammonia industry in the Fit for 55 package.

Potential penalty

As part of the EU ETS program of changes, if a plant does not enact proposed decarbonization activities with a payback better than five years, the plant will lose 25 percent of free allowances. Decarbonization audits will be completed every year.

Opportunity

Green ammonia, especially in the maritime sector, is identified in the FuelEU Maritime – green European maritime space – as a fuel that needs support for increased market penetration. In this document the EU Commission sees ammonia as a longer-term potential for widespread use in shipping.

The ammonia industry will be impacted by the inclusion of fertilizers in the CBAM, which could raise the cost of imports if their carbon intensities are deemed higher than EU-produced ammonia. Ammonia is being considered as a zero-carbon emissions marine fuel and for power generation. The ammonia industry is continuing to decarbonize through low-carbon hydrogen. Green ammonia is now eligible for funding under the Innovation Fund.

1.2.5 Aluminium

The aluminium industry faces challenges and opportunities under the Fit for 55 policies.

Opportunity

Reducing GHG emissions from new passenger cars, vans and light-duty trucks will increase the demand for aluminium to reduce vehicle weight. This trend will continue with the increased adoption of battery and fuel cells vehicles as manufacturers strive to increase range by reducing vehicle weight.

Challenge

Carbon inventorying on a plant-by-plant basis will be required for any company exporting to Europe to comply with the CBAM. For companies in Europe carbon inventorying is already in place under the EU ETS. It is likely that we will see increased pressure for companies who do not export to Europe to follow suit, especially if other regions (e.g. Canada and the US) develop their own CBAMs.

Aluminium producers in Europe without access to stable and reliable renewable power will find it difficult to meet decarbonization targets. Innovative technologies to allow for variable power supply to a smelter or use of inert anodes are not yet commercial.

1.2.6 Hydrogen

Hydrogen and low-carbon hydrogen are mentioned in most of the updated policy documents. The 40 GW electrolytic hydrogen target outlined in the EU 2020 Hydrogen Strategy has clearly fed into several policies.

Blue hydrogen has been given a 10-year transition period, tacitly supported by the lowest minimum taxation reference rate, and not explicitly excluded elsewhere. It is also clear that hydrogen from renewable energy is seen as the primary production pathway that will be supported across Europe.

In terms of applications, hydrogen in transport and industry are both supported in the policy documents. Due to the current lack of market-ready liquid hydrogen refueling stations, the inclusion of liquid hydrogen across the TEN-T fuels distribution network could signal future directions for research and development (R&D).

Note that the full taxation framework for hydrogen is due to be finalized in December 2021.

1.2.7 Carbon price

From the policy frameworks being generated under the Fit for 55 proposal, it is expected that there will be an increase in the price of allowances in the EU ETS.

While there is not a target price for carbon in the Fit for 55 documents, it is clear that the EU is aiming to create a tipping point where it is more economic for a company to invest in decarbonization activities than buy allowances from the EU ETS.

We are of the opinion that the 2030 carbon price will be in the region of €100 per tonne, with perhaps a high side estimate of €130 per tonne.

A price of €100/tonne for CO_2 is still well below the European Investment Bank's (EIB) shadow price for €250 per tonne for 2030, which it believes is necessary to meet the Paris Agreement's target to keep global warming below 1.5 degrees Celsius.

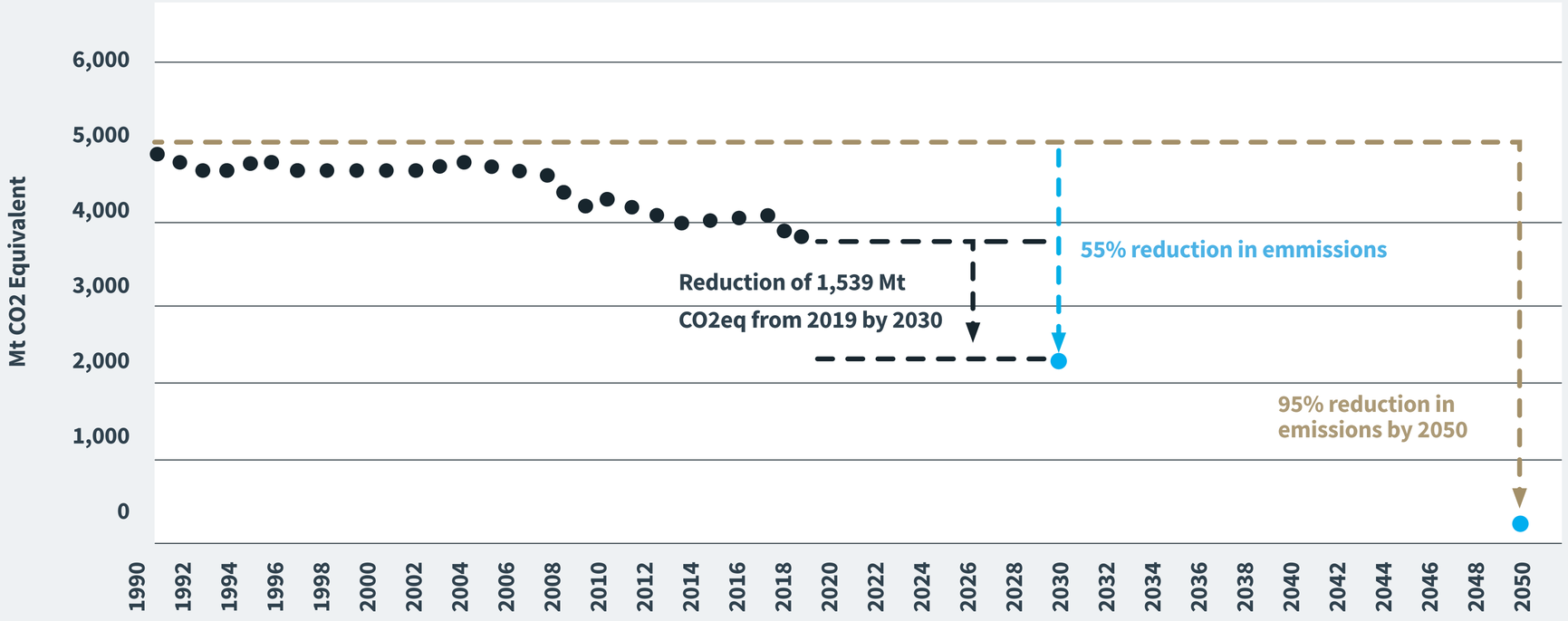
Part 2

Background to the EU and Fit for 55 policies

2.1 Timing of proposed GHG emissions reduction

The aim of the Fit for 55 package is to ensure that EU policy is aligned so the 27 member states of the EU can reduce their overall GHG emissions by 55 percent by 2030 from a 1990 baseline. Figure 1, using data from the European Environment Agency, highlights the challenges ahead.

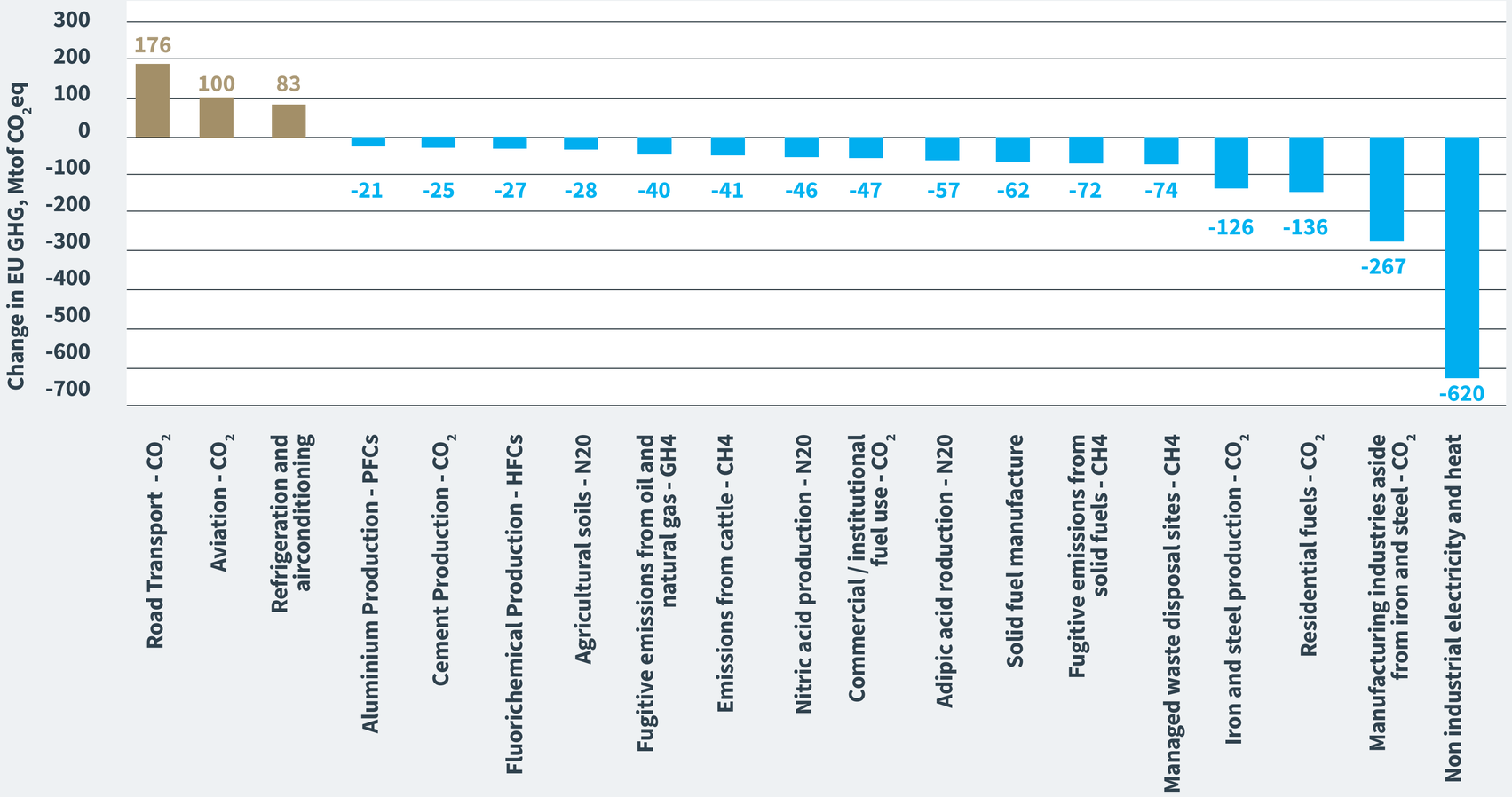
Figure 1 *EU-27 CO_2 equivalent emissions data and 2030 and 2050 legally binding targets*



Source: European Environment Agency, 2021

Figure 2 shows how the emissions profiles of various sectors have evolved since 1990 in the EU. In 2017, direct emissions from aviation in the EU accounted for 3.8 percent of total CO_2 emissions. The aviation sector creates 13.9 percent of the emissions from transport, making it the second biggest source of transport GHG emissions after road transport.

Figure 2 *Changes in EU 28 GHG emissions from 1990 to 2019 (These data include those from the UK, which as of 2020 is no longer part of the EU.)*



Source: Eurostat, 2021 and ***https://ec.europa.eu/clima/policies/transport/aviation_en***

2.2 EU policy types overview and Fit for 55 policy broken out by policy type

The European Commission, which acts as the executive branch of the EU, has a range of instruments at its disposal.

To clarify the Fit for 55 policy proposals, we provide a brief overview of the types of instruments used and, on the next page, the potential timing of their translation to regulation.

The policy proposals in the Fit for 55 package are shown in Table 2 broken out by their policy type.

Table 1 *Overview of policy types in the EU*

	Instrument	Explanation
Legally binding	**Decisions**	Legally binding in their entirety. A decision can be specific to a subset of either countries or groups and is only binding on them.
	Delegated acts	Legally binding, allowing the EU to modify or expand the non-essential part of EU legislative acts. The commission adopts the delegated act, which enters into force if Parliament and council have no objections.
	Implementing acts	Legally binding acts which outline how the EU laws are uniformly applied across the member states.
	Regulations	Legally binding acts that are automatically and uniformly applied to all EU countries as soon as they come into force. They are binding in their entirety and do not need transposition into national law. They are finalized and part of law 14 days from publication in the Official Journal of the European Union (OJEU).
Non-legally binding	**Communications**	Documents explaining EU policy. They have no binding force.
	Directives	Policy which requires EU countries to achieve a net result. A directive is the overall target generally applied to all European countries. Each EU country is required to submit a plan of action for their percentage of the overall target. Transposition into national law is required. This process takes two years, and the deadline is set when the directive is adopted.
	Recommendations	Outline of a suggested line of action on a specific subject that the EU agencies have views on. A recommendation has no legal authority.
	Opinions	Statements made by an EU institution with no binding force

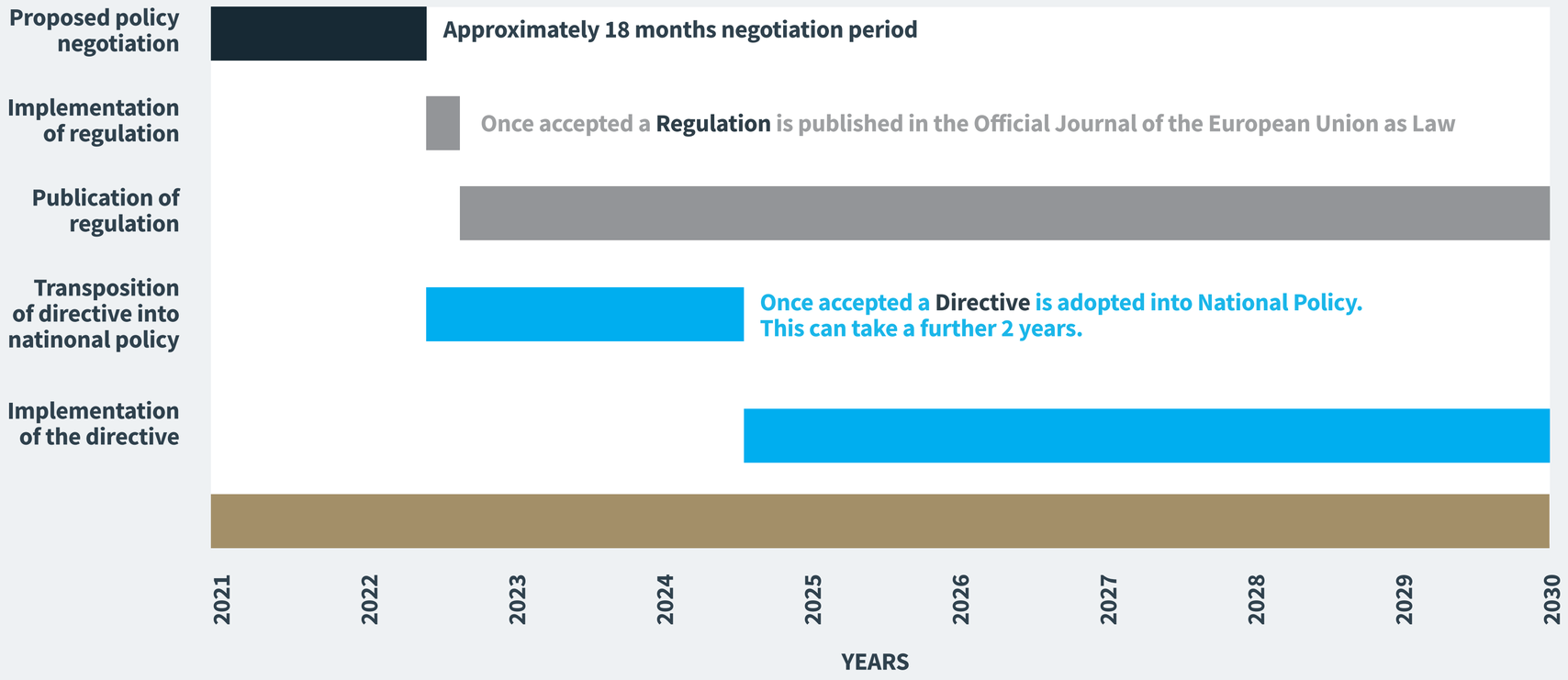
2.3 Enactment – suggested timeline to 2030

The Fit for 55 proposals include regulations, directives, and revisions and amendments to existing directives and communications.

The next steps to implementation include negotiations, development of nation specific regulations, and policy adoption and implementation.

Figure 3 shows a potential timeline for development and implementation of regulations from the Fit for 55 proposals over the next nine years. It underscores the need for timely adoption of the pathways so the 55 percent target to reduce emissions is met by 2030.

Figure 3 *Suggested Timeline for Implementation*



2.4 TEN-T Network

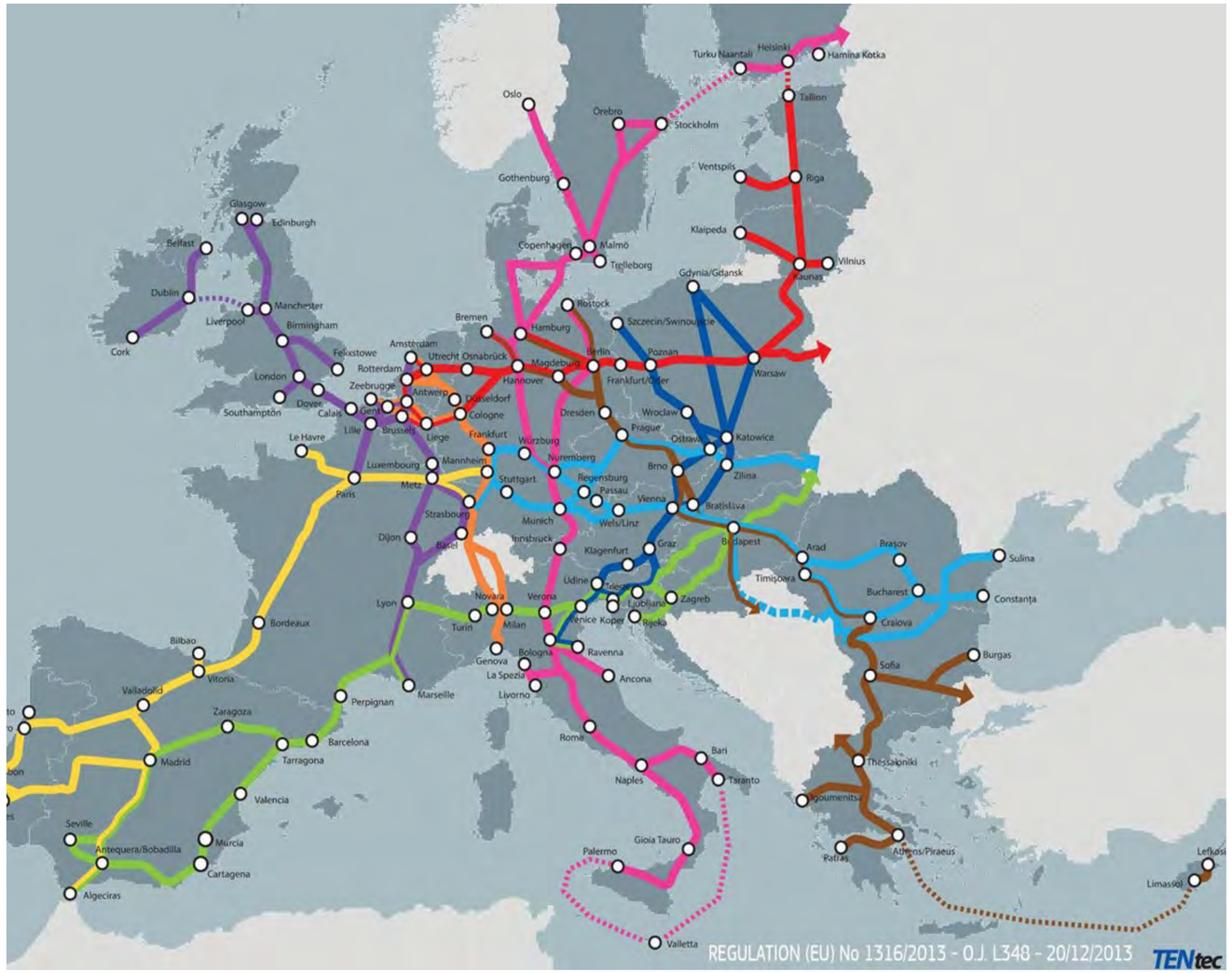
Several policies reference the TEN-T (Trans European Network – Transport, Figure 4) – a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports, and railroad terminals to be implemented and developed.

Key points to note about this network include:

- The TEN-T core corridors include nine major corridors covering 35,000 kms of roads.
- The **core network** includes the most important connections, linking the most important nodes, and is to be completed by 2030.
- The **comprehensive network** covers all European regions and is to be completed by 2050.

The TEN-T network promotes low-carbon transportation and shipment of goods, which requires low-carbon refueling networks.

Figure 4 *Ten-T Network*



Source: Directorate General Mobility and Transport, European Commission, 2021

Part 3

Policy walk through

This section walks through each of the policy updates outlined in Table 2.

Table 2 Fit for 55 proposed communications, directives, regulations

Policy Type	Sectors Covered	Subject
Regulation	Carbon tax/emissions trading	Revision of the Regulation on the inclusion of GHG emissions and removals from land use, land use change and forestry
Regulation	Carbon tax/emissions trading	Effort sharing regulation
Directive	Renewable energy	Amendment to the Renewable Energy Directive to implement the ambition of the new 2030 climate target
Directive	Energy efficiency	Proposal for a Directive on energy efficiency
Directive	Aviation	Revision of the EU Emission Trading System for Aviation
Regulation	Aviation	ReFuelEU Aviation – sustainable aviation fuels
Regulation	Maritime	FuelEU Maritime – green European maritime space
Directive	Alternative fuels	Revision on the Directive on deployment of the alternative fuels infrastructure
Communication	Alternative fuels	Strategic rollout plan to support rapid deployment of alternative fuels infrastructure
Regulation	Automotive	Amendment of the Regulation setting CO_2 emissions standards for cars and vans
Regulation	Carbon tax/emissions trading	Carbon border adjustment mechanism
Directive	Carbon tax/emissions trading	Revision of the Energy Tax Directive
Directive	Carbon tax/emissions trading	Revision of the EU Emission Trading System
Directive	Aviation	Notification on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
Decision	Emissions trading	Revision the Market Stability Reserve
Regulation	Investment/innovation	Social Climate Fund
Communication	Forest credits/land use	New EU Forest Strategy for 2030

3.1 Revision of the regulation referring to the inclusion of GHG emissions and removals from land use, land use change and forestry

There are three objectives outlined in the proposed revision to this regulation.

3.1.1 Objective one: a climate-neutral land sector by 2035

To align with the 55 percent reduction target by 2030, the level of GHG removal due to land use, land use change and forestry (LULUCF) sector is targeted to reach 300 Mt CO_2eq. Following on from this LULUCF is targeted to then be carbon neutral by 2035.

Post 2035, if the LULUCF sector continues to remove carbon and becomes a carbon sink, further carbon reduction from the LULUCF sector can be allowed to offset emissions in other industries to achieve the overall aim of carbon neutrality across the EU.

3.1.2 Objective two: a fair, flexible, and integrated climate policy framework for the land sector

As opportunities to increase carbon removals are unevenly distributed across member states, and the multi-functionality of land creates varying synergies and tradeoffs, revision of LULUCF regulation will need to ensure a fair, flexible, and integrated policy framework. This includes specifying the annual allocations for the period 2026 to 2030 under both the LULUCF and Effort Sharing Regulation (ESR) sectors.

3.1.3 Objective three: simplifying the LULUCF rules

It was noted that several current accounting concepts used in the LULUCF sector can be optimized and simplified. This can reduce implementation costs and improve the integration of the LULUCF sector into national climate strategies. In addition, monitoring and reporting systems need to better reflect the climate performance of the sector.

3.2 Effort sharing regulation

Effort sharing regulation (ESR) translates the EU commitment on GHG reductions into binding annual GHG emission targets for each member state for the period 2021 to 2030. The modified ESR continues to allow the flexibility mechanisms in place (e.g., banking, borrowing, trading of credits). The ESR currently covers all GHG emissions included in the EU's target that are not included in the EU ETS scheme or LULUCF. The ESR covers emissions from:

- transport (except aviation and non-domestic shipping)
- buildings
- agriculture (until it moves into the LULUCF scheme)
- industrial installations
- gases not covered by the EU ETS and waste non-combustion related emissions from energy and product use.

The updated ESR focuses on:

- changes in the emissions targets per member state
- a proposal to include maritime emissions under the ESR
- establishing a voluntary additional reserve (formed by any unused LULUCF credits at the end of the second compliance period) to be used by member states for compliance with their ESR 2030 target, subject to the condition that the 55 percent EU-level reduction target is reached with a maximum contribution of 225 Mt CO_2eq of net removals in accordance with the European Climate Law. This maximum contribution of 225 Mt CO_2eq from LULUCF is 15 percent of the 1,539 Mt CO_2eq that must be removed from 2019 GHG levels to meet the EU Fit for 55 target in 2030.

3.3 Amendment of the Renewable Energy Directive to implement the new 2030 climate target ambition

The Renewable Energy Directive (RED) is the core directive aimed at increasing the use and adoption of renewable energy across the EU member states. It is being updated in the Fit for 55 proposals. The original RED II comes into force in 2021 and has set an overall EU 27 target of at least 32 percent renewable energy by 2030.

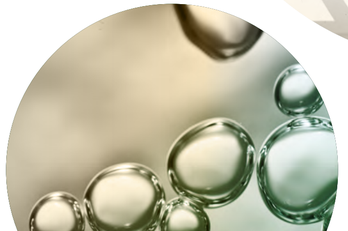
Key changes in the updated RED directive are:

- The share of renewable energy is increased to 40 percent by 2030 as compared to the previous target of 32 percent.
- Unlike RED, the new set of proposed changes to RED II now cover the transport and industry sectors.
- Expanding the EU emissions monitoring database to cover liquid and gaseous renewable fuels and recycled carbon fuels tracking as well as their lifecycle GHG emissions outside the transport sector.
- For the transportation sector, the amended directive includes adopting renewables, including green hydrogen, with a target to reduce GHG intensity by 13 percent.
- Energy use in the building sector should have renewable sources providing at least 49 percent of its energy.
- For the industrial sector, there is an indicative target of a 1.1 percent annual increase in renewable energy use, and a binding target of 50 percent of industry feedstock, including petrochemicals, coming from renewable liquid and gaseous fuels of non-biological origin (RFNBOs) by 2030.
- In monitoring reporting and verification (MRV), member states must issue Guarantees of Origin (GO) of renewable energy for any project that receives financial support from government agencies. Fossil fuel-based projects are not subject to this requirement.

3.4 Proposal for a Directive on energy efficiency

The updates from the Energy Efficiency Directive (EED) are:

- A call for a binding target on energy efficiency.
- The move to using energy system efficiency. This is a more holistic approach to the simplistic base definition of energy that involves using less energy to produce the same amount of output. Energy system efficiency, on the other hand, includes areas such as time efficiency, resource efficiency, and efficiency of dispatchability of resources. This change in definition is designed to address some of the issues being discussed about zero-carbon energy transition technologies. For example, using the traditional definition of energy efficiency, a solar panel will never be efficient because converting solar energy to electricity is inefficient. But under an energy system efficiency approach, linking a solar panel to batteries provides overall system- level efficiency.
- It should be noted that using energy system efficiency in policy documents is still in its infancy and is expected to be fleshed out as a criterion over the next years
- A new target is proposed in which member states must collectively reduce energy consumption by at least nine percent by 2030, as compared with the 2020 reference scenario. This nine percent reduction corresponds to 39 percent and 36 percent energy efficiency targets for primary and final energy consumption.
- EU countries must achieve energy efficiency savings of 1.5 percent per year of final energy consumption from 2024 to 2030, up from the current improvement target of 0.8 percent per year.



3.5 Revision of the EU Emission Trading System for aviation

This revision introduces three legal amendments:

1. Reducing free allowances apportioned to the EU aviation industry. The revision aims to consolidate the total quantity of allowances at the level of allocation/ auctioning for intra- European flights and departing flights from European Economic Area (EEA) airports to Switzerland and the UK.
2. The free allowance allocation for 2024 will be based on the total allocation to active aircraft operators in 2023, reduced by the linear reduction factor as specified in the ETS directive. The allocation will be increased by the level of allocation that would have been made if routes between outermost regions and states, other than the member state in which the outermost region is located, had been covered by the ETS in 2023.
3. The temporary derogation from EU ETS obligations for these routes expires on 31 December 2023. The increased cap will be reduced by the linear reduction factor as specified in the ETS.

The other key changes proposed by revision are to:

- consolidate the total quantity of aviation allowances at current levels, and apply the linear reduction factor in accordance with Article 9 of the ETS directive
- increase auctions aviation allowances
- continue intra-European application of the EU ETS while applying CORSIA as appropriate to extra-European flights
- ensure that airlines are treated equally on the same routes.

3.6 ReFuelEU aviation – sustainable aviation fuels

The EU aviation regulations call for four to eight percent use of SAF by 2030, and 63 to 68 percent by 2050, of which 28 percent is synthetic SAF.

Figure 5 shows the proposed blending targets.

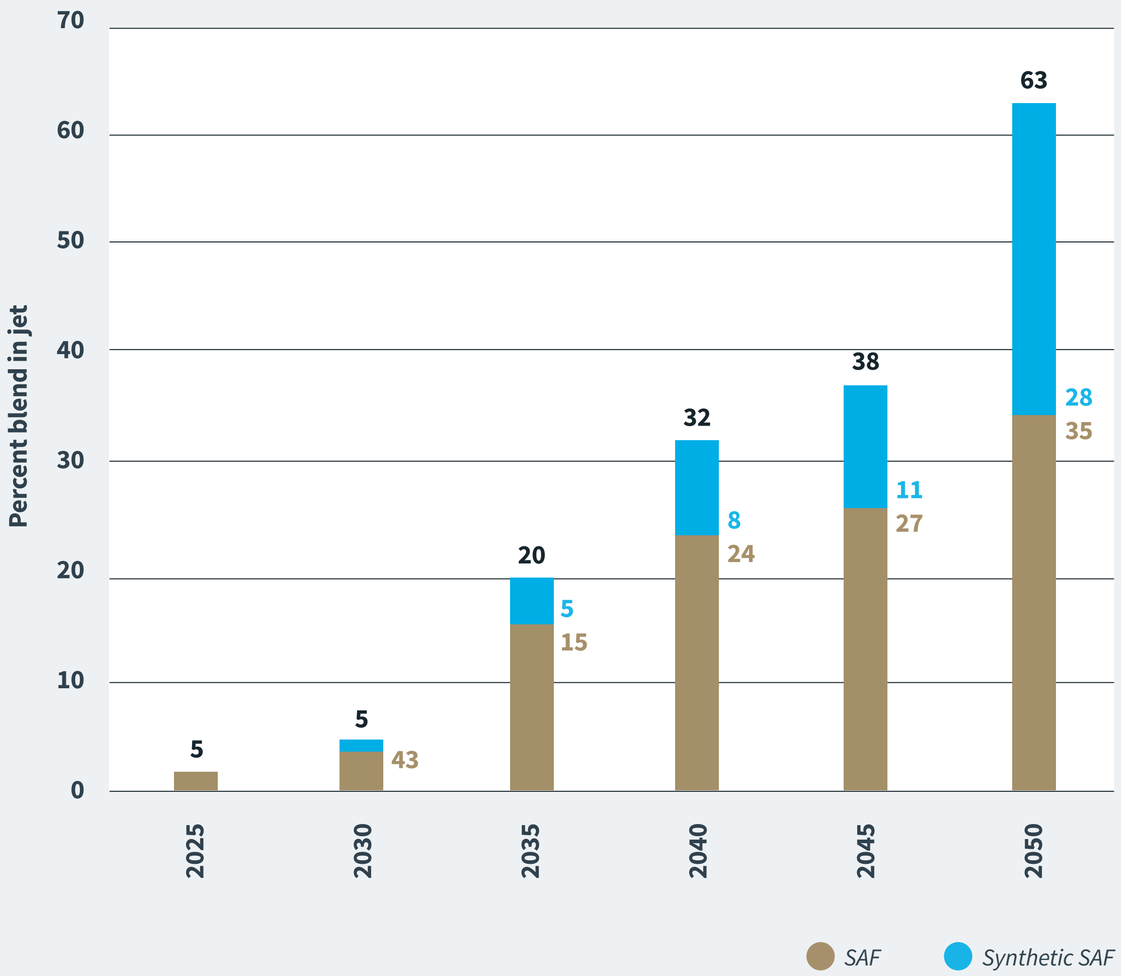
Synthetic SAF is defined as RFNBOs. These fuels are made from feed stocks such as CO_2.

The headline from the policy is that there is a mandatory obligation for fuel suppliers to supply SAF to airlines at all EU airports.

This comes into force on 1 January 2025. The obligation for the airlines is to use at least 90 percent of the SAF at a given EU airport.

The policy document focuses on current drop-in fuels, and therefore does not include electricity or hydrogen. The proposed proportion of SAF in liquid jet fuel consumed in the EU over time are shown in the adjacent figure.

Figure 5 *Proposed SAF Blending in EU Jet Fuel*



3.7 FuelEU maritime: green European maritime space

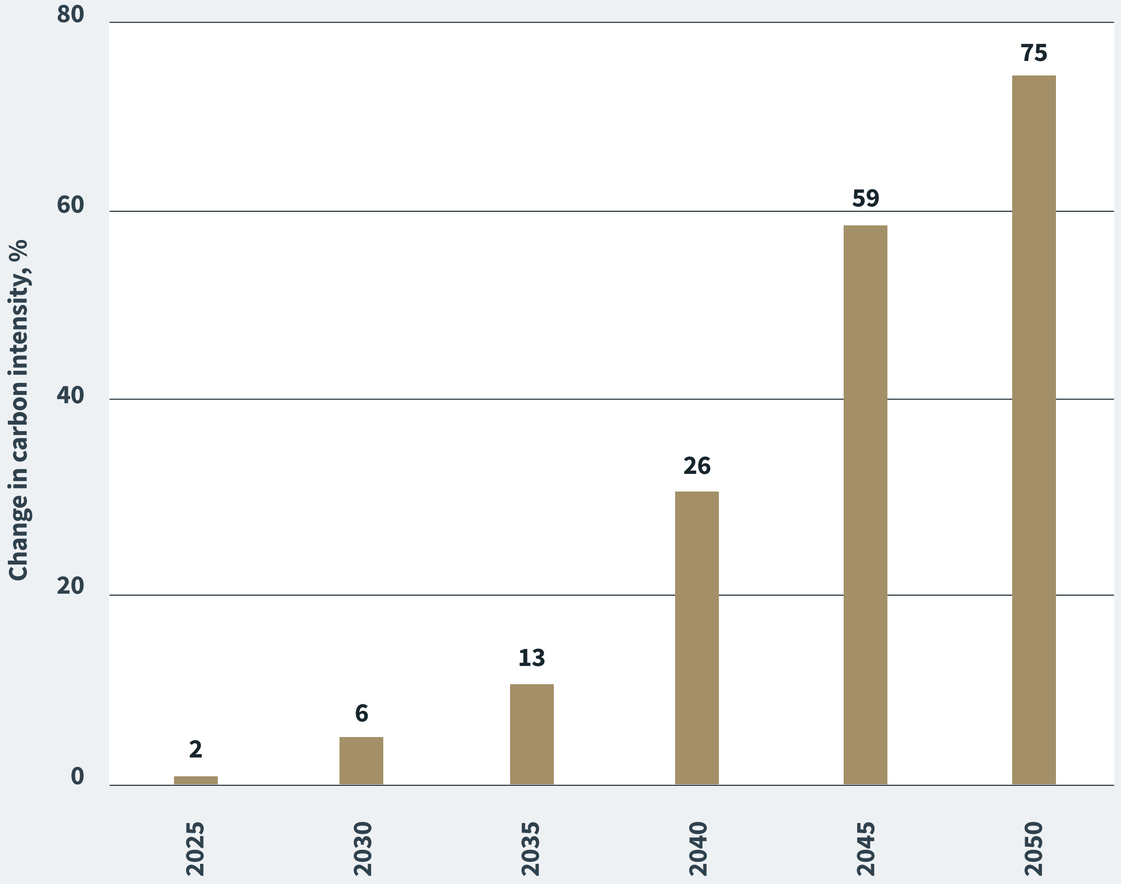
The proposed regulation establishes rules to reduce the GHG (CO_2 + CH4+ N2O) intensity of energy used on-board ships arriving at, within or departing from, ports under the authority of an EU member state. The regulation places ships under an obligation to use on-shore power supply or zero-emission technology in ports under the jurisdiction of a member state. This regulation applies to all ships above a gross tonnage of 5,000 regardless of the country their flag state.

The fleet average GHG intensity of energy used onboard ships in 2020 will be reduced over time at the rate shown in Figure 6.

Where a ship has a verified compliance surplus for the reporting period, the company may bank it to that ship's compliance balance for the next reporting period.

Conversely, where the ship has a compliance deficit for the reporting period, the company may borrow an advance compliance surplus of the corresponding amount from the next reporting period.

Figure 6 *Proposed Reduction in Marine Energy GHG Intensity*



3.8 Revision of the Directive on deployment of the alternative fuels infrastructure

3.8.1 Objectives

- Ensuring minimum infrastructure to support the required uptake of alternative fuel vehicles across all transport modes and in all member states to meet the EU's climate objectives.
- Ensuring the infrastructure's full interoperability by developing common technical specifications and fuel types, including hydrogen, liquid hydrogen, and ammonia.
- Ensuring full user information and adequate payment options.

This directive contains significant levels of data in terms of its requirements. These are included, in tabular and note format on the following pages. As a directive, this is an overall EU target that must be translated into policy country by country.

Analyst comment: this is one of the key unlocking policy documents across the entire Fit for 55 package. This directive is aimed at removing the chicken and egg problem in fuel/system decarbonization by outlining the required deployment of alternative fuel infrastructure, and critically, its interoperability.

The following table shows the battery electric vehicle (EV) recharging network requirements in TEN-T for light duty vehicles.

Table 3 *Battery EV infrastructure – light duty vehicles (LDV) under TEN-T*

By date	TEN-T core network max spacing	TEN-T comprehensive network max spacing	TEN-T core network max power requirements	TEN-T comprehensive network power requirements
31 December 2025	60km		At least 300 kW and one recharging station with an individual power output of at least 150 kW	
31 December 2030	60km		At least 600 kW and two recharging stations with an individual power output of at least 150 kW	
		60km		At least 300 kW and one recharging station with an individual power output of at least 150 kW
31 December 2035		60km		At least 600 kW and two recharging stations with an individual power output of at least 150 kW

The following tables shows the TEN-T requirements for the battery EV recharging network for trucks.

Table 4 *Battery EV infrastructure – trucks under TEN-T*

By Date	TEN-T Core Network Max Spacing	TEN-T Comprehensive Network Max Spacing	TEN-T Core Network Max Power Requirements	TEN-T Comprehensive Network Power Requirements
31 Dec 2025	60km		At least 1400 kW and one recharging station with an individual power output of at least 350 kW	
31 Dec 2030	60km		At least 3500 kW and two recharging stations with an individual power output of at least 350 kW	
31 Dec 2030		100km		Each recharging pool shall offer a power output of at least 1400 kW and include at least one recharging station with an individual power output of at least 350 kW
31 Dec 2035		100km		Each recharging pool shall offer a power output of at least 3500 kW and include at least two recharging stations with an individual power output of at least 350 kW
Other requirements				
31 Dec 2025				In each urban node publicly accessible recharging points dedicated to heavy-duty vehicles providing an aggregated power output of at least 600 kW are deployed, provided by recharging stations with an individual power output of at least 150 kW
31 Dec 2030				In each safe and secure parking area, at least one recharging station dedicated to heavy-duty vehicles with a power output of at least 100 kW is installed
31 Dec 2030				In each urban node publicly accessible recharging points dedicated to heavy-duty vehicles providing an aggregated power output of at least 1200 kW are deployed, provided by recharging stations with an individual power output of at least 150 kW

3.8.2 Ensuring full user options

In terms of pricing and ability to access the infrastructure, the directive makes clear that while payment 'clubs' can be developed they cannot be a barrier to use for publicly available recharging points. Each station must be accessible to any user and payment should be made available by standard pathways, such as contactless payment, particularly stations funded by government subsidy or government roll out funds.

Analyst comment: this is a really interesting part of the directive as it goes against the current trend across Europe where EV infrastructure is only accessible if you become a subscriber to the service provider's electrons as a service offering. It does suggest that all infrastructure which is publicly funded must be accessible and have full interoperability.

There is also a clause on making prices easily accessible and comparable. Again, this is against the trend of electrons as a service.

This is not to suggest that private networks will not continue to develop. Making core infrastructure publicly accessible removes a potential barrier to adoption for EVs and fuel cell electric vehicles (FCEV).

3.8.3 Fuel cell and hydrogen infrastructure – light duty vehicles and trucks

For hydrogen, the refueling network must be available to both LDVs and trucks; freight terminals must provide access to hydrogen. As with EVs, users of these refueling stations must be allowed to use them without barriers to access.

Table 5 shows the requirements for hydrogen refueling networks for both light duty vehicles and heavy duty (HDV) trucks under TEN-T.

3.8.4 LNG infrastructure – heavy duty vehicles

Until 1 January 2025, member states will ensure that an appropriate number of publicly accessible refueling points for LNG are put in place along the TEN-T core network. This is to allow LNG heavy-duty motor vehicles to circulate throughout the EU, where there is demand, unless the costs are disproportionate to the benefits, including environmental benefits.

Table 5 *Hydrogen refueling networks for cars and trucks under TEN-T*

	By date	TEN-T core network max spacing	TEN-T comprehensive network Max spacing	TEN-T core network refueling requirements	TEN-T comprehensive network refueling requirements	Other
LDV and HDV	31 December 2030	150km	150km	2 tonnes/day available at 700 bar	2 tonnes/day available at 700 bar	
	31 December 2030					At least one publicly accessible hydrogen refueling station is deployed in each urban node
	31 December 2030	450km	450km	For liquid hydrogen		

3.8.5 Shore-side electricity supply for marine vessels

Table 6 shows the requirements for shore-side electricity supply to ships under TEN-T.

If the TEN-T network covers an island without a power grid this requirement does not come into force until a grid is in place. Ships with onboard zero emission power, including fuel cells, do not need to use shore-side power.

Table 6 *Shore-side electricity supply to ships under TEN-T*

	Vehicle Type	By date	Number of ships in port per year to trigger requirement	TEN-T core network	TEN-T comprehensive network
Port	Container Ships >5,000 gross tonnes	1 January 2030	50	Shore-side power output to 90 percent of demand	
	Seagoing Ro-ro ferries >5,000 gross tonnes	1 January 2030	40	Shore-side power output to 90 percent of demand	
	Other vessels >5,000 gross tonnes	31 December 2030	25	Shore-side power output to 90 percent of demand	
		1 January 2025		One installation providing shore-side electricity supply at all inland waterway ports	
		1 January 2030			One installation providing shore- side electricity supply at all inland waterway ports
Other					
Ports	LNG	1 January 2025		Appropriate number of refueling points	

If the TEN-T network covers an island without a power grid this requirement does not come into force until a grid is in place. Ships with onboard zero emission power, including fuel cells, do not need to use shore-side power.

3.8.6 Shore-side electricity supply for aircraft directive policy requirements

TEN-T core and comprehensive network airports ensure the provision of electricity supply from renewable energy wherever possible to stationary aircraft by the following dates:

- 1 January 2025 at all gates used for commercial air transport operations
- 1 January 2030 at all outfield posts used for commercial air transport operations.

As well as the specific roll out requirements of public and accessible alternative fuels infrastructure, the directive requires national governments to also develop a range of measures to promote infrastructure for both battery EV and hydrogen vehicles in areas including captive fleets, urban nodes, and rapid recharging.

In general, the directive makes it clear that both electric and hydrogen infrastructure must be developed in tandem for the transport sector (road, marine and aviation). These need to be coalesced into member state deployment plans and submitted to the commission for approval. They are to be submitted to the commission no later than 1 January 2025.

3.9 Strategic rollout plan to support rapid deployment of Alternative Fuels Infrastructure Regulation

The strategic rollout plan document is a communication document. It supports rapid deployment of alternative fuels infrastructure and, published alongside Alternative Fuels Infrastructure Regulation (AFIR), proposes several additional supporting actions. As well as a swathe of recommendationsto local councils to encourage them to support the rollout of infrastructure, the focus of this document is the proposed increase in investment in research and innovation, data, and interoperability.

Analyst comment: this document focuses very heavily on suggested funding that governments make available to underwrite the roll out of publicly accessible infrastructure. The key areas that they see as a level that European Commission can fiscally support are specifically around data and interoperability. They see the need for a common data platform, common standards, and common technology. These issues are substantial and not fully dealt with in this document, suggesting that we could see a more thorough program of works being released if AFIR is swiftly adopted.

3.10 Amendment of the regulation setting CO_2 emissions standards for cars and vans

This regulation change has three stated objectives:

1. Contribute to the 2030 and 2050 climate objectives by reducing CO_2 emissions from cars and light commercial vehicles
2. Provide benefits to consumers and citizens by deploying zero-emission vehicles more widely, including improved air quality, particularly in cities
3. Stimulate innovation in zero-emission technologies.

Specific changes to the regulations include:

- From 2030 the EU fleet-wide CO_2 emissions target for new cars is set 37.5 percent lower than 2021. For new vans, the fleet average must be 31 percent lower than 2021. For reference, these 2021 fleet average GHG emission levels are 95g CO_2/km for cars and 147g CO_2/km for vans
- Until 2030 the Zero-Low Emissions Vehicle (ZLEV) incentive for vehicles of up to 50g CO_2/km remains. This incentive grants car manufacturer credits against zero and low emissions vehicles. These credits can be used against their overall emissions targets. Post 2030 this incentive is removed.
- From 2035 the EU fleet wide CO_2 target for new cars is set at 0g CO_2/km.
- Car makers with less than 1,000 vehicles registered per annum will continue to be exempt from the changes in the regulation.

The penalty remains that if the average CO_2 emissions of a manufacturer's fleet exceed its specific emission target each year, the manufacturer must pay an excess emissions premium of €95 per g/km for each of its vehicles newly registered that year. Car manufacturers will continue to have the ability to group together and act jointly to meet their emissions target. In forming such a pool, manufacturers must respect the rules of competition law. Pooling between car and van manufacturers is not possible.

3.11 Carbon border adjustment mechanism

The aim of the CBAM is to ensure that the price of imports into the EU reflects their carbon content more accurately, with the intent to reduce the risk of carbon leakage. The CBAM will apply to imports of goods at the price of carbon determined by the EU ETS system through the system of auctions. Importers will need to provide audited data for imported goods, including:

- a unique identifier assigned by a CBAM authority that is to be created
- the type and quantity of emissions
- country of origin
- the calculation methodology that has been used.

Importers would be required to buy digital certificates, with each one representing a tonne of carbon dioxide emissions embedded in their imported goods.

The price of the certificates will be linked to the cost of permits in the EU carbon market and based on the average price of auctions of EU carbon permits each week. Certificates will have to be surrendered on a periodic basis (likely annually) to prevent banking cheaper certificates for later use when the carbon price is higher.

At launch, Scope 3 emissions have not been included.

Analyst comment: figure 7 provides a snapshot of the information known on the CBAM. For more information on this topic, and the current stance on the debate on the pros and cons, we refer you to the analyst note: Carbon Border Adjustment Mechanisms – updated July 2021 in the report section of Advisian Carbon Risk Index Service.

Figure 7 Carbon Border Adjustment Mechanisms (CBAM)

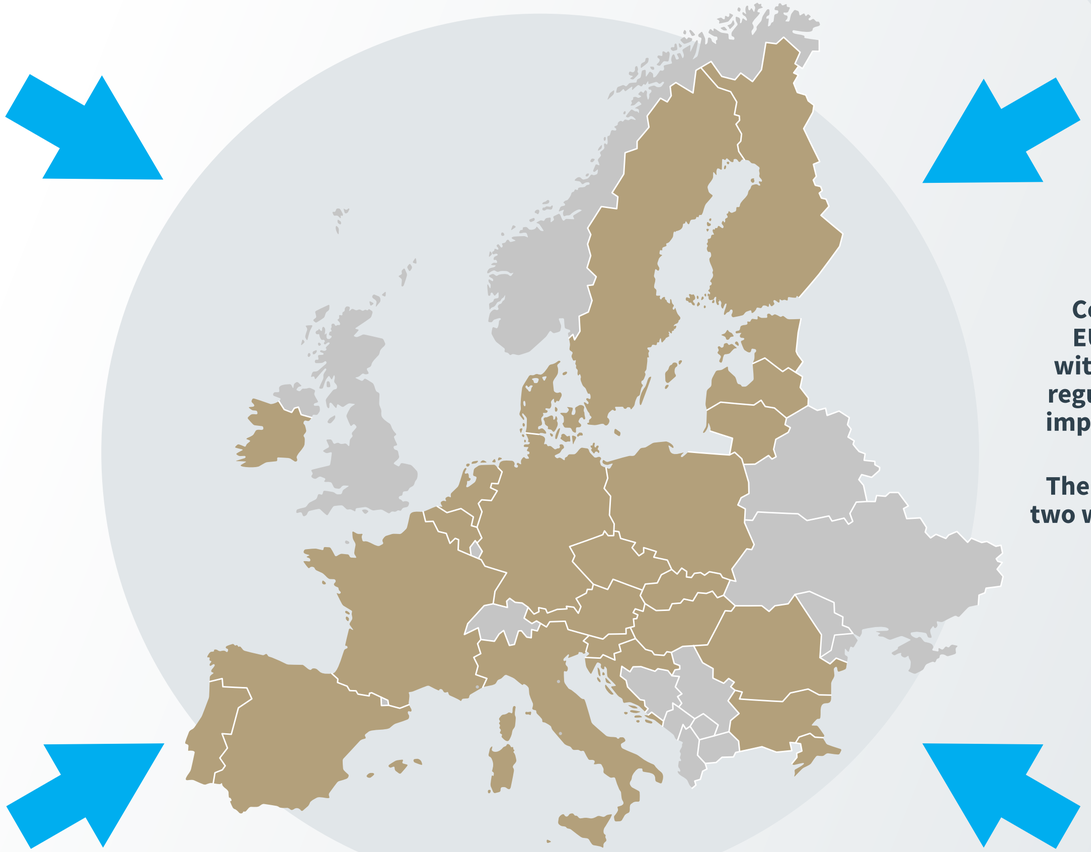
Launch: 2023

Full roll out: 2023

Initially covering: steel, iron, cement, fertilizers, aluminium and electricity

Includes: Scope 1 and Scope 2 emissions

The EU free allowances under the EU ETS will be phased out by 2035.
All finance raised from the CBAM will be used for climate mitigation activities



Companies outside the EUoperating in regions with less stringent carbon regulations will potentially import product with higher carbon footprint.

The difference between the two will be levelled out by the CBAM mechanism.

EUA allowances to emit are being reduced due to effects of the EU Climate Law

3.12 Revision of the energy tax directive

The European Commission identified that the original Energy Tax Directive (ETD) post 2003 (the date of the release of the original ETD) taxed any new fuels at the same level as fossil fuels irrespective of their carbon intensity. This resulted in fuels with lower carbon intensity and lower fuel density being fiscally penalized, which reduced the incentive for their adoption. In addition, the various levels of tax breaks and exemptions across EU countries provided incentives for fossil fuels. The aim of the revised ETD is to tackle both issues. First by providing a sliding taxation scale based on carbon intensity. Second by addressing the issues of tax exemptions for fossil fuels. The revised ETD also looks to include aviation and shipping in its scope.

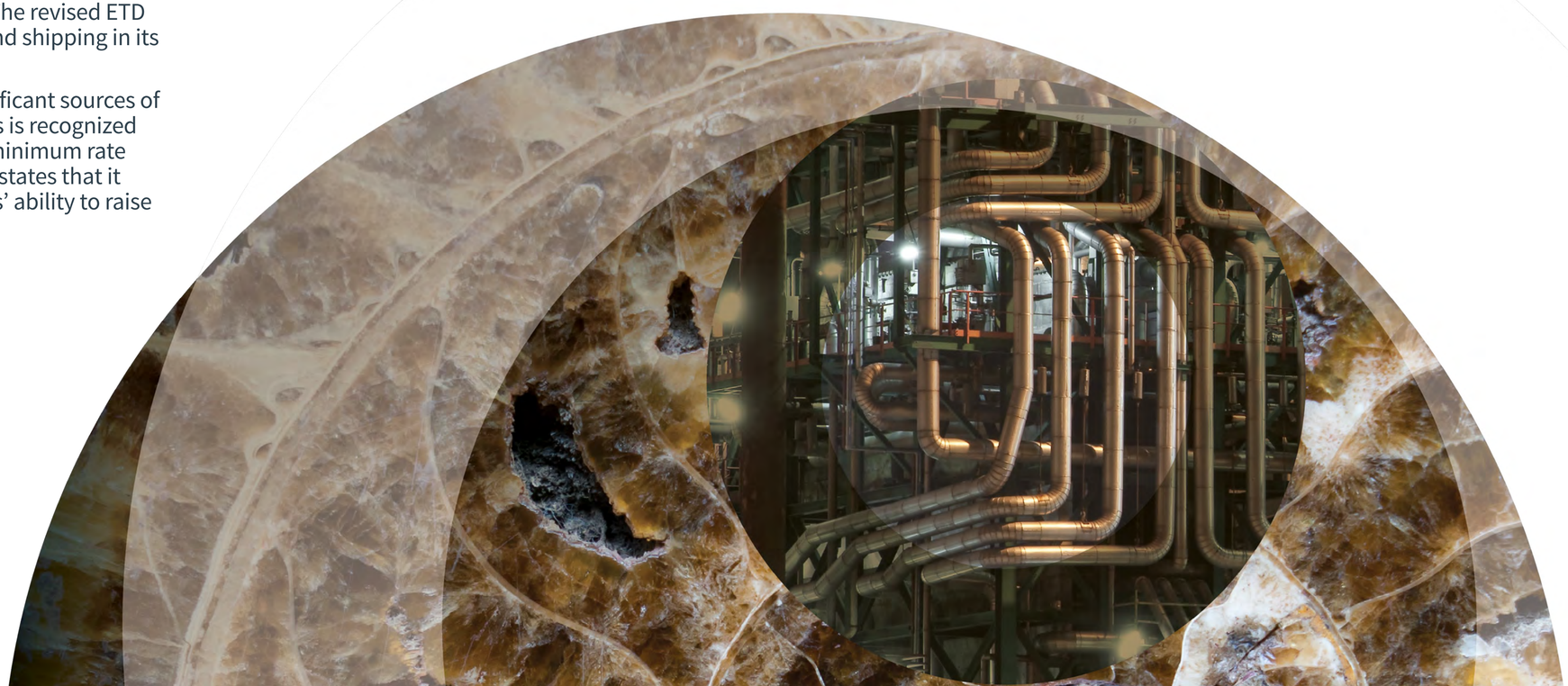
Taxes from motor fuels are significant sources of revenue for member states. This is recognized by the EU, which is why only a minimum rate of taxation is outlined. The ETD states that it aims to preserve member states' ability to raise revenue from taxation.

The new ETD is aligned around:

- Switching from taxation based on volume to taxation based on energy content.
- Eliminating incentives on fossil fuels.
- Introducing a ranking system of rates according to their environmental performance. The environmental performance is defined in relation to other EU policies under the European Green Deal.
- Higher taxes on fuels used for transportation rather than heating.

The proposed taxation rates under the new ETD are shown in Table 7. These rates are a minimum, with each member state able to increase this to levels that they see fit for their own revenue raising purposes.

To prevent double counting and potential retardation of the nascent energy storage market, any electricity storage facilities and transformers of electricity are to be classed as redistributors and are therefore tax exempt.



In addition to the changes in fuel taxation outlined in Table 7, the following changes will be introduced:

- The tax rate for aviation fuel for intra-European flights will be introduced over the next 10 years and will reach the minimum rate of €10.75 per GJ after this transitional period.
- For the maritime sector, due to the potential of ships to buy fuels outside of the EU, known as 'bunker evasion,' the shipping sector will be taxed at the levels of the agriculture sector.

Alternative fuels to fossil fuels used in the aviation and maritime sectors will not be taxed for a 10- year transition period.

Analyst comment: the policy framework for taxing hydrogen is not due for completion until December 2021.

Table 7 *New Tax rates for Motor Fuels and Heating Fuels*

Fuels covered	Use	Rate level	Minimum tax rate			
			€ per GJ	€ per kwh	€ per liter	€ per tonne CO2
Conventional fossil fuels and non-sustainable biofuels (e.g. diesel fuel)	Motor fuels	Reference rate	10.75	--	0.39	144
	Heating fuels		0.90	--	0.03	12
Natural gas, LPG, fossil hydrogen, non-renewable fuels of non-biological origin as motor fuels	Motor fuels	2/3 reference rate for a period of 10 years	7.17	--	--	127
	Heating fuels		0.60	--	--	11
Sustainable, but not advanced, biofuels as motor fuels (e.g. renewable diesel)	Motor fuels	1/2 reference rate	5.38	--	0.18	--
	Heating fuels		0.45	--	0.02	
Electricity, advanced sustainable biofuels and biogas, green hydrogen, renewable fuels of non-biological origin		Lowest minimum rate	0.15	0.00054	--	
Blue hydrogen and related fuels, for a period of 10 years			0.15	0.00054	--	

3.13 Revision of the EU Emission Trading Scheme

3.13.1 Overview of the EU Emissions Trading Scheme

The EU Emissions Trading Scheme (ETS) is one of the cornerstone policies to decarbonize the EU. It relies on a cap-and-trade mechanism and operates in all EU countries plus Iceland, Liechtenstein, and Norway (EEA-EFTA states). As of 1January 2020, Switzerland linked its own ETS to the EU ETS. Currently the EU ETS limits emissions from approximately 10,000 installations in the power sector and manufacturing industries, as well as airlines operating between these countries.

The current allocation of free allowances covering the period 2021 to 2025 was agreed upon in July 2021. Under the current scheme, 41 percent of emissions in the EU are covered, including the following sectors:

- carbon dioxide (CO_2) from all sources including:
  - electricity, fuel consumption and from hydrogen generation
  - steel works
  - production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals
  - commercial aviation within the European Economic Area (EEA)
- nitrous oxide (N_2O) from producing nitric, adipic and glyoxylic acids and glyoxal
- perfluorocarbons (PFCs) from the manufacture of aluminium.

3.13.2 Summary of key proposed changes

The need to revise the EU ETS originates from the new goal to reduce GHG 55 percent by 2030 from the 1990 base. Currently, approximately 41 percent of the emissions in the EU are covered under the EU-ETS Scheme. These sectors comprise highly carbon emission intensive industries such as steel, and industries that emit gases with high global warming potentials such as PFC's from aluminium smelting. Within this scheme, the volume of greenhouse gas emissions emitted by facilities covered under the EU ETS is limited by a cap on the number of emissions allowances. As the cap is reduced, emissions will also be reduced. In this proposal, the commission is now seeking mechanisms to reduce emissions from these sectors (along with the maritime sector) by 61 percent by 2030 from 2005 levels.

The proposal includes several changes to the EU ETS:

- Inclusion of shipping, buildings, and transport (details on the following pages).

  "Rebasing" the ETS system by reducing the overall emissions cap. As a one-off measure, the cap will be increased in 2023 when the maritime sector comes into the EU ETS.
- Increasing the linear reduction factor (LRF) to 4.2 percent per year from the current 2.2 percent per year. The linear reduction factor is a measure of the annual decrease of the number allowances in the cap.
- The gradual removal of free emissions allowances to enable the move to a full auction system for the aviation sector by 2027.
- All revenue generated from allowance auctions, which is not already apportioned to a budget, must be spent on climate-related purposes.
- Free allocation of allowances will, in future, be conditional on project owners, and companies implementing decarbonization efforts. These potential actions will be documented during annual energy audits. If a proposed decarbonization project has a payback of less than five years and is not implemented in a timely fashion, then allowances will be reduced by 25 percent. Initially, this applies only to companies required to conduct an energy audit under the Energy Efficiency Directive (EED). Small to medium sized enterprises (SMEs) are exempt.
- The CBAM is introduced. Any industry covered by the CBAM which currently receives free allowances under the existing ETS will have a 10-year transition period before all free allowances are phased out.
- The scope of the Innovation Fund is extended to allow support for projects through competitive tendering mechanisms such as Carbon Contracts for Difference (CCDs). Using CCDs is a new tool which could potentially be deployed under the banner of the EU ETS.
- The proposal supports the implementation of carbon capture and utilization technology by allowing for companies to retain allowances for emissions of CO_2 that end up permanently incorporated into a product such that the carbon does not enter into the atmosphere as CO_2 under normal use.
- Maintaining innovative installations in the EU ETS through a combination of activities, encouraging greater emissions reductions.
- The proposal includes a clause which brings producers of electrolytic hydrogen into the EU ETS. They will receive free allowances which can be auctioned off.

3.13.3 Extension to shipping

Shipping, specifically vessels above 5,000 gross tonnes, will be included in the EU ETS scheme from 2023. This policy will be enacted at the level of the shipping companies which own the vessels. For vessels over 5,000 gross tonnes this will apply to all intra-EU voyages, half of the emissions generated from extra-EU voyages and emissions occurring at berth in an EU port. In other words, 50 percent of all emissions generated by extra-EU voyages, or ships leaving the waters of the EU, will come under the EU ETS. Also, any ship that is not using shore-to-ship power will have its emissions from berthing included in the EU ETS.

Shipping will be under the same rules that apply to other sectors covered by the EU ETS regarding auctioning, the transfer, surrender and cancellation of allowances, penalties and registries.

The obligation to surrender allowances in the maritime transport sector will be gradually phased-in between 2023 to 2025, with shipping companies having to surrender 100 percent of their verified emissions as of 2026. In other words, free allowances granted to the shipping sector will have to be surrendered in accordance with their emissions profile. During the phase in period of the ETS, any allowances not surrendered because the emissions were lower than the overall number of allowances will be cancelled.

Each shipping company (owner of vessels) falling within the scope of application of the EU ETS is attributed to a Member State – the administering authority– for its administration under the directive. If the company has a flag state external to the EU, the EU country with the highest number of port calls from this company over the last two years will be deemed its member state.

3.13.4 Introducing a parallel ETS scheme for buildings and transport from 2025

The revision to the EU ETS scheme reaffirms the creation of a parallel and separate ETS scheme for buildings and transport. The scheme is to be started in 2025 with the regulated entities required to hold a GHG permit and to report their emissions for the years 2024 and 2025. This allows a baseline to be calculated. Allowances for emissions will be issued from 2026. There will be no free allowances in the buildings and transport ETS. All allowances will be auctioned off.

Due to the makeup of these sectors (e.g. small emitters), the point of regulation is to be established further upstream in the supply chain. The activity regulated will be the release of emissions associated with consumption of fuels for combustion in the buildings and road transport sectors.

The emissions cap for the new emissions trading system will be set from 2026 based on data collected under the Effort Sharing Regulation (ESR) and will decrease so as to achieve emission reductions of 43 percent in 2030 compared to 2005. A separate market stability reserve (MSR) will be applied post 2028.

Analyst comment: the transport sector will face an upheaval over the next decade with many new opportunities and threats from implementing the ambition of the new 2030 climate target expressed in the Revision on the Directive on Deployment of the Alternative Fuels Infrastructure and the Amendment to the Renewable Energy Directive. The new ETS for buildings and transport is being set up without any of the deficiencies noted in the establishment of the original ETS. A MSR will be built in and funds from the Innovation Fund will be released to stimulate the green transition.

3.14 Notification on the Carbon Offsetting and Reduction Scheme for International Aviation

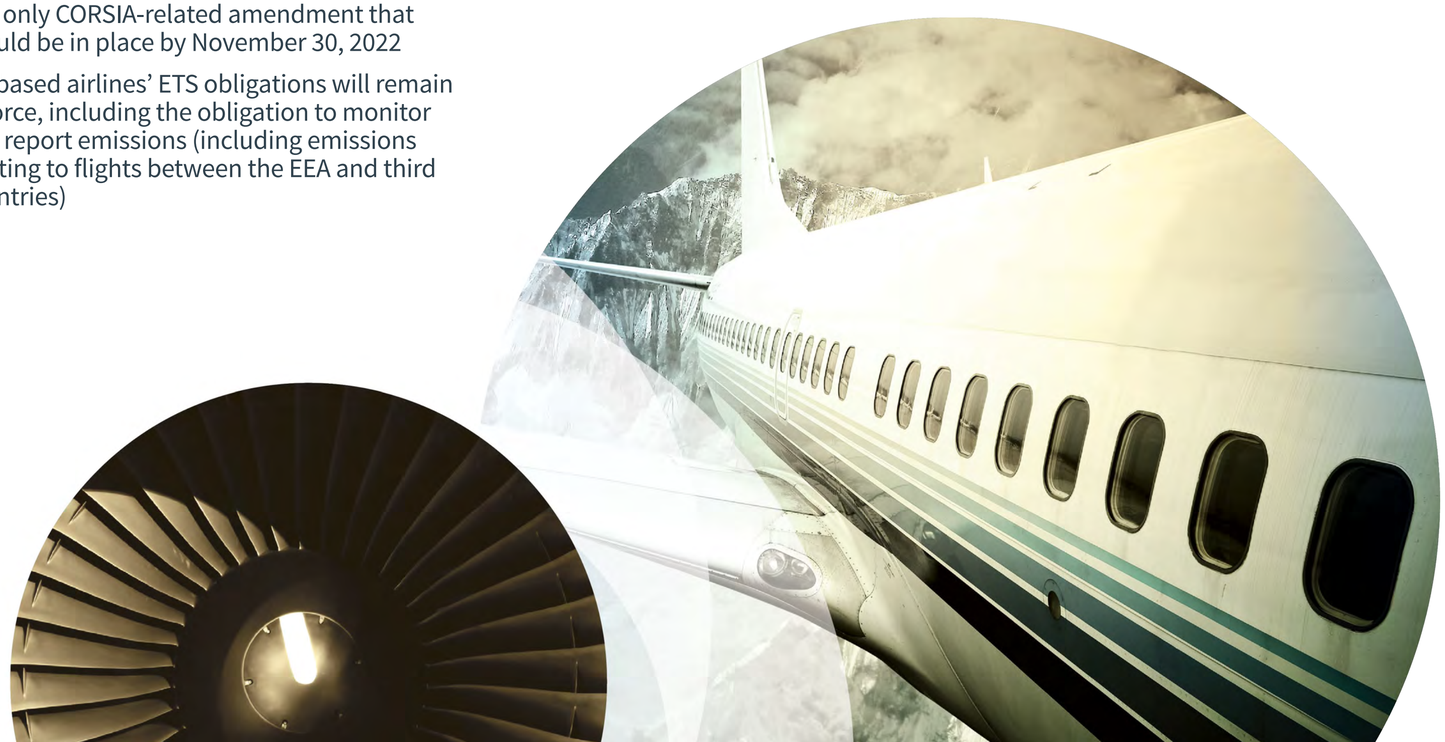
The International Civil Aviation Organization's (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is a mechanism for airlines to offset CO_2 emissions that exceed the relevant baseline.

To safeguard against an inappropriate economic burden on airplane operators, the ICAO council agreed in June 2020 to use emissions from 2019 as the baseline against which to compare emissions for 2021 to 2023, instead of using the average of 2019 to 2020 emissions as the baseline. The baseline was changed because COVID-19 caused aviation ETS CO_2 emissions to decrease by 64 percent in 2020 when compared to 2019. Forecasts for the recovery of the European aviation sector, published by the European organization for the safety of air navigation (Eurocontrol), predicts that 2019 emission levels will not be reached before 2024 (optimistic recovery scenario) and potentially not until 2029 (worst-case scenario).

The main points of the notification regarding ICAO's CORSIA mechanism for offsetting CO_2 from air transport are as follows:

- CORSIA introduces a legal obligation for member states to notify EU-based airlines by November 30, 2022 of the necessary offsetting figures relating to 2021 emissions. Thereafter airlines should cancel the according number of credits by January 31, 2025
- CORSIA foresees that it is highly unlikely that aviation emissions in 2021 will exceed their 2019 baseline and therefore expects additional airline offsetting by operators to be zero for 2021
- The only CORSIA-related amendment that should be in place by November 30, 2022
- EU-based airlines' ETS obligations will remain in force, including the obligation to monitor and report emissions (including emissions relating to flights between the EEA and third countries)
- Other CORSIA implementation amendments included in a wider proposal are as follows:
- Provisions regarding the use of international credits for extra-EEA flights
- Surrender obligations for extra-EEA flights
- Treatment of non-EU-based airlines for extra-European flights
- Treatment of EU-based airlines on routes where CORSIA is not applied in the same way
- Directive's coverage to flights of EU airlines between two third countries

Analyst Comment: This proposal is a practical response to the COVID-19 pandemic. Reduced air travel means that it is very unlikely that airlines will need to offset any additional emissions in 2021. The period 2021-2023 is the "pilot phase" for CORSIA so it will be interesting to see how this develops if the aviation sector does not recover before 2024 as each of the pilot years would see airlines incur no offsetting requirements.



3.15 Revision of the Market Stability Reserve

The proposed revision of the Market Stability Reserve (MSR) is that throughout Phase IV of the EU ETS, until 31 December 2030, the level of allowances removed from the EU ETS remains at 24 percent. The reserve includes 200 million annual allowances during this time. Post 2030, the rate of removal from the EU ETS and into the MSR drops to 12 percent.

In practical terms, the 200 million annual allowances will be withheld from auction and added to the MSR total. Release of some of the banked allowances is possible but only under circumstances of extreme changes in carbon price.

Analyst comment: The MSR is a mechanism where surplus ETS allowances can be removed from the marketplace, creating a more effective ETS scheme. An allowance surplus can be generated by slumps in economic activity, which results in lower production of goods which cause emissions. As a result of this drop in emissions companies could have significant levels of surplus allowances, which could cause a drop in the price of allowances and destabilize the market. The MSR would bank these surplus allowances, rendering them impotent to affect the carbon price. Since launch, the MSR has moved from being reactive – removing surpluses from the market only when it is in oversupply – to being proactive and setting a documented level where allowances would be removed from the market in each trading period of the ETS.

3.16 Social Climate Fund

Under the Fit for 55 legislative package, the EU Commission is proposing to trade emissions from the buildings and road transport sectors under a trading scheme separate from the existing EU ETS. The Social Climate Fund is introduced to temporarily support vulnerable households, micro-enterprises and transport users who will be significantly impacted by this legislation.

Major provisions in the new emission trading scheme for buildings and road transport that is separate from the EU ETS include the following:

- An annual declining emissions cap from the road transport and buildings sectors. In this separate trading scheme, all allowances will be auctioned
- The size of the fund will correspond to a certain percentage of the revenues from the auctioning of emission allowances in the new system
  - The total size of the fund during the period from 2025 to 2032 is proposed to be €72.2 billion:
  - The Fund should correspond to 25 percent of the expected revenues of emissions trading for building and road transport fuels.
- The fund will provide support to member states to decrease emissions in these sectors by supporting; an increase energy efficiency in buildings, decarbonization of the heating and cooling of buildings (including energy from renewable sources), and improved access to zero and low-emission mobility and transport.
- The fund will also finance temporary direct income support for vulnerable households during the period that is required for these investments to create an impact on costs and emissions.

Analyst comment: the most significant part of this fund (allotted for innovation) will need to be directed towards increased infrastructure (additional grids, wiring, pipelines) for renewable energy in buildings and transport, as this is currently a major limitation.
In addition, using renewable heating in buildings, for example replacing natural gas with green hydrogen, needs to be tested in controlled situations to completely understand the risks and safety aspects before a national roll-out.

3.17 New EU Forest Strategy for 2030

The commission is aware of the critical nature of the forestry sector across Europe and the step change in the increased roles that wood, wood-based products, and carbon sinks will play in the energy transition. The strategy lays out a framework for developing a comprehensive forestry management system across the EU.

The proposed strategy includes:

- A roadmap for planting 3 billion trees by 2030
- Guidelines on biodiversity-friendly afforestation and reforestation by Q1 2022
- Producing a toolkit for people who want to get involved in the reforestation effort
- Launching a dedicated webpage for the 3 billion additional trees pledge
- Developing a tree monitoring platform by Q1 2022 and made available on the Forest Information System for Europe website
- Developing an EU tree counter by Q1 2022
- Launching a study by the commission to compile an overview of all existing pledges to plant trees in the EU and produce a set of policy briefs and communications by Q1 2022 with results expected by Q2 2022
- Identifying a list of stakeholders and organizing a conference or meeting, once the guidelines and visual identity for the pledge (to plant trees) are out by Q1 2022.

Analyst comment: there is a significant requirement to adopt pledges to plant trees by both the private and public sectors for this to scheme to work. Although one of the drivers behind this plan to plant trees is to support the move by the land use sector to become carbon neutral, it is not clear from this communication how the carbon from these additional trees will be accounted for and if this will be classed as 'free tree carbon,' as opposed to selling tree carbon in a recognized offset scheme. This apparent lack of a market-based model in the Forest Strategy may hamper adoption as an increasing number of stakeholders look to develop tree planting for commercial return.

Part 4
Analysis

4.1 Overview

The Fit for 55 package sets out to be an interlinked package of proposed changes to EU regulations and break down barriers to reaching the 55 percent reduction target in GHG emissions. It does this in a methodical way focusing on market, technical and deployment possibilities. Whilst some of these proposed changes are related to Directives, and therefore will need to be translated into national law and require effort sharing, they do so under the banner of the EU Climate Law.

In terms of technology, and deploying technologies, the proposed policies suggest that the current development level of key technologies is good enough to move forward and can no longer be used as a reason to focus solely on research, development, and demonstration (RD&D). This is a clear signal to the marketplace, including the investor community, that opportunities are being opened for new businesses to come forward with new business models to work alongside the technology roll out.

What is also clear from the proposals is that carbon sinks will play a key role in achieving carbon neutrality, alongside carbon capture and storage (CCS) in geological formations. Green and blue (e.g., from land and water) sinks are now increasingly important in terms of the growth in the carbon trading and offset markets. Post 2035, an EU-wide carbon sink reserve is likely, which should be needed to stabilize the price of carbon being traded as it will remove any over-supply. However, in the short-term cheap carbon offsets will remain available.

The proposed changes to policies are not always prescriptive in terms of solutions. For example, it is clear from the goals laid out in ReFuelEU Aviation - Sustainable Aviation Fuels that technology development and commercialization timelines will be under pressure to deliver these goals. It is not clear in the proposed policy where the SAF will come from to meet the timing of the EU requirements, especially if there are restrictions on using food or crop-based feeds. This policy is an example of setting the goals and market opportunities, and industry needing to work out the pathways to respond to them. It should be noted that nowhere does it prevent importing fuels to support the EU market.

4.2 Transport

Without explicitly saying it, the Fit for 55 package has placed a 2035 end date on the sale of new petrol and diesel light duty vehicles. The aim of deploying infrastructure for electric and hydrogen vehicles combined with technical requirements for heavy goods vehicles (HGVs), and for the first time the inclusion of liquid hydrogen fuel, are obvious signs the EU is moving away from petrol and diesel vehicles. Transport is also now being included in the EU ETS scheme ensuring price signals in the medium term for increased incentivization for switching to both battery and fuel cell EVs.

With the end of new petrol and diesel light duty vehicle sales after 2035, around 14 to 16 million new light duty EV and FCEV vehicles per year will be needed. This is an exceptionally large increase in EV and FCEV sales in just 14 years. For reference, data from the European Alternative Fuels Observatory (EAFO) shows that current sales of all alternative fueled light duty vehicles are under 100,000 vehicles a year. This number includes natural gas vehicles.

Whilst it may be possible to increase sales in the EU 27 of alternative fueled vehicles from around 100,000 per year to 15 million per year by 2035, it is more likely that we will see some form of carbon neutral driving scheme being implemented, akin to carbon neutral cargos of LNG. Operators of petrol and diesel vehicles could offset the emissions of their current vehicles allowing them to claim to be carbon neutral. The secondary effect of this would be to slow down sales of new EV and FCEV vehicles.

What we can also impute from the Fit for 55 package is that many companies and providers of refueling infrastructure will be busy in the medium term. In the short-term, understanding the optimal locations of the refueling and recharging points, and the requirement for interoperability of refueling systems and payment systems, will drive innovative technology and new business models to the fore.

4.3 Aviation

The proposed changes favor advanced drop-in aviation fuels (from waste biomass, trees, algae) and synthetic aviation fuels (from CO_2, green hydrogen, Fischer Tropsch liquids, or from alcohols). There is little clear analysis on the ability of current technology development and commercialization efforts to meet these goals; new technologies will be under extreme pressure to deliver new green fuels in time.

One objective in the regulations is that food and food-based crops are not promoted. According to the aviation document, 'Regulation of The European Parliament and of the Council on ensuring a level playing field for sustainable air transport:

"…crop-based biofuels may generate non-negligible indirect land use change emissions (ILUC) as a result of displacing other agricultural crops. ILUC can reduce importantly their sustainability potential or even lead to an increase in CO_2 emissions compared to the use of fossil fuel. Under RED II, biofuels produced from high ILUC risk feedstock are capped at 2019 levels and phased out by 2030. Finally, in the past year, companies producing or using certain types of crop-based biofuels have been subject to criticism by environmental groups. Indeed, such biofuels are associated by the public with issues such as deforestation and damage to biodiversity, notably in developing countries. Airlines are generally discarding the possibility of using crop-based biofuels."

Because of this decision to avoid using food and food-based crops, it is not clear where the feeds will come from and this is recognized in the document:

"Advanced biofuels can be produced through the approved and certified Gasification + Fischer Tropsch (Gas + FT) (TRL 6-8) and Alcohol-to-Jet (ATJ) (TRL 7-8) pathways. These pathways are generally associated with high production costs relative to those of fossil fuels and of HEFA (hydroprocessed esters and fatty acids). The production of advanced biofuels is currently only at demonstration phase, meaning that only a handful of industrial projects in the EU are effectively able to produce them at this stage. Substantial investments are needed to scale them up to the commercialization stage."

The document discusses the potential of RFNBOs to supply aviation fuels:

"RFNBOs (e.g. synthetic liquid fuels) have significant potential to decarbonize aviation but face resource availability and technology readiness challenges. Synthetic liquid fuels (also called Power-to-Liquids) are produced through the conversion of renewable electricity (e.g. from wind and solar) into liquid hydrocarbons, via the electrolysis of water (TRL 9) to produce green hydrogen followed by a synthesis (TRL 5-6) with CO_2 captured directly from air (TRL 6), from biogenic origin or from industrial processes. RFNBOs have considerable potential for large-scale production and replacement of fossil jet fuel. RFNBOs can be produced using two different production routes, namely the Fischer-Tropsch (FT) or the methanol route (see Annex 15).

At this stage, only the FT route (TRL 9) is approved and ASTM-certified for blending with conventional petroleum-based kerosene up to 50%. Like the FT route, the methanol pathway relies on process steps already used in refineries, but ASTM certification is pending. While RFNBOs offer significant opportunities to decarbonize aviation (emissions savings compared to conventional jet fuel can exceed 85%), their large-scale deployment currently faces challenges when it comes to the availability of renewable electricity in the EU and CO_2 direct air capture technology. In addition, in the short-term, RFNBOs are also faced with high production costs compared to conventional petroleum-based jet fuel."

If restrictions on using food or crop-based feeds remain in place it is not clear where the SAF will come from to meet the timing of the EU requirements. There may be opportunities for SAF from gasifying municipal solids, plastics and biomass, alcohols, and CO_2 converted to methanol with green hydrogen. However, analysis of capacity via these routes and the timing of commercialization needs to be done.

There could be a significant opportunity for importing SAF fuels if manufacturers outside the EU can ramp up and produce fuels at low carbon intensity.

4.4 Maritime

The proposed changes in the maritime industry from the Fit for 55 package come from three angles:

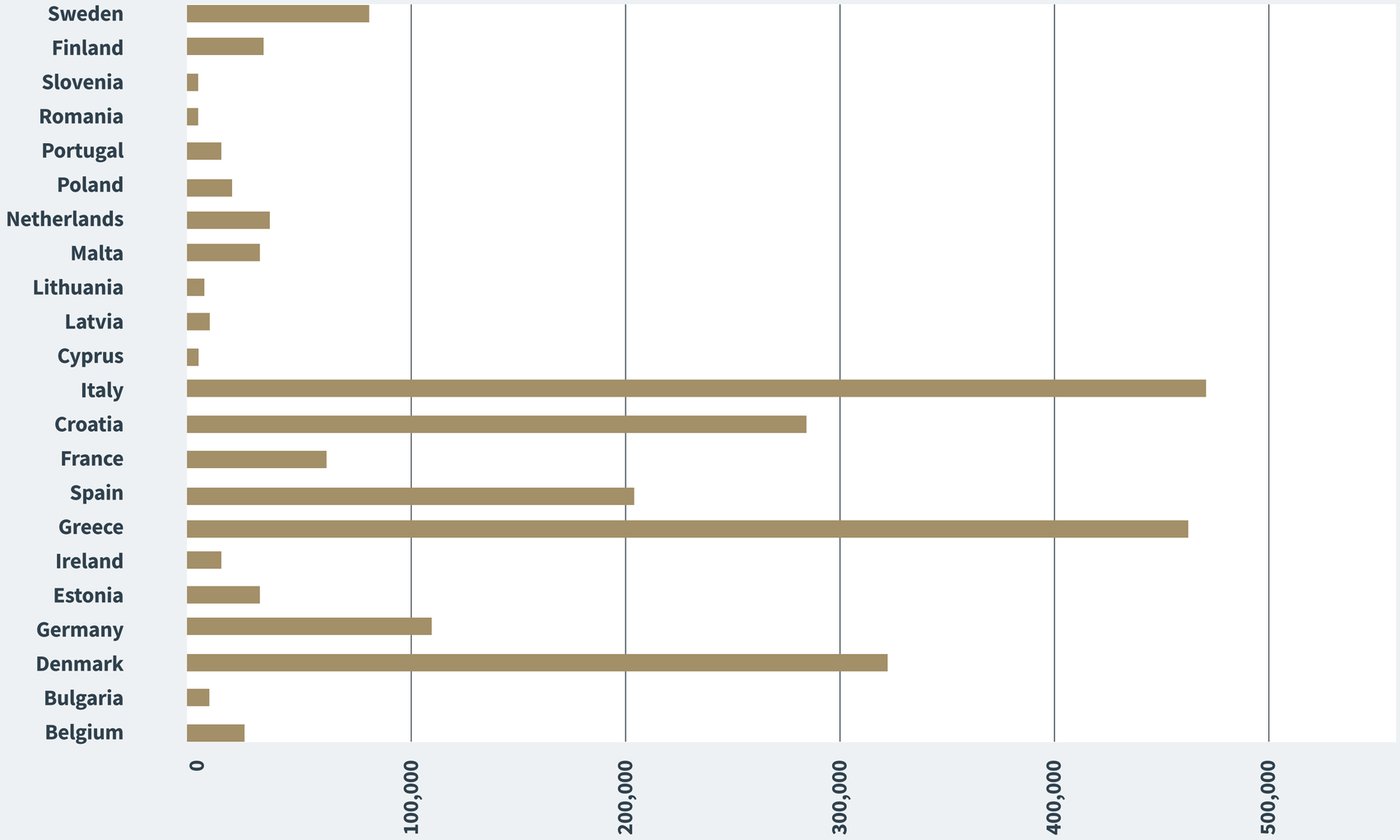
1. Including the maritime sector in the EU ETS scheme
2. Reducing the fleet average GHG intensity
3. Requirement to use shore-to-ship power

Whilst the requirement for shore-to-ship power is a Directive and therefore will need translating into national law, the requirement for reducing fleet average GHG intensity is a Regulation and therefore is directly applied to all national laws within the EU 27.

With interest in developing and launching new battery, hydrogen, ammonia, methanol and in some cases, LNG fueled vessels across the EU, these policies are more likely to impact older vessels over time. Because the marine industry has slow turnover of its fleet, increased focus on older, higher GHG emitting vessels will likely increase.

In terms of developing shore-to ship power, whilst it is not explicit in the Directive, using low or zero carbon intensity power to ships when docked will most likely be required to reduce the overall footprint of the shipping sector. This will require the installation of large sources of localized power supply and heavy investment by port authorities. This could open the door to different business models and operating companies such as specialist ship power utility companies. The knock-on impact on the demand for bunker fuel will need to be analyzed to understand the potential impacts on volumes, prices and impacts on refineries.

Figure 8 *Number of vessels in main ports across the EU 27*



4.5 Ports

The demand for the addition of shore-side power in ports by 2030 adds additional new power demand to ports. This step change in power demand from a port is due to two

factors: first the power requirements of ships and second the number, size and type of vessels docked.

According to a report from the World Business Council for Sustainable Development (WBCSD), per vessel requirements for shore-to-ship power are in the range of:

- 3 MWs for a roll-on roll-off ferry
- 7.5 MWs for a container ship
- More than 20 MWs pre cruise ship (covered under 'other vessels' in the policy document)

Figure 8 uses data from Eurostat to plot the number of vessels which docked in the main ports across the EU 27 in 2019. In Greece and Italy alone, over 450 thousand vessels were docked in each country in 2019. The implication is that ports across Europe will need to invest significantly to support the major increase in shore-to-ship power required.

The opportunities to develop new business models out of this policy are high, but so are the upfront costs.

4.6 Refining

As with other sectors, one incentive to move along the decarbonization curve is adopting the requirement in the EU ETS to either implement decarbonization opportunities with payback periods below 5 years or lose 25 percent of free allowances. With carbon prices over €50 per tonne this could represent an economic hit running into the millions of euros.

Coupled with falling demand for traditional refined products over time, some refineries risk becoming stranded assets, even if they switch to lower carbon intensity input fuels, such as biomass-based feeds or green hydrogen. This interplay between the investment needed to reduce the carbon intensity of the process versus the need for products will likely see a number of changes in the makeup of the refining industry in Europe closer to 2030 and beyond, as well changes in the rate of import of specific products.

The market opportunities prior to 2030 represented in the Fit for 55 package are substantial for refineries that can switch to production of e-fuels and SAF. These though are not low cost or easy solutions. They will take major investment and foresight and likely be different for each refinery. Further, the expense of major new investment in refining could accelerate the rationalization of the refining industry in the EU resulting in greater import of refined products to meet demand.

With refineries not included in the CBAM but the Scope 3 emissions from use of their products coming under the EU ETS scheme, we expect to see increased demand for inventorying of emissions per asset across Europe.

4.7 Ammonia

In many ways, ammonia comes off lightly in the Fit for 55 package. Although fertilizers are called out under the CBAM, the industry overall

is continuing to decarbonize through increased use of low carbon hydrogen, which includes hydrogen produced from natural gas with carbon capture and from electrolysis of water using low carbon electricity.

In several places throughout the package of policies, ammonia is actively called out as a future marine fuel, and it is now eligible for funding under the Innovation Fund. If it is green ammonia. Green ammonia, especially in the maritime sector, is identified in FuelEU Maritime - green European maritime space, among other fuels as fuels that need support for increased market penetration. The commission in this document sees green ammonia as a longer- term potential solution to decarbonize shipping that may be widely used by 2050. Due to its toxicity stringent safety measures must be developed for ammonia used as a fuel.

Overall, we are likely to see an increased focus on large-scale innovation funded projects across Europe for both the production and verification of green ammonia and its use as a shipping fuel. How this will interact with the inclusion of shipping in the ETS scheme in terms of emissions and allowances is unknown, but it is important to monitor as it directly impacts the rate of uptake of ammonia as a fuel.

4.8 Aluminium

The aluminium sector is facing two new challenges from the Fit for 55 policies.

Whilst aluminium is included in the CBAM due to its status as a potential high carbon leakage industry, it receives free European Union Allowances (EUA) which are currently at their maximum amount. This allows the industry to transition from switching to cleaner fuels in the short term to adding cleaner processes and technologies in the medium to long term.

A challenge to the industry is the data requirements that will be needed for the CBAM. Carbon inventorying on a plant-by-plant basis will be required for any company exporting to Europe. For companies in Europe, this is already in place under the EU ETS. For companies not exporting to Europe we are likely to see increased pressure for them to follow suit, especially if Canada and the US follow the lead of Europe and develop their own CBAM.

Alongside industries such as refining, one key incentive to move along the decarbonization curve is adopting the requirement in the EU ETS to either enact decarbonization opportunities identified in annual audit reports with a payback of less than five years or lose 25 percent of free allowances.

In terms of market demand, the market for aluminium is expected to continue to expand with the increase in demand for aluminium driven by light-weighting of vehicles. In addition, consumer demand for packaging and products from green aluminium is driving demand in market niches such as premium drinks cans and laptop cases. The recognition that plastics can only be recycled a limited number of times before loss of functionality is leading to growing interest in using aluminium for more packaging because it is easier to recycle and can be done so for an unlimited number of times.

4.9 Hydrogen

Hydrogen and specifically low carbon hydrogen are mentioned in most of the updated policy documents. It is clear from the position of green hydrogen throughout Fit for 55 that the 40 GW electrolytic hydrogen target outlined in the EU 2020 Hydrogen Strategy has fed into several policies.

Blue hydrogen (hydrogen produced from natural gas feedstock via steam methane reforming coupled with carbon capture) has been given a clear 10-year transition period, supported by the lowest minimum reference rate for taxation, and not being explicitly excluded elsewhere in the package.

In terms of applications, hydrogen in transport and industry are both being supported, and the inclusion of liquid hydrogen across the TEN-T network could signal future R&D directions.

The required roll out of hydrogen refueling stations will stimulate development of a hydrogen transport sector across Europe. Combined with the fact that it is being taxed for the first time, a signal of the normalization of the industry, hydrogen across Europe will continue to move out of the shadows and into the mainstream.

As noted earlier in this report, the full taxation framework for hydrogen is due to be finalized in December 2021. We expect to see continued clear emphasis on the production of green hydrogen, but with acknowledgment that blue hydrogen will be important over a transitional period.

4.10 Carbon price

The price of carbon in the EU ETS is expected to increase under the policy frameworks being generated under the Fit for 55 package. While at no point is there a target price for carbon, the EU is clearly aiming to create a tipping point where it is more economic for a company to invest in decarbonization activities and potential offsets in the short term than to buy allowances from the EU ETS.

The cost of carbon under the parallel ETS for buildings and transport is likely to mirror that of the larger ETS, especially due to the need to have a unified carbon price for the CBAM to operate effectively.

Analysis undertaken by the Advisian EMEA decarbonization team, led by Nicola Knight, has concluded that the 2030 carbon price will be in the region of €100 per tonne, with perhaps a high side estimate of €130 per tonne. This view is shared by others.

It should be noted that this is still well below the European Investment Bank (EIB)'s shadow price for €250 per tonne for 2030, which it believes is necessary to meet the Paris Agreement target of 1.5 degrees Celsius increase.

Acronym List

AFIR	Alternative Fuels Infrastructure Regulation
ASTM	American Society for Testing Materials
BEV	Battery electric vehicle
bn	billion
CBAM	Carbon Border Adjustment Mechanism
CCD	Carbon Contracts for Difference
CCS	Carbon capture and storage
CEF	Connecting Europe Facility
CO2eq	CO_2 equivalent
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CTP	Climate Target Plan
EAFO	European Alternative Fuels Observatory
EEA	European Economic Area
EED	Energy Efficiency Directive
EIB	European Investment Bank
EUA	European Union Allowance
ESR	Effort Sharing Regulation
ETD	Energy Tax Directive
ETS	Emissions trading scheme
EU	European Union - 27 member states
EV	Electric vehicles
FCEV	Fuel cell electric vehicle
FT	Fischer Tropsch
GHG	Greenhouse Gases
GO	Guarantees of Origin
GW	Gigawatt
HGV	Heavy Goods Vehicles
IA	Impact Assessment
ICAO	International Civil Aviation Organization
kw	Kilowatt
LDV	Light duty vehicle
LNG	Liquified natural gas
LULUCF	land use, land use change and forestry
LRF	Linear Reduction Factor
MRV	Monitoring, Reporting and Verification
MSR	Market Stability Reserve
Mt	Million tonnes
NECP	National Energy and Climate Plan
OJEU	Official Journal of the European Union
RCFs	Recycled carbon fuels
RD&D	Research Development and Demonstration
RED	Renewable Energy Directive
RES	Renewable energy's
RFNBO	Renewable Liquid and Gaseous Fuels of Non-Biological Origin
Ro-Ro	Ro – roll on – roll off (ferry)
SAF	Sustainable Aviation Fuels
SME	Small to Medium Sized Enterprise
TEN-T	Trans European Network - Transport
tonne	1000 kg (a metric ton)
WBCSD	World Business Council for Sustainable Development
ZLEV	Zero low emission vehicles

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