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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

in accordance with Article 9 of Directive 98/70/EC relating to the quality of petrol and diesel fuels

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1. Introduction

The Fuel Quality Directive[1] aims to improve and maintain the quality of transport fuel sold on the European internal market. Its objectives are to secure high minimum levels of environmental and health protection in relation to transport fuel use and to ensure technical compatibility with internal combustion engines. It establishes environmental specifications for petrol and diesel (and the biofuels blended in them) used in road transport and in non-road mobile machinery. The Directive also includes an obligation on fuel suppliers to reduce the greenhouse gas intensity of the fuel mix they supply by 6% in 2020 compared to 2010.

This report fulfils the requirement under which the Commission must report on a range of specific issues listed in Article 9 of the Fuel Quality Directive.

The Commission has also conducted an evaluation of certain parts[2] of the Fuel Quality Directive as part of its Regulatory Fitness and Performance Programme (REFIT). The evaluation, which is published together with this report[3], concluded that the Fuel Quality Directive provides EU added value in improving and maintaining the quality of transport fuels. The Directive is found to be generally fit for purpose and, based on the evidence available, it is considered to achieve its aims in an effective and broadly efficient manner. However, closer monitoring of how the internal market for transport fuels develops would be useful.

In November 2016 the Commission adopted the Clean Energy for All Europeans package, which included a proposal for a recast of the Renewable Energy Directive[4] (COM(2016) 767 final). It proposed using this Directive alone to regulate the uptake of low-emission and renewable fuels for the period 2021-2030 and not extending the GHG reduction target under the Fuel Quality Directive beyond 2020.

2. The quality of fuels and related greenhouse gas issues

Progress in achieving the 6% greenhouse gas emission target

1 Directive 98/70/EC relating to the quality of petrol and diesel fuels, OJ L 350, 28.12.1998.
2 This evaluation was limited to Articles 1 to 7, 8, 8a, 9 and 9a of the Fuel Quality Directive.
3 SWD(2017) 178 and SWD(2017) 179.
4 Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, OJ L 140, 5.6.2009.

Member States must undertake comprehensive monitoring and reporting of the GHG intensity of transport fuels in accordance with Council Directive (EU) 2015/652[5], for which the transposition deadline is 21 April 2017. The first reports are expected in 2018.

Preliminary conclusions can already be drawn from the reporting on renewable energy in the transport sector required under the Renewable Energy Directive. The 2017 progress report on renewable energy[6] shows that the renewable energy share in transport was 6 % in 2015. Biofuels account for 88% of this share, while electricity still plays a more limited role[7].

Member States reported net savings in greenhouse gas emissions resulting from the use of renewable energy in transport of around 35 Mt CO_2-equivalent in 2014. Most of these savings came from the use of biofuels, with a small but growing role for renewable electricity. These savings cover only direct emissions and do not include emissions from indirect land use change (ILUC).

ILUC emissions associated with biofuels consumed in the EU are estimated at 23 Mt CO_2-equivalent, resulting in a net saving of 12 Mt CO_2-equivalent. Applying the associated sensitivity range in Annex VIII to the Renewable Energy Directive, ILUC emissions would range from 14 to 28 Mt CO_2-equivalent, with corresponding net savings of between 7 and 21 Mt CO_2-equivalent.

Recent modelling work[8] on the ILUC impacts of individual biofuel feedstock confirms that ILUC emissions for biofuels produced from vegetable oils can be far higher than for biofuels produced from starch or sugar. Advanced biofuels from non-food crops have generally very low or no ILUC emissions.

Meeting the 6% target requires a reduction of approximately 66 Mt CO_2-equivalent by 2020 compared to the 2010 fuel baseline. However, contributions to the 6% target can also come from non-renewable fuels (e.g. LPG, CNG, and LNG) and upstream emission reductions, on which there is no reporting requirement under the Renewable Energy Directive. Therefore, overall progress towards the 6% GHG reduction target under Article 7a, and the target's impact on the EU Emission Trading Scheme cannot be fully assessed at present.

The Commission proposed not extending the GHG emission target under the Fuel Quality Directive beyond 2020. Instead, the Renewable Energy Directive should become the key instrument for driving the uptake of renewable and low-emission transport fuels up to 2030.

It is therefore not considered appropriate to propose a changing the 6% target for 2020. This would also exclude the options of increasing the target by using more Clean Development Mechanism credits or using carbon capture and storage technologies (CCS) and electrical

5 Council Directive (EU) 2015/652 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC, OJ L 107, 25.4.2015.

6 COM(2017) 57 final.

7 Biodiesel is the main biofuel used for transport in the EU. It accounted for 79% of all biofuel use in 2015 (10.9 Mtoe). Bioethanol is the second largest contributor, with a 20% share (2.6 Mtoe). Other renewable energy sources (including biogas) do not play a prominent role in the transport sector across the EU-28, but are used in some Member States (including Sweden and Finland). The proportion of biofuels produced from waste, residues, and ligno-cellulosic and non-food cellulosic material in the EU biofuel mix increased from 1% in 2009 to 23% in 2015. Renewable electricity contributed 1.7 Mtoe to gross final energy consumption in transport in 2015.

8 Ecofys, IIASA, E4Tech, 2015.

energy in road vehicles. The Commission notes the limited market penetration of these technologies and therefore their limited potential for reducing the life-cycle GHG emissions from fuels and energy up to 2020.

Biofuel blend limits

The Fuel Quality Directive has dual implications for biofuel blending. On the one hand, the 6 % reduction target for GHG emissions from fuels provides an incentive for using more low-carbon fuels, such as biofuels, in the transport sector. On the other hand, the fuel specifications set out in the Directive define maximum levels for the biofuel content in petrol and diesel[9] of freely marketed fuels to make these fuels compatible with engines and after-treatments in vehicles operating across the EU.

A study for the Commission[10] assessed the feasibility and the economic and environmental implications of a hypothetical increase in the current blending levels for biofuels, including its impact on the fuel sector and vehicle fleet. It concluded that the current blending limits still allow for an increase in biofuel use. The main fuels currently marketed in the EU are diesel with up to 7 % FAME[11] (B7) and petrol with up to 5 % ethanol (E5)[12]. Biofuel use could be further increased by increasing the blending rate up to the allowed limits, and in particular by introducing E10 across all Member States. Further, 'drop-in' fuels such as HVO could be used, for which no limits apply.

The evaluation of the Fuel Quality Directive also showed that there is no evidence that the blending limits constitute a barrier to achieving the 10 % renewables target in transport. This is because other means than those mentioned above are available to help meet the target, such as double-counted advanced biofuels and renewable electricity[13]. The evaluation did not cover potential impacts of blending limits for the fulfilment of the proposed incorporation obligation in the Renewable Energy Directive for the period after 2020 where the blending limits for ethanol might be of relevance.

A limited proportion of the fleet, however still representing a significant number of vehicles unable to take higher biofuels blends is expected to remain in the fleet in 2020 and beyond[14]. Under the Alternative Fuels Infrastructure Directive[15], since 18 November 2016 consumers must be informed of fuel and car compatibility to help them avoid non-compatible fuels. In this respect, the European Committee for Standardization (CEN) adopted standard EN 16942 "Fuels-Identification of vehicle compatibility-Graphical expression for consumer information" in October 2016. This standard will provide consumers with information on the

9 The maximum content of ethanol in petrol is 10%. There are further limits for other oxygenates such as ethers. The maximum content of fatty acid methyl ester (FAME) in diesel is generally limited to 7%.

10 *Impact of higher levels of bio components in transport fuels in the context of the Fuel Quality Directive*, ICF International, 2015.

11 Fatty acid methyl ester.

12 Up to 2015, petrol with a maximum ethanol content of 10 % by volume (E10) had been introduced in six Member States (Bulgaria, Finland, France, Germany, Lithuania, and Slovenia), while E5 petrol continued to dominate the market even in most Member States where E10 was available.

13 SWD(2017) 178 and SWD(2017) 179.

14 Between 1.3% and 6.8 % of the EU light-duty fleet – roughly 1.6 to 9 million vehicles - is expected to be E10-intolerant in 2020. Also, higher FAME blends (e.g. B10 and B30) could cause technical problems such as oil dilution, especially at low ambient temperatures.

15 Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, OJ L 307/1, 28.10.2014

compatibility between their vehicles and the fuels available in filling stations. At present, CEN is also carrying out research work on behalf of the Commission[16] on various biofuels blends and in particular E20/25. Some car manufacturers claim that their engines can already operate with a E20 or E25 blend. The results from the CEN contract are expected in 2019.

Introducing higher biofuel blends, in particular of bioethanol and FAME, in some cases may also have technical implications and related costs for the fuel distribution infrastructure (e.g. service stations, pipelines, storage tanks, pumps) and logistics in the fuel supply chain. These effects are not specific to biofuels and would also result from the use of other alternative fuels, unless these are drop-in fuels such as HVO. Some pump price increases[17] and issues with the compatibility of older cars have to be considered, notably where a 'protection grade' would become unavailable.

The hypothetical scenarios of higher biofuel blending limits for general market fuels modelled in the study[10] suggest that there will be no significant negative effects on pollutant emissions in cars or in refineries and a positive but relatively small increase in GHG savings if all impacts on life-cycle emissions, including ILUC, are taken into account. A more significant positive effect on GHG emissions would be possible through broader use of advanced biofuels, e.g. from waste and residues.

The most recent monitoring report[18] on EU fuel quality, for 2014 and 2015, shows overall compliance with the specifications for petrol and diesel in the Fuel Quality Directive, with very few deviations from the relevant provisions. The Commission has not been made aware of any negative repercussions on vehicle emissions or engine functioning. This suggests that so far the trend towards greater bio-blend diversification has been accommodated within the current fuel specifications.

In view of this there does, at present, not appear to be a case for changing the specifications for general market fuels with regard to maximum EU bio-blend levels. The Commission should revisit this question in light of the development of CEN standards for higher blends and the need to ensure the long-term decarbonisation of transport.

Linkages with CO_2 emission standards

The decarbonisation of road transport is promoted by policies to cut CO_2 emissions from road vehicles. Regulations (EC) 443/2009[19] and (EU) 510/2011[20] set CO_2 targets for new passenger cars and new light commercial vehicles, respectively. Vehicle manufacturers must reduce CO_2 emissions from vehicles to reach EU fleet-wide average targets of 95 g CO_2/km

16 Contract SA/CEN/RESEARCH/EFTA/000/2014-13.

17 Depending on the different assumptions on underlying crude prices, the scenarios analysed for increased levels of biofuels use suggest increases in pump prices in the range of 1 to 2.3 euro cents per litre 2020 and 2 to 7.5 euro cents per litre in 2030.

18 COM(2017) 49 final

19 Regulation (EC) No 443/2009 of the European Parliament and of the Council setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO 2 emissions from light-duty vehicles, OJ L 140, 5.6.2009.

20 Regulation (EU) No 510/2011 of the European Parliament and of the Council setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO 2 emissions from light-duty vehicles, OJ L 145, 31.5.2011.

for new passenger cars by 2021 and of 147 g CO_2/km for new light commercial vehicles by 2020.

A 2015 report[21] assessing these Regulations concluded that they had been effective in reducing CO_2 emissions from new cars and light commercial vehicles. Moreover they had generated net economic benefits and they continued to be relevant, effective, and coherent, and to generate EU added value. While some weaknesses were identified, especially with test procedures, no concerns were raised in relation to fuel.

The Commission is currently drawing up future emission standards for heavy-duty vehicles and has conducted a public consultation on legislation for monitoring and reporting fuel consumption data and CO_2 emissions from heavy-duty vehicles.

In principle, better fuel quality can positively affect exhaust emissions from road vehicles. It may be possible to enhance engine design for use with gasoline with an increased research octane number (RON) to allow for higher compression ratios leading to a reduction in fuel consumption and CO_2 emissions. A higher RON grade (e.g. RON 100) would, however, increase refining emissions (by 1 Mt CO_2 overall) and production costs (by 1 to 2% of the product value)[22]. Fuels with a higher RON than the minimum threshold are already on the market. These fuels have no benefits for engines not specifically adapted to them.

As the current fuel specifications already permit the marketing of gasoline with enhanced RON, at present there does not seem to be a case for amending them in this regard.

3. The quality of fuels and related environmental issues

One of the aims of the Fuel Quality Directive is to reduce atmospheric pollution caused by vehicles. Its fuel specifications control primary air pollutants (such as lead, sulphur oxides, nitrogen oxides, unburnt hydrocarbons, particulate matter, carbon monoxide, and benzenes) and other toxic emissions which contribute to the formation of secondary pollutants (such as ozone) and which are emitted through the exhaust and evaporative fumes from motor vehicles and non-road mobile machinery.

Over the period 1995-2013 transport emissions of SO_x declined by -98%, emissions of lead declined by -95%, emissions of NO_x declined by -51%, emissions of PM10 declined by -42%, ad emissions of PAH declined by -62%.

Environmental specifications for fuels for non-road mobile machinery

The environmental specifications for diesel fuels to be used for road vehicles do not fully apply to gas-oils used in non-road mobile machinery[23]. The possibility of further extending these requirements to non-road mobile machinery fuel and its related implications has been

21 https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/evaluation_ldv_co2_regs_en.pdf

22 *Oil refining in the EU in 2020, with perspectives to 2030*, report 1/13R by CONCAWE, April 2013

23 The 10 ppm limit on sulphur content to already applies to both non-road mobile machinery gas-oils and on-road diesel.

analysed for the Commission[24]. The analysis concluded that such an extension is unlikely to have significant impact for most Member States. There could be some limited benefits for air pollution. Non-road mobile machinery manufacturers would also see limited benefits, notably fewer maintenance requirements and lower engine development costs resulting from joint development with engines for heavy-duty road use. The overall impact on European refineries is expected to be relatively small. No outstanding issues were identified that would currently necessitate aligning the requirements for non-road mobile machinery gas-oils with those for on-road diesel.

Fuel additives

Fuel additives are substances intentionally added to fuel to improve running conditions for engines. Fuel additives that act as detergents prevent the build-up of internal deposits and can thus help lower fuel consumption, emissions and maintenance needs. Deposit control additives are used in about 75% of the road fuel sold in the EU. They are handled as part of the fuel in closed systems and are completely combusted before entering the environment.

The Commission recognised earlier that there is currently no satisfactory way of testing fuel samples for their detergency properties and suggested that the responsibility for informing their customers of the benefits of detergents and their use should rest with suppliers of fuel and vehicles[25]. Detergents also provide a means for fuel marketers to distinguish themselves from their competitors and advertise this fact to consumers.

European standards for fuel quality (EN228 for petrol and EN590 for automotive diesel) allow the use of fuel additives to improve performance quality. The Commission considers that the current practice of voluntary standard-setting has led to an appropriate level of detergent use and related benefits. No further action is required in this regard.

Metallic additives

Metallic fuel additives are potentially more problematic, since their metallic components are not degraded during fuel use and eventually enter the environment. This is the basis for the ban on lead and the limits on MMT[26] set out in the Fuel Quality Directive.

The Commission has developed a test methodology to assess the health and environmental risks of using metallic fuel additives[27]. The report shows that these additives' intrinsic reactivity, toxicity and possible capacity to accumulate within living organisms could have an impact on humans and the environment. This potential impact is affected by several factors: the type of metallic fuel additive, the level of concentration, the level and duration of exposure and the exposure pathway.

The legal requirements for fuel quality monitoring and measurement by Member States for metallic fuel additives are limited to lead and MMT. The Commission is not aware of the use

24 Support for report drafting under Article 9(1)(c) and (j) of Directive 98/70/EC relating to the quality of petrol and diesel fuels from AMEC Environment & Infrastructure UK Limited with the Laboratory of Applied Thermodynamics, Aristotle University, Greece.

25 COM(2007) 18 final.

26 Methylcyclopentadienyl manganese tricarbonyl.

27 COM(2013) 456 final.

of other metallic fuel additives sold through the fuel distribution network. While there are reports that other metallic additives (Cerium and Ferrocene) have been used in some captive fleets in the past, there is no information to show that these additives are still in use.

Components regulated under environmental legislation

The Commission must report on components used in petrol and diesel having regard to Community environmental legislation, including the objectives of the Water Framework Directive[28]. However, legal requirements for fuel quality monitoring and measurement for Member States are limited to regulated parameters only[29]. The fuel industry considers total fuel composition to be proprietary information.

The Water Framework Directive sets environmental quality standards for priority substances and certain other pollutants in water bodies, which would include certain substances regulated under the Fuel Quality Directive (e.g. polycyclic aromatic hydrocarbons and benzenes). While monitoring and reporting under the Water Framework Directive does not focus on fuel components, the most recent report on the Water Framework Directive's implementation[30] is relevant as regards regulated chemical substances. It indicates that the information provided by Member States in the River Basin Management Plans on the chemical status of surface waters is not clear enough. Not all priority substances are monitored and the number of water bodies where monitoring takes place is limited.

From the information available the quantity of fuel components addressed under the Water Framework Directive cannot be stated. Consequently, there is at present no case for amending the fuel specifications in this regard.

Vapour pressure

The Fuel Quality Directive helps lower the emissions of volatile organic compounds and thus complements the VOC-I and VOC-II Directives[31]. Relevant fuel quality parameters in this regard include the content of benzene and oxygenates and, in particular, the petrol vapour pressure. The maximum permitted vapour pressure is set at a level of 60 kPa for summer grade petrol to reduce non-methane volatile organic compound (NMVOC) emissions from road vehicles. Derogations from this value can be granted in cases of bioethanol blending and low ambient temperature.

A report for the Commission[32] has assessed the costs and benefits and the impact of a further reduction in this maximum permitted vapour pressure. It indicates that this would result in fewer evaporative emissions, particularly from older vehicles. On the other hand, there would be technical, commercial, environmental and operational implications for the fuel industry resulting in increased capital and operating costs. These would include higher energy intensity of refineries, and the need to restructure or replace existing facilities. Based on this

28 Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000

29 Annexes I and II, and CEN standards EN 590 for diesel and EN 228 for petrol.

30 COM(2015) 120 final.

31 Directives 1994/63/EC and 2009/126/EC.

32 Support for report drafting under Article 9(1)(c) and (j) of Directive 98/70/EC relating to the quality of petrol and diesel fuels from AMEC Environment & Infrastructure UK Limited with the Laboratory of Applied Thermodynamics, Aristotle University, Greece.

analysis, the associated costs[33] are very high compared to the expected environmental and monetary benefits.

4. Conclusion

This report complements the findings of the Fuel Quality Directive evaluation report[34]. In line with the latter's findings, the available evidence as set out above on the items listed in Article 9 shows that there is currently no case for legislative amendments to the Fuel Quality Directive.

The Commission will continue to monitor compliance with the environmental specifications for fuels laid down in the Fuel Quality Directive along with its impact on the protection of the environment and human health and on the internal market for transport fuels, vehicles and non-road mobile machinery. It will also monitor the transposition of the provisions related to the greenhouse gas reduction target in the Fuel Quality Directive, due in April 2017.

33 Under various scenarios for lowering vapour pressure by 10 kPa the cost per mass of NMVOC abated is estimated at EUR 22 to EUR 175 per kg, depending on the fuel composition and scenario considered. On the other hand, the estimated monetary benefits from the reduction in NMVOC emissions seem rather low, at between EUR 0.95 to EUR 2.8 per kg NMVOC abated.

34 SWD(2017) 178 and SWD(2017) 179.