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## Legislation

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<sup>(1)</sup> Text with EEA relevance

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<sup>(1)</sup> Text with EEA relevance

## I

(Legislative acts)

## DIRECTIVES

**DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 22 October 2014  
on the deployment of alternative fuels infrastructure**

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 91 thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee <sup>(1)</sup>,

Having regard to the opinion of the Committee of the Regions <sup>(2)</sup>,

Acting in accordance with the ordinary legislative procedure <sup>(3)</sup>,

Whereas:

- (1) In its Communication of 3 March 2010 entitled 'Europe 2020: A strategy for smart, sustainable and inclusive growth', the Commission aims at enhancing competitiveness and energy security by a more efficient use of resources and energy.
- (2) The Commission's White Paper of 28 March 2011 entitled 'Roadmap to a Single European Transport Area — Towards a Competitive and Resource Efficient Transport System' called for a reduction in the dependence of transport on oil. This needs to be achieved by means of an array of policy initiatives, including the development of a sustainable alternative fuels strategy as well as of the appropriate infrastructure. The Commission's White Paper also proposed a reduction of 60 % in greenhouse gas emissions from transport by 2050, as measured against the 1990 levels.
- (3) Directive 2009/28/EC of the European Parliament and of the Council <sup>(4)</sup> sets a market share target of 10 % of renewables in transport fuels.
- (4) Based on the consultation of stakeholders and national experts, as well as the expertise reflected in the Communication from the Commission of 24 January 2013 entitled 'Clean Power for Transport: A European alternative fuels strategy', electricity, hydrogen, biofuels, natural gas, and liquefied petroleum gas (LPG) were identified as currently the principal alternative fuels with a potential for long-term oil substitution, also in light of their possible simultaneous and combined use by means of, for instance, dual-fuel technology systems.

<sup>(1)</sup> OJ C 271, 19.9.2013, p. 111.

<sup>(2)</sup> OJ C 280, 27.9.2013, p. 66.

<sup>(3)</sup> Position of the European Parliament of 15 April 2014 (not yet published in the Official Journal) and decision of the Council of 29 September 2014.

<sup>(4)</sup> Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, 5.6.2009, p. 16).

- (5) Power sources means all alternative sources of energy for transport, such as electricity and hydrogen, that do not have to be released through combustion or non-combustion oxidation.
- (6) Synthetic fuels, substituting diesel, petrol and jet fuel, can be produced from different feedstock, converting biomass, gas, coal or plastic waste into liquid fuels, methane and dimethyl ether (DME). Synthetic paraffinic diesel fuels, such as hydrotreated vegetable oils (HVO) and Fischer-Tropsch diesel, are fungible and can be blended into fossil diesel fuel at very high blending ratios, or can be used neat in all existing or future diesel vehicles. Therefore, those fuels can be distributed, stored and used with the existing infrastructure. Synthetic fuels substituting petrol, such as methanol and other alcohols, can be blended with petrol and can be technically used with current vehicle technology with minor adaptations. Methanol can also be used for inland navigation and short-sea shipping. Synthetic and paraffinic fuels have a potential to reduce the use of oil sources in the energy supply to transport.
- (7) LPG or autogas is an alternative fuel, derived from natural gas processing and oil refining, with a lower carbon footprint and significantly less pollutant emissions than conventional fuels. Bio-LPG derived from various biomass sources is expected to emerge as a viable technology in the medium to long term. LPG can be used for road transport (for cars and trucks) for all ranges of distances. It can also be used for inland navigation and short-sea shipping. LPG infrastructure is relatively well developed, with a significant number of filling stations already present in the Union (approximately 29 000). However, the distribution of those filling stations is uneven, with low penetration in a number of countries.
- (8) Without prejudice to the definition of alternative fuels in this Directive, it should be noted that additional types of clean fuels exist that can represent potential alternatives to fossil fuels. Promising results from research and development should be considered when new types of alternative fuels are selected. Standards and legislation should be drawn up, without giving preference to any particular type of technology, so as not to hamper further development towards alternative fuels and energy carriers.
- (9) The CARS 21 High Level Group report of 6 June 2012 stated that the lack of a Union-wide harmonised alternative fuel infrastructure hampers the market introduction of vehicles using alternative fuels and delays their environmental benefits. In its Communication of 8 November 2012 entitled 'CARS 2020: Action Plan for a competitive and sustainable automotive industry in Europe', the Commission took up the main recommendations of the CARS 21 High Level Group report and presented an Action Plan based on them. This Directive is one of the key actions regarding alternative fuels infrastructure announced by the Commission.
- (10) Fragmentation of the internal market due to uncoordinated market introduction of alternative fuels should be avoided. Coordinated policy frameworks of all Member States should therefore provide the long-term security required for private and public investment in vehicle and fuel technology, and infrastructure build-up, in order to serve the dual purpose of minimising dependence on oil and mitigating the environmental impact of transport. Member States should therefore establish national policy frameworks outlining their national targets and objectives, and supporting actions for the development of the market as regards alternative fuels, including the deployment of the necessary infrastructure to be put into place, in close cooperation with regional and local authorities and with the industry concerned, while taking into account the needs of small and medium-sized enterprises. Where necessary, Member States should cooperate with other neighbouring Member States at regional or macro-regional level, by means of consultation or joint policy frameworks, in particular where continuity of alternative fuels infrastructure coverage across national borders or the construction of new infrastructure in the proximity of national borders is required, including different non-discriminatory access options for recharging and refuelling points. The coordination of those national policy frameworks and their coherence at Union level should be supported by cooperation between Member States and assessment and reporting by the Commission. In order to facilitate reporting by the Member States of the information provided for in Annex I, non-binding guidelines should be adopted by the Commission.
- (11) A coordinated approach is necessary in order to meet the long-term energy needs of all transport modes. In particular, policies should build upon the use of alternative fuels, with a focus on the specific needs of each transport mode. In the elaboration of national policy frameworks, account should be taken of the needs of the different transport modes existing on the territory of the Member State concerned, including those for which limited alternatives to fossil fuels are available.
- (12) The development and implementation of the national policy frameworks of the Member States should be facilitated by the Commission by means of exchanges of information and best practices between the Member States.

- (13) In order to promote alternative fuels and develop the relevant infrastructure, the national policy frameworks may consist of several plans, strategies or other planning documentation developed separately or in an integrated manner, or in another form, and at the administrative level decided upon by the Member States.
- (14) Fuels included in the national policy frameworks should be eligible for Union and national support measures for alternative fuels infrastructure, in order to focus public support on a coordinated internal market development towards Union-wide mobility using alternative fuels vehicles and vessels.
- (15) This Directive is not intended to place an additional financial burden on Member States or on regional and local authorities. It should be possible for Member States to implement this Directive by making use of a wide range of regulatory and non-regulatory incentives and measures, in close cooperation with private sector actors, who should play a key role in supporting the development of alternative fuels infrastructure.
- (16) In accordance with Regulation (EU) No 1316/2013 of the European Parliament and of the Council <sup>(1)</sup>, the development of new technologies and innovation, in particular regarding the decarbonisation of transport, is eligible for Union funding. That Regulation also provides for additional funding to be granted for actions which exploit the synergies between at least two of the sectors covered by it (namely transport, energy and telecommunications). Lastly, the Commission is assisted by the Connecting Europe Facility (CEF) Coordination Committee in coordinating the work programmes with a view to allowing multi-sectoral calls for proposals in an effort to take full advantage of possible synergies between those sectors. The CEF would, therefore, contribute to the deployment of alternative fuels infrastructure.
- (17) The Horizon 2020 framework programme, established by Regulation (EU) No 1291/2013 of the European Parliament and of the Council <sup>(2)</sup>, will also provide support for research and innovation with regard to alternative fuel vehicles and the related infrastructure, in particular through the Societal Challenge 'Smart, green and integrated transport'. That specific source of financing should also contribute to the development of alternative fuels infrastructure and should be fully considered as an additional opportunity to ensure a sustainable mobility market throughout the Union.
- (18) In order to trigger investment in sustainable transport and support the deployment of a continued network of alternative fuels infrastructure in the Union, the Commission and the Member States should support national and regional development measures in this area. They should encourage exchanges of best practices in alternative fuels infrastructure deployment and management between local and regional development initiatives and, to this end, they should promote the use of the European Structural and Investment Funds, in particular the European Regional Development Fund and the Cohesion Fund.
- (19) Support measures for alternative fuels infrastructure should be implemented in compliance with the State aid rules contained in the Treaty on the Functioning of the European Union (TFEU). Member States may consider it necessary to provide support to operators affected by this Directive in accordance with the applicable State aid rules. Any national support measures for alternative fuels infrastructure notified to the Commission should be assessed without delay.
- (20) The Trans-European Network for Transport (TEN-T) guidelines recognise that alternative fuels serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport, contribute to its decarbonisation and enhance the environmental performance of the transport sector. The TEN-T guidelines require, with regard to new technologies and innovation, that the TEN-T is to enable the decarbonisation of all transport modes by stimulating energy efficiency as well as by introducing alternative propulsion systems and the provision of corresponding infrastructure. The TEN-T guidelines also require that inland and sea ports, airports and roads of the core network established by Regulation (EU) No 1315/2013 of the European Parliament and of the Council <sup>(3)</sup> ('TEN-T Core Network') provide for the availability of alternative fuels. In the CEF, the TEN-T funding instrument

<sup>(1)</sup> Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010 (OJ L 348, 20.12.2013, p. 129).

<sup>(2)</sup> Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 — the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC (OJ L 347, 20.12.2013, p. 104).

<sup>(3)</sup> Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013, p. 1).

makes the deployment on the TEN-T Core Network of those new technologies and innovation, including infrastructure for alternative clean fuels, eligible for grants. In addition, the deployment of infrastructure for alternative clean fuels on the broader comprehensive network will be able to receive financial assistance from the CEF in the form of procurement and financial instruments, such as project bonds.

- (21) Biofuels, as defined in Directive 2009/28/EC, are currently the most important type of alternative fuels, accounting for 4,7 % of the total fuels consumed in Union transport in 2011. They can also contribute to a substantial reduction in overall CO<sub>2</sub> emissions if they are produced sustainably. They could provide clean power to all forms of transport.
- (22) The lack of harmonised development of alternative fuels infrastructure across the Union prevents the development of economies of scale on the supply side and Union-wide mobility on the demand side. New infrastructure networks need to be built up, such as for electricity, natural gas (liquefied natural gas (LNG) and compressed natural gas (CNG)) and, where appropriate, hydrogen. It is important to acknowledge the different stages of development of each fuel technology and related infrastructures, including the maturity of business models for private investors and the availability and user acceptance of alternative fuels. Technological neutrality should be ensured and national policy frameworks should take due account of the requirement to support the commercial development of alternative fuels. Moreover, population density and geographical characteristics should be taken into account in the elaboration of national policy frameworks.
- (23) Electricity has the potential to increase the energy efficiency of road vehicles and to contribute to a CO<sub>2</sub> reduction in transport. It is a power source that is indispensable for the deployment of electric vehicles, including L-category vehicles as referred to in Directive 2007/46/EC of the European Parliament and of the Council <sup>(1)</sup> and Regulation (EU) No 168/2013 of the European Parliament and of the Council <sup>(2)</sup>, which can contribute to improving air quality and reducing noise in urban/suburban agglomerations and other densely populated areas. Member States should ensure that recharging points accessible to the public are built up with adequate coverage, in order to enable electric vehicles to circulate at least in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States. The number of such recharging points should be established taking into account the number of electric vehicles estimated to be registered by the end of 2020 in each Member State. As an indication, the appropriate average number of recharging points should be equivalent to at least one recharging point per 10 cars, also taking into consideration the type of cars, charging technology and available private recharging points. An appropriate number of recharging points accessible to the public should be installed, in particular at public transport stations, such as port passenger terminals, airports or railway stations. Private owners of electric vehicles depend to a large extent on access to recharging points in collective parking lots, such as in apartment blocks and office and business locations. Public authorities should take measures to assist users of such vehicles by ensuring that the appropriate infrastructure with sufficient electric vehicle recharging points is provided by site developers and managers.
- (24) Member States should ensure that publicly accessible infrastructure for the supply of electricity to motor vehicles is built up. To define an appropriate number of recharging points accessible to the public in their national policy frameworks, it should be possible for Member States to take into consideration the number of existing recharging points accessible to the public on their territory and their specifications, and to decide whether to concentrate deployment efforts on normal or high power recharging points.
- (25) Electro-mobility is a fast developing area. Current recharging interface technologies include cable connectors, but future interface technologies such as wireless charging or battery swapping need to be considered as well. Legislation needs to ensure that technological innovation is facilitated. This Directive should therefore be updated as appropriate in order to take into account future standards for technologies such as wireless charging and battery swapping.
- (26) A recharging or refuelling point accessible to the public may include, for example, privately owned recharging or refuelling points or devices accessible to the public through registration cards or fees, recharging or refuelling points of car-sharing schemes which allow access for third party users by means of subscription, or recharging or refuelling points in public parking. Recharging or refuelling points which allow private users physical access with an authorisation or a subscription should be considered to be recharging or refuelling points accessible to the public.

<sup>(1)</sup> Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (Framework Directive) (OJ L 263, 9.10.2007, p. 1).

<sup>(2)</sup> Regulation (EU) No 168/2013 of the European Parliament and of the Council of 15 January 2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles (OJ L 60, 2.3.2013, p. 52).

- (27) Electricity and hydrogen are particularly attractive power sources for the deployment of electric/fuel cell vehicles and L-category vehicles in urban/suburban agglomerations and other densely populated areas, which can contribute to improving air quality and reducing noise. Electro-mobility is an important contributor to meeting the Union's ambitious climate and energy targets for 2020. Indeed, Directive 2009/28/EC, transposed by Member States by 5 December 2010, set mandatory targets for all Member States for the share of energy from renewable sources, with the aim of reaching by 2020 a Union target of at least a 20 % share of energy from renewable sources, and a 10 % share of renewable energy being specifically used in the transport sector.
- (28) The recharging of electric vehicles at recharging points should, if technically and financially reasonable, make use of intelligent metering systems in order to contribute to the stability of the electricity system by recharging batteries from the grid at times of low general electricity demand and to allow secure and flexible data handling. In the long term, this may also enable electric vehicles to feed power from the batteries back into the grid at times of high general electricity demand. Intelligent metering systems as defined in Directive 2012/27/EU of the European Parliament and of the Council <sup>(1)</sup> enable real-time data to be produced which is needed to ensure the stability of the grid and to encourage rational use of recharging services. Intelligent metering systems provide accurate and transparent information on the cost and availability of recharging services, thereby encouraging recharging at 'off-peak' periods, which means times of low general electricity demand and low energy prices. The use of intelligent metering systems optimises recharging, with benefits for the electricity system and for consumers.
- (29) With respect to recharging points for electric vehicles which are not publicly accessible, Member States should aim to explore the technical and financial feasibility of synergies with intelligent meter roll-out plans following the obligation under Annex I.2 to Directive 2009/72/EC of the European Parliament and of the Council <sup>(2)</sup>. Distribution system operators play an important role in relation to recharging points. In the development of their tasks, the distribution system operators, some of whom may be part of a vertically integrated undertaking owning or operating recharging points, should cooperate on a non-discriminatory basis with any other owners or operators of recharging points, in particular providing them with the information needed for the efficient access to and use of the system.
- (30) In the development of infrastructure for electric vehicles, the interaction of that infrastructure with the electricity system, as well as the electricity policy of the Union, should be consistent with the principles established under Directive 2009/72/EC. The establishment and operation of recharging points for electric vehicles should be developed as a competitive market with open access to all parties interested in rolling-out or operating recharging infrastructures.
- (31) The access of Union electricity suppliers to recharging points should be without prejudice to the derogations under Article 44 of Directive 2009/72/EC.
- (32) In 2010, the Commission delivered a mandate (M468) to the European Standardisation Organisations (ESOs) to issue new standards or review existing standards with the aim of ensuring interoperability and connectivity between an electricity supply point and a charger of electric vehicles. CEN/CENELEC set up a focus group, which published a report in October 2011. Whereas the report contained a number of recommendations, no consensus on the selection of one standard interface was reached. Therefore, further policy action is needed in order to provide a non-proprietary solution ensuring interoperability across the Union.
- (33) Interface to charge electric vehicles could include several socket outlets or vehicle connectors as long as one of them complies with the technical specifications set out in this Directive, so as to allow multistandard recharging. However, the choice made in this Directive of Union-wide common connectors for electric vehicles (Type 2 and Combo 2) should not be detrimental to Member States having already invested in the deployment of other standardised technologies for recharging points and should not affect existing recharging points deployed before the entry into force of this Directive. Electric vehicles already in circulation before the entry into force of this Directive should be able to recharge, even if they were designed to recharge at recharging points that do not comply with the technical specifications set out in this Directive. The choice of equipment for normal and high power recharging points should comply with specific safety requirements in force at national level.

<sup>(1)</sup> Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

<sup>(2)</sup> Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC (OJ L 211, 14.8.2009, p. 55).

- (34) Shore-side electricity facilities can serve maritime and inland waterway transport as clean power supply, in particular in maritime and inland navigation ports where air quality or noise levels are poor. Shore-side electricity can contribute to reducing the environmental impact of sea-going ships and inland waterway vessels.
- (35) Standardisation of shore-side electricity supply should not impede the use of systems already in place prior to the entry into force of this Directive. In particular, Member States should allow maintenance and upgrading of existing systems with a view to ensuring their efficient use throughout their lifespan, without requiring full compliance with the technical specifications set out in this Directive.
- (36) Electricity supply to stationary airplanes at airports can reduce fuel consumption and noise, improve air quality and reduce the impact on climate change. Member States should therefore ensure that the need to install electricity supply at airports is considered in their national policy frameworks.
- (37) Hydrogen-powered motor vehicles, including hydrogen-powered L-vehicles, have at present very low market penetration rates but a build-up of sufficient hydrogen refuelling infrastructure is essential in order to make larger-scale hydrogen-powered motor vehicle deployment possible.
- (38) Member States which decide to include hydrogen refuelling points in their national policy frameworks should ensure that publicly accessible infrastructure for the supply of hydrogen to motor vehicles is built up, ensuring circulation of hydrogen-powered motor vehicles within the networks determined by the Member States. Where appropriate, cross-border links should be taken into account with a view to enabling hydrogen-powered motor vehicles to circulate Union-wide.
- (39) As far as natural gas vehicles are concerned, around 3 000 refuelling points are presently in operation in the Union. Additional refuelling points could be put in place and supplied from the existing well-developed area covering natural gas distribution networks in the Union, provided that the quality of the gas is suitable for use in current and advanced technology gas vehicles. The current distribution network for natural gas could be supplemented with local refuelling points utilising locally produced biomethane.
- (40) Common infrastructure for natural gas requires common technical specifications for its hardware as well as for the gas quality. The quality of natural gas used in the Union depends on its origin, on its constituents, for example biomethane blended into natural gas, and on the way in which natural gas is handled through the distribution chain. Therefore, a spread of technical characteristics could prevent the optimal use of engines and reduce their energy efficiency. In this respect, the Technical Committee CEN/TC 408 — Project Committee is developing a set of quality specifications for natural gas used in transport and for the injection of biomethane into the natural gas grid.
- (41) Member States should ensure, by means of their national policy frameworks, that an appropriate number of refuelling points accessible to the public for the supply of CNG or compressed biomethane to motor vehicles is built up, in order to ensure that CNG motor vehicles can circulate in urban/suburban agglomerations and other densely populated areas as well as throughout the Union, at least along the existing TEN-T Core Network. When establishing their networks for the supply of CNG to motor vehicles, Member States should ensure that refuelling points accessible to the public are put in place, taking into account the minimum range of CNG motor vehicles. As an indication, the necessary average distance between refuelling points should be approximately 150 km. To ensure market functioning and interoperability, all CNG refuelling points for motor vehicles should provide gas of the quality required for use in current and advanced technology CNG vehicles.
- (42) LNG is an attractive fuel alternative for vessels to meet the requirements for decreasing the sulphur content in marine fuels in the SO<sub>x</sub> Emission Control Areas which affect half of the ships sailing in European short sea shipping, as provided for by Directive 2012/33/EU of the European Parliament and of the Council <sup>(1)</sup>. A core network of refuelling points for LNG at maritime and inland ports should be available at least by the end of 2025 and 2030, respectively. Refuelling points for LNG include, inter alia, LNG terminals, tanks, mobile containers, bunker vessels and barges. The initial focus on the core network should not rule out the possibility of LNG also being made available in the longer term at ports outside the core network, in particular those ports that are important for vessels not engaged in transport operations. The decision on the location of the LNG

<sup>(1)</sup> Directive 2012/33/EU of the European Parliament and of the Council of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels (OJ L 327, 27.11.2012, p. 1).

refuelling points at ports should be based on a cost-benefit analysis including an examination of the environmental benefits. Applicable safety-related provisions should also be taken into account. The deployment of LNG infrastructure provided for in this Directive should not hamper the development of other potentially upcoming energy-efficient alternative fuels.

- (43) The Commission and the Member States should endeavour to modify the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways, concluded at Geneva on 26 May 2000, as amended (ADN), to allow large-scale carriage of LNG on inland waterways. The amendments which this entails should be made applicable to all transport in the territory of the Union by adapting Annex III, Section III.1 of Directive 2008/68/EC of the European Parliament and of the Council <sup>(1)</sup>. Directive 2006/87/EC of the European Parliament and of the Council <sup>(2)</sup> should be amended, where necessary, to allow the efficient and safe use of LNG for propulsion of vessels on inland waterways. Proposed amendments should not conflict with the provisions of the ADN applicable in the Union territory by virtue of Annex III, Section III.1 of Directive 2008/68/EC.
- (44) Member States should ensure an appropriate distribution system between storage stations and refuelling points for LNG. As regards road transport, the availability and geographical location of loading points for LNG tank vehicles are essential to developing an economically sustainable LNG mobility.
- (45) LNG, including liquefied biomethane, might also offer a cost-efficient technology allowing heavy-duty vehicles to meet the stringent pollutant emission limits of Euro VI standards as referred to in Regulation (EC) No 595/2009 of the European Parliament and of the Council <sup>(3)</sup>.
- (46) The TEN-T Core Network should be the basis for the deployment of LNG infrastructure as it covers the main traffic flows and allows for network benefits. When establishing their networks for the supply of LNG to heavy-duty motor vehicles, Member States should ensure that refuelling points accessible to the public are put in place, at least along the existing TEN-T Core Network, within adequate distances taking into account the minimum range of LNG heavy-duty motor vehicles. As an indication, the necessary average distance between refuelling points should be approximately 400 km.
- (47) The deployment of the refuelling points for both LNG and CNG should be adequately coordinated with the implementation of the TEN-T Core Network.
- (48) An appropriate number of LNG and CNG refuelling points accessible to the public should be put in place by 31 December 2025, at least along the TEN-T Core Network existing at that date and, after that date, on the other parts of the TEN-T Core Network where these are made accessible to vehicles.
- (49) In light of the increasing diversity in the type of fuels for motorised vehicles coupled with on-going growth in the road mobility of citizens across the Union, it is necessary to provide vehicle users with clear and easy-to-understand information on the fuels available at refuelling stations and on the compatibility of their vehicle with different fuels or recharging points on the Union market, without prejudice to Directive 2009/30/EC of the European Parliament and of the Council <sup>(4)</sup>. Member States should be able to decide to implement such information measures also in respect of vehicles in circulation.
- (50) In the absence of a European standard for a given alternative fuel, Member States should be allowed to use other standards for user information and labelling.

<sup>(1)</sup> Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods (OJ L 260, 30.9.2008, p. 13).

<sup>(2)</sup> Directive 2006/87/EC of the European Parliament and of the Council of 12 December 2006 laying down technical requirements for inland waterway vessels and repealing Council Directive 82/714/EEC (OJ L 389, 30.12.2006, p. 1).

<sup>(3)</sup> Regulation (EC) No 595/2009 of the European Parliament and of the Council of 18 June 2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC (OJ L 188, 18.7.2009, p. 1).

<sup>(4)</sup> Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC (OJ L 140, 5.6.2009, p. 88).

- (51) Simple and easy-to-compare information on the prices of different fuels could play an important role in enabling vehicle users to better evaluate the relative cost of individual fuels available on the market. Therefore, when fuel prices are displayed at a fuel station, in particular for natural gas and hydrogen, it should be possible for unit price comparison to conventional fuels, such as '1 petrol litre equivalent', to be displayed for information purposes.
- (52) In light of the increasing diversity in the type of fuels for motorised vehicles, it is necessary to provide vehicle users with data regarding the geographic location of the refuelling and recharging points accessible to the public of alternative fuels covered by this Directive. Therefore, when companies or internet sites provide this information, it should be accessible on an open and non-discriminatory basis to all users.
- (53) It is of particular importance for fact-based policy-making at all levels to collect best practice and coordinated data through monitoring activities, such as the Clean Vehicle Portal and the European Electro-mobility Observatory.
- (54) Key information concerning the availability of recharging and refuelling points and any other information necessary for Union-wide mobility should be included, where applicable, in traffic and travel information services as part of the intelligent transport system.
- (55) In order to ensure adaptation of the provisions of this Directive to market developments and technical progress, the power to adopt acts in accordance with Article 290 TFEU should be delegated to the Commission in respect of the technical specifications of refuelling and recharging points and relevant standards. It is of particular importance that the Commission follow its usual practice and carry out appropriate consultations during its preparatory work, including at expert level. The Commission, when preparing and drawing up delegated acts, should ensure a simultaneous, timely and appropriate transmission of relevant documents to the European Parliament and to the Council.
- (56) The International Maritime Organization (IMO) develops uniform and internationally recognised safety and environmental standards for maritime transport. Conflicts with international standards should be avoided in view of the global nature of maritime transport. Therefore, the Union should ensure that technical specifications for maritime transport adopted pursuant to this Directive are consistent with international rules adopted by the IMO.
- (57) Technical specifications for interoperability of recharging and refuelling points should be specified in European or international standards. The ESOs should adopt European standards in accordance with Article 10 of Regulation (EU) No 1025/2012 of the European Parliament and of the Council<sup>(1)</sup>, and those standards should be based on current international standards or ongoing international standardisation work, where applicable. For standards not yet adopted, the work should be based on standards under development: 'Guidelines for systems and installations for supply of LNG as fuel to ships' (ISO/DTS 18683), 'Natural gas fuelling stations — LNG stations for fuelling vehicles' (ISO/DIS 16924) and 'Natural gas fuelling stations — CNG stations for fuelling vehicles' (ISO/DIS 16923). The Commission should be empowered to update the references to technical specifications given in European or international standards by means of delegated acts.
- (58) In the application of this Directive, the Commission should consult relevant expert groups, including at least the European Expert Group on Future Transport Fuels, consisting of experts from industry and civil society, as well as the Joint Expert Group on Transport & Environment, which brings together experts from the Member States.
- (59) A group of experts called the European Sustainable Shipping Forum (ESSF) has been established by the Commission in order to assist it in implementing the Union's activities in the area of maritime transport sustainability. A sub-group on marine LNG has been set up under the ESSF, with the mandate of proposing to the ESSF the development of standards or rules for marine LNG as ship fuel covering technical, operational, safety, security, training and environmental aspects of LNG bunkering. A Committee for the Creation of Technical Standards (CESTE) has

<sup>(1)</sup> Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European Standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council (OJ L 316, 14.11.2012, p. 12).

also been established to deal with the technical standards in the field of inland navigation. It is of particular importance that the Commission follow its usual practice and carry out consultations with experts, including the ESSF and the CESTE, before adopting delegated acts on requirements on the bunkering of LNG, including the safety aspects related thereto.

- (60) The Central Commission for the Navigation of the Rhine (CCNR) is an international organisation that addresses all issues concerning inland navigation. The Danube Commission is an international intergovernmental organisation that provides and develops free navigation on the Danube. It is of particular importance that the Commission follow its usual practice and carry out consultations with experts, including the CCNR and the Danube Commission, before adopting delegated acts on inland navigation.
- (61) When matters relating to this Directive, other than its implementation or infringements, are being examined by experts, thereby acting as expert groups, the European Parliament should receive full information and documentation and, where appropriate, an invitation to attend the relevant meetings.
- (62) In order to ensure uniform conditions for the implementation of this Directive, implementing powers should be conferred on the Commission to lay down common procedures and specifications. Those powers should be exercised in accordance with Regulation (EU) No 182/2011 of the European Parliament and of the Council<sup>(1)</sup>.
- (63) To ensure that alternative fuels for transport are of the quality required for use in current and future technology engines, and that they offer a high level of environmental performance with regard to CO<sub>2</sub> and other pollutant emissions, the Commission should monitor their introduction on the market. To that end, the Commission should, if appropriate, propose the necessary legal measures to ensure a harmonised high level of fuel quality throughout the Union.
- (64) In order to achieve the broadest possible use of alternative fuels for transport, while ensuring technological neutrality, and to promote sustainable electric mobility throughout the Union, the Commission should, if it considers appropriate, take suitable measures, such as the adoption of an Action Plan for the implementation of the strategy set out in the Communication entitled 'Clean Power for Transport: A European alternative fuels strategy'. For this purpose, the Commission could take into account individual market needs and developments in the Member States.
- (65) Since the objective of this Directive, namely to promote a broad market development of alternative fuels, cannot be sufficiently achieved by the Member States individually, but can rather, by reason of the need for action to meet the demand for a critical mass of alternatively fuelled vehicles and for cost-efficient developments by European industry, and to allow Union-wide mobility of alternatively fuelled vehicles, be better achieved at Union level, the Union may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty on European Union. In accordance with the principle of proportionality, as set out in that Article, this Directive does not go beyond what is necessary in order to achieve that objective,

HAVE ADOPTED THIS DIRECTIVE:

#### *Article 1*

#### **Subject matter**

This Directive establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimise dependence on oil and to mitigate the environmental impact of transport. This Directive sets out minimum requirements for the building-up of alternative fuels infrastructure, including recharging points for electric vehicles and refuelling points for natural gas (LNG and CNG) and hydrogen, to be implemented by means of Member States' national policy frameworks, as well as common technical specifications for such recharging and refuelling points, and user information requirements.

<sup>(1)</sup> Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers (OJ L 55, 28.2.2011, p. 13).

*Article 2***Definitions**

For the purpose of this Directive, the following definitions apply:

- (1) 'alternative fuels' means fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector. They include, inter alia:
  - electricity,
  - hydrogen,
  - biofuels as defined in point (i) of Article 2 of Directive 2009/28/EC,
  - synthetic and paraffinic fuels,
  - natural gas, including biomethane, in gaseous form (compressed natural gas (CNG)) and liquefied form (liquefied natural gas (LNG)), and
  - liquefied petroleum gas (LPG);
- (2) 'electric vehicle' means a motor vehicle equipped with a powertrain containing at least one non-peripheral electric machine as energy converter with an electric rechargeable energy storage system, which can be recharged externally;
- (3) 'recharging point' means an interface that is capable of charging one electric vehicle at a time or exchanging a battery of one electric vehicle at a time;
- (4) 'normal power recharging point' means a recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 22 kW, excluding devices with a power less than or equal to 3,7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public;
- (5) 'high power recharging point' means a recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW;
- (6) 'shore-side electricity supply' means the provision of shore-side electrical power through a standardised interface to seagoing ships or inland waterway vessels at berth;
- (7) 'recharging or refuelling point accessible to the public' means a recharging or refuelling point to supply an alternative fuel which provides Union-wide non-discriminatory access to users. Non-discriminatory access may include different terms of authentication, use and payment;
- (8) 'refuelling point' means a refuelling facility for the provision of any fuel with the exception of LNG, through a fixed or a mobile installation;
- (9) 'refuelling point for LNG' means a refuelling facility for the provision of LNG, consisting of either a fixed or mobile facility, offshore facility, or other system.

*Article 3***National policy frameworks**

1. Each Member State shall adopt a national policy framework for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. It shall contain at least the following elements:
  - an assessment of the current state and future development of the market as regards alternative fuels in the transport sector, including in light of their possible simultaneous and combined use, and of the development of alternative fuels infrastructure, considering, where relevant, cross-border continuity,

- national targets and objectives, pursuant to Articles 4(1), 4(3), 4(5), 6(1), 6(2), 6(3), 6(4), 6(6), 6(7), 6(8) and, where applicable, Article 5(1), for the deployment of alternative fuels infrastructure. Those national targets and objectives shall be established and may be revised on the basis of an assessment of national, regional or Union-wide demand, while ensuring compliance with the minimum infrastructure requirements set out in this Directive,
- measures necessary to ensure that the national targets and the objectives contained in the national policy framework are reached,
- measures that can promote the deployment of alternative fuels infrastructure in public transport services,
- designation of the urban/suburban agglomerations, of other densely populated areas and of networks which, subject to market needs, are to be equipped with recharging points accessible to the public in accordance with Article 4(1),
- designation of the urban/suburban agglomerations, of other densely populated areas and of networks which, subject to market needs, are to be equipped with CNG refuelling points in accordance with Article 6(7),
- an assessment of the need to install refuelling points for LNG in ports outside the TEN-T Core Network,
- consideration of the need to install electricity supply at airports for use by stationary airplanes.

2. Member States shall ensure that national policy frameworks take into account the needs of the different transport modes existing on their territory, including those for which limited alternatives to fossil fuels are available.

3. National policy frameworks shall take into account, as appropriate, the interests of regional and local authorities, as well as those of the stakeholders concerned.

4. Where necessary, Member States shall cooperate, by means of consultations or joint policy frameworks, to ensure that the measures required to achieve the objectives of this Directive are coherent and coordinated.

5. Support measures for alternative fuels infrastructure shall be implemented in compliance with the State aid rules contained in the TFEU.

6. National policy frameworks shall be in line with the Union's environmental and climate-protection legislation in force.

7. Member States shall notify their national policy frameworks to the Commission by 18 November 2016.

8. Based on the national policy frameworks, the Commission shall publish and regularly update information on the national targets and the objectives submitted by each Member State regarding:

- the number of recharging points accessible to the public,
- refuelling points for LNG at maritime and inland ports,
- refuelling points for LNG accessible to the public for motor vehicles,
- CNG refuelling points accessible to the public for motor vehicles.

Where applicable, information regarding the following shall also be published:

- hydrogen refuelling points accessible to the public,
- infrastructure for shore-side electricity supply in maritime and inland ports,
- infrastructure for electricity supply for stationary airplanes.

9. The Commission shall assist Member States in the reporting on the national policy frameworks by means of the guidelines referred to in Article 10(4), shall assess the coherence of the national policy frameworks at Union level and shall assist Member States in the cooperation process provided for in paragraph 4 of this Article.

*Article 4***Electricity supply for transport**

1. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of recharging points accessible to the public are put in place by 31 December 2020, in order to ensure that electric vehicles can circulate at least in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States. The number of such recharging points shall be established taking into consideration, inter alia, the number of electric vehicles estimated to be registered by the end of 2020, as indicated in their national policy frameworks, as well as best practices and recommendations issued by the Commission. Particular needs related to the installation of recharging points accessible to the public at public transport stations shall be taken into account, where appropriate.

2. The Commission shall assess the application of the requirements in paragraph 1 and, as appropriate, submit a proposal to amend this Directive, taking into account the development of the market for electric vehicles, in order to ensure that an additional number of recharging points accessible to the public are put in place in each Member State by 31 December 2025, at least on the TEN-T Core Network, in urban/suburban agglomerations and other densely populated areas.

3. Member States shall also take measures within their national policy frameworks to encourage and facilitate the deployment of recharging points not accessible to the public.

4. Member States shall ensure that normal power recharging points for electric vehicles, excluding wireless or inductive units, deployed or renewed as from 18 November 2017, comply at least with the technical specifications set out in point 1.1 of Annex II and with specific safety requirements in force at national level.

Member States shall ensure that high power recharging points for electric vehicles, excluding wireless or inductive units, deployed or renewed as from 18 November 2017, comply at least with the technical specifications set out in point 1.2 of Annex II.

5. Member States shall ensure that the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports is assessed in their national policy frameworks. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits.

6. Member States shall ensure that shore-side electricity supply installations for maritime transport, deployed or renewed as from 18 November 2017, comply with the technical specifications set out in point 1.7 of Annex II.

7. The recharging of electric vehicles at recharging points accessible to the public shall, if technically feasible and economically reasonable, make use of intelligent metering systems as defined in point (28) of Article 2 of Directive 2012/27/EU and shall comply with the requirements laid down in Article 9(2) of that Directive.

8. Member States shall ensure that operators of recharging points accessible to the public are free to purchase electricity from any Union electricity supplier, subject to the supplier's agreement. The operators of recharging points shall be allowed to provide electric vehicle recharging services to customers on a contractual basis, including in the name and on behalf of other service providers.

9. All recharging points accessible to the public shall also provide for the possibility for electric vehicle users to recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned.

10. Member States shall ensure that prices charged by the operators of recharging points accessible to the public are reasonable, easily and clearly comparable, transparent and non-discriminatory.

11. Member States shall ensure that distribution system operators cooperate on a non-discriminatory basis with any person establishing or operating recharging points accessible to the public.

12. Member States shall ensure that the legal framework permits the electricity supply for a recharging point to be the subject of a contract with a supplier other than the entity supplying electricity to the household or premises where such a recharging point is located.

13. Without prejudice to Regulation (EU) No 1025/2012, the Union shall pursue the development by the appropriate standardisation organisations of European standards containing detailed technical specifications for wireless recharging points and battery swapping for motor vehicles, and for recharging points for L-category motor vehicles and electric buses.

14. The Commission shall be empowered to adopt delegated acts in accordance with Article 8 to:

- (a) supplement this Article and points 1.3, 1.4, 1.5, 1.6 and 1.8 of Annex II in order to require compliance of the infrastructures to be deployed or renewed with the technical specifications contained in the European standards to be developed pursuant to paragraph 13 of this Article, where the relevant ESOs have recommended only one technical solution with technical specifications as described in a relevant European standard;
- (b) update the references to the standards referred to in the technical specifications set out in point 1 of Annex II where those standards are replaced by new versions thereof adopted by the relevant standardisation organisations.

It is of particular importance that the Commission follow its usual practice and carry out consultations with experts, including Member States' experts, before adopting those delegated acts.

Those delegated acts shall provide for transitional periods of at least 24 months before the technical specifications contained therein, or amendments thereof, become binding on the infrastructure to be deployed or renewed.

#### *Article 5*

### **Hydrogen supply for road transport**

1. Member States which decide to include hydrogen refuelling points accessible to the public in their national policy frameworks shall ensure that, by 31 December 2025, an appropriate number of such points are available, to ensure the circulation of hydrogen-powered motor vehicles, including fuel cell vehicles, within networks determined by those Member States, including, where appropriate, cross-border links.

2. Member States shall ensure that hydrogen refuelling points accessible to the public deployed or renewed as from 18 November 2017 comply with the technical specifications set out in point 2 of Annex II.

3. The Commission shall be empowered to adopt delegated acts in accordance with Article 8 to update the references to the standards referred to in the technical specifications set out in point 2 of Annex II where those standards are replaced by new versions thereof adopted by the relevant standardisation organisations.

It is of particular importance that the Commission follow its usual practice and carry out consultations with experts, including Member States' experts, before adopting those delegated acts.

Those delegated acts shall provide for transitional periods of at least 24 months before the technical specifications contained therein, or amendments thereof, become binding on the infrastructure to be deployed or renewed.

#### *Article 6*

### **Natural gas supply for transport**

1. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG are put in place at maritime ports, to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2025. Member States shall cooperate with neighbouring Member States where necessary to ensure adequate coverage of the TEN-T Core Network.

2. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG are put in place at inland ports, to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2030. Member States shall cooperate with neighbouring Member States where necessary to ensure adequate coverage of the TEN-T Core Network.

3. Member States shall designate in their national policy frameworks the maritime and inland ports that are to provide access to the refuelling points for LNG referred to in paragraphs 1 and 2, also taking into consideration actual market needs.

4. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network, in order to ensure that LNG heavy-duty motor vehicles can circulate throughout the Union, where there is demand, unless the costs are disproportionate to the benefits, including environmental benefits.

5. The Commission shall assess the application of the requirement in paragraph 4 and, as appropriate, submit a proposal to amend this Directive by 31 December 2027, taking into account the LNG heavy-duty motor vehicles market, in order to ensure that an appropriate number of refuelling points for LNG accessible to the public are put in place in each Member State.

6. Member States shall ensure that an appropriate LNG distribution system is available in their territory, including loading facilities for LNG tank vehicles, in order to supply the refuelling points referred to in paragraphs 1, 2 and 4. By way of derogation, neighbouring Member States may, in the context of their national policy frameworks, form a pool for the purposes of fulfilling this requirement. Pooling agreements shall be the subject of the reporting obligations of the Member States under this Directive.

7. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of CNG refuelling points accessible to the public are put in place by 31 December 2020, in order to ensure, in line with the sixth indent of Article 3(1), that CNG motor vehicles can circulate in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States.

8. Member States shall ensure, by means of their national policy frameworks, that an appropriate number of CNG refuelling points accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network, to ensure that CNG motor vehicles can circulate throughout the Union.

9. Member States shall ensure that CNG refuelling points for motor vehicles deployed or renewed as from 18 November 2017 comply with the technical specifications set out in point 3.4 of Annex II.

10. Without prejudice to Regulation (EU) No 1025/2012, the Union shall pursue the development by the relevant European or international standardisation organisations of standards, including detailed technical specifications, for:

- (a) refuelling points for LNG for maritime and inland waterway transport;
- (b) refuelling points for LNG and CNG motor vehicles.

11. The Commission shall be empowered to adopt delegated acts in accordance with Article 8 to:

- (a) supplement this Article and points 3.1, 3.2 and 3.4 of Annex II, in order to require compliance of the infrastructures to be deployed or renewed with the technical specifications contained in the standards to be developed pursuant to points (a) and (b) of paragraph 10 of this Article, where the relevant ESOs have recommended only one technical solution with technical specifications as described in a relevant European standard compatible with the relevant international standards, where applicable;
- (b) update the references to the standards referred to in the technical specifications set out or to be set out in point 3 of Annex II where those standards are replaced by new versions thereof adopted by the relevant European or international standardisation organisations.

It is of particular importance that the Commission follow its usual practice and carry out consultations with experts, including Member States' experts, before adopting those delegated acts.

Those delegated acts shall provide for transitional periods of at least 24 months before the technical specifications contained therein, or amendments thereof, become binding on the infrastructure to be deployed or renewed.

12. In the absence of a standard containing detailed technical specifications for refuelling points for LNG for maritime and inland waterway transport, referred to in point (a) of paragraph 10, and in particular in the absence of those specifications relating to bunkering of LNG, the Commission, taking into account the work ongoing within the IMO, the CCNR, the Danube Commission and other relevant international fora, shall be empowered to adopt delegated acts in accordance with Article 8 to lay down:

- requirements for interfaces of bunker transfer of LNG in maritime and inland waterway transport,
- requirements related to safety aspects of the onshore storage and bunkering procedure of LNG in maritime and inland waterway transport.

It is of particular importance that the Commission follow its usual practice and carry out consultations with relevant groups of experts on maritime transport and on inland waterway transport, including experts from national maritime or inland navigation authorities, before adopting those delegated acts.

#### Article 7

##### User information

1. Without prejudice to Directive 2009/30/EC, Member States shall ensure that relevant, consistent and clear information is made available as regards those motor vehicles which can be regularly fuelled with individual fuels placed on the market, or recharged by recharging points. Such information shall be made available in motor vehicle manuals, at refuelling and recharging points, on motor vehicles and in motor vehicle dealerships in their territory. This requirement shall apply to all motor vehicles, and their motor vehicle manuals, placed on the market after 18 November 2016.

2. The supply of information referred to in paragraph 1 shall be based on the labelling provisions regarding fuel compliance under standards of the ESOs setting the technical specifications of fuels. Where such standards refer to a graphical expression, including a colour coding scheme, the graphical expression shall be simple and easy to understand, and it shall be placed in a clearly visible manner:

- (a) on corresponding pumps and their nozzles at all refuelling points, as from the date on which fuels are placed on the market;
- (b) on or in the immediate proximity of all fuel tanks' filling caps of motor vehicles recommended and compatible with that fuel and in motor vehicle manuals, when such motor vehicles are placed on the market after 18 November 2016.

3. Where appropriate, and in particular for natural gas and hydrogen, when fuel prices are displayed at a fuel station, a comparison between the relevant unit prices shall be displayed for information purposes. The display of this information shall not mislead or confuse the user.

In order to increase consumer awareness and provide for fuel price transparency in a consistent way across the Union, the Commission shall be empowered to adopt, by means of implementing acts, a common methodology for alternative fuels unit price comparison.

4. Where ESO standards setting technical specifications of a fuel do not include labelling provisions for compliance with the standards in question, where the labelling provisions do not refer to a graphical expression including colour coding schemes, or where the labelling provisions are not suitable for attaining the objectives of this Directive, the Commission may, for the purposes of the uniform implementation of paragraphs 1 and 2, mandate ESOs to develop compatibility labelling specifications, or may adopt implementing acts determining the graphical expression, including a colour coding scheme, of compatibility for fuels introduced in the Union market which reach the level of 1 % of the total volume of sales, in the assessment of the Commission, in more than one Member State.

5. If labelling provisions of the respective ESO standards are updated, if implementing acts regarding the labelling are adopted or if new ESO standards for alternative fuels are developed as necessary, the corresponding labelling requirements shall apply to all refuelling and recharging points and motor vehicles registered on the territory of the Member States as of 24 months after their respective updating or adoption.

6. The implementing acts referred to in this Article shall be adopted in accordance with the examination procedure referred to in Article 9(2).

7. Member States shall ensure that, when available, the data indicating the geographic location of the refuelling and recharging points accessible to the public of alternative fuels covered by this Directive are accessible on an open and non-discriminatory basis to all users. For recharging points, such data, when available, may include information on real-time accessibility as well as historical and real-time charging information.

#### Article 8

##### Exercise of the delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.
2. The power to adopt delegated acts referred to in Articles 4, 5 and 6 shall be conferred on the Commission for a period of five years from 17 November 2014. The Commission shall draw up a report in respect of the delegation of power not later than nine months before the end of the five-year period. The delegation of power shall be tacitly extended for periods of an identical duration, unless the European Parliament or the Council opposes such extension not later than three months before the end of each period.
3. The delegation of power referred in Articles 4, 5 and 6 may be revoked at any time by the European Parliament or by the Council. A decision to revoke shall put an end to the delegation of the power specified in that decision. It shall take effect the day following the publication of the decision in the *Official Journal of the European Union* or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.
4. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.
5. A delegated act adopted pursuant to Articles 4, 5 and 6 shall enter into force only if no objection has been expressed either by the European Parliament or the Council within a period of two months of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by three months at the initiative of the European Parliament or of the Council.

#### Article 9

##### Committee procedure

1. The Commission shall be assisted by a committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011.
2. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply. Where the committee delivers no opinion, the Commission shall not adopt the draft implementing act and the third subparagraph of Article 5(4) of Regulation (EU) No 182/2011 shall apply.
3. Where the opinion of the committee is to be obtained by written procedure, that procedure shall be terminated without result when, within the time limit for delivery of the opinion, the chair of the committee so decides or a simple majority of committee members so request.

#### Article 10

##### Reporting and review

1. Each Member State shall submit to the Commission a report on the implementation of its national policy framework by 18 November 2019, and every three years thereafter. Those reports shall cover the information listed in Annex I and shall, where appropriate, include a relevant justification regarding the level of attainment of the national targets and objectives referred to in Article 3(1).

2. By 18 November 2017, the Commission shall submit to the European Parliament and to the Council a report on the assessment of the national policy frameworks and their coherence at Union level, including an evaluation of the level of attainment of the national targets and objectives referred to in Article 3(1).

3. The Commission shall submit a report on the application of this Directive to the European Parliament and to the Council every three years with effect from 18 November 2020.

The Commission report shall contain the following elements:

- an assessment of the actions taken by Member States,
- an assessment of the effects of this Directive on the development of the market as regards alternative fuels infrastructure and its contribution to the market of alternative fuels for transport, as well as its impact on the economy and the environment,
- information on technical progress and the development of the market as regards alternative fuels in the transport sector and of the relevant infrastructure covered by this Directive and of any other alternative fuel.

The Commission may outline examples of best practices and make appropriate recommendations.

The Commission report shall also assess the requirements and the dates set out in this Directive in respect of the infrastructure build-up and implementation of specifications, taking into account the technical, economic and market developments of the respective alternative fuels, accompanied if appropriate by a legislative proposal.

4. The Commission shall adopt guidelines concerning the reporting by the Member States of the elements listed in Annex I.

5. By 31 December 2020, the Commission shall review the implementation of this Directive, and, as appropriate, submit a proposal to amend it by laying down new common technical specifications for alternative fuels infrastructure within the scope of this Directive.

6. By 31 December 2018, the Commission shall, if it considers it appropriate, adopt an Action Plan for the implementation of the strategy set out in the Communication entitled 'Clean Power for Transport: A European alternative fuels strategy' in order to achieve the broadest possible use of alternative fuels for transport, while ensuring technological neutrality, and to promote sustainable electric mobility throughout the Union. To that end, it may take into account individual market needs and developments in the Member States.

#### Article 11

#### Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 18 November 2016. They shall forthwith inform the Commission thereof.

2. When Member States adopt those provisions, they shall contain a reference to this Directive, or be accompanied by such a reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.

3. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

#### Article 12

#### Entry into force

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

*Article 13***Addressees**

This Directive is addressed to the Member States.

Done at Strasbourg, 22 October 2014.

*For the European Parliament*

*The President*

M. SCHULZ

*For the Council*

*The President*

B. DELLA VEDOVA

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## ANNEX I

## REPORT

The report shall contain a description of the measures taken in a Member State in support of alternative fuels infrastructure build-up. The report shall include at least the following elements:

**1. Legal measures**

Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.

**2. Policy measures supporting the implementation of the national policy framework**

Information on those measures shall include the following elements:

- direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure,
- availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure,
- use of public procurement in support of alternative fuels, including joint procurement,
- demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes,
- consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network,
- technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.

**3. Deployment and manufacturing support**

Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).

Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.

Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.

**4. Research, technological development and demonstration (RTD&D)**

Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.

**5. Targets and objectives**

- estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030,
- level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air),
- level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes,
- information on the methodology applied to take account of the charging efficiency of high power recharging points.

**6. Alternative fuels infrastructure developments**

Changes in supply (additional infrastructure capacity) and demand (capacity actually used).

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## ANNEX II

**TECHNICAL SPECIFICATIONS****1. Technical specifications for recharging points****1.1. Normal power recharging points for motor vehicles**

Alternating current (AC) normal power recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with socket outlets or vehicle connectors of Type 2 as described in standard EN 62196-2. While maintaining the Type 2 compatibility, those socket outlets may be equipped with features such as mechanical shutters.

**1.2. High power recharging points for motor vehicles**

Alternating current (AC) high power recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of Type 2 as described in standard EN 62196-2.

Direct current (DC) high power recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of the combined charging system 'Combo 2' as described in standard EN 62196-3.

**1.3. Wireless recharging points for motor vehicles****1.4. Battery swapping for motor vehicles****1.5. Recharging points for L-category motor vehicles****1.6. Recharging points for electric buses****1.7. Shore-side electricity supply for seagoing ships**

Shore-side electricity supply for seagoing ships, including the design, installation and testing of the systems, shall comply with the technical specifications of the IEC/ISO/IEEE 80005-1 standard.

**1.8. Shore-side electricity supply for inland waterway vessels****2. Technical specifications for hydrogen refuelling points for motor vehicles**

2.1. Outdoor hydrogen refuelling points dispensing gaseous hydrogen used as fuel on board motor vehicles shall comply with the technical specifications of the ISO/TS 20100 Gaseous Hydrogen Fuelling specification.

2.2. The hydrogen purity dispensed by hydrogen refuelling points shall comply with the technical specifications included in the ISO 14687-2 standard.

2.3. Hydrogen refuelling points shall employ fuelling algorithms and equipment complying with the ISO/TS 20100 Gaseous Hydrogen Fuelling specification.

2.4. Connectors for motor vehicles for the refuelling of gaseous hydrogen shall comply with the ISO 17268 gaseous hydrogen motor vehicle refuelling connection devices standard.

**3. Technical specifications for natural gas refuelling points**

3.1. Technical specifications for refuelling points for LNG for inland waterway vessels or sea-going ships

3.2. Technical specifications for refuelling points for LNG for motor vehicles

3.3. Technical specifications for CNG connectors/receptacles

CNG connectors/receptacles shall comply with UNECE Regulation No 110 (referring to ISO 14469, parts I and II).

3.4. Technical specifications for CNG refuelling points for motor vehicles

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## II

(Non-legislative acts)

## REGULATIONS

**COMMISSION REGULATION (EU) No 1134/2014**

**of 23 October 2014**

**establishing a prohibition of fishing for haddock in VIIb-k, VIII, IX and X; Union waters of CECAF 34.1.1 by vessels flying the flag of Belgium**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy <sup>(1)</sup>, and in particular Article 36(2) thereof,

Whereas:

- (1) Council Regulation (EU) No 43/2014 <sup>(2)</sup>, lays down quotas for 2014.
- (2) According to the information received by the Commission, catches of the stock referred to in the Annex to this Regulation by vessels flying the flag of or registered in the Member State referred to therein have exhausted the quota allocated for 2014.
- (3) It is therefore necessary to prohibit fishing activities for that stock,

HAS ADOPTED THIS REGULATION:

*Article 1*

**Quota exhaustion**

The fishing quota allocated to the Member State referred to in the Annex to this Regulation for the stock referred to therein for 2014 shall be deemed to be exhausted from the date set out in that Annex.

*Article 2*

**Prohibitions**

Fishing activities for the stock referred to in the Annex to this Regulation by vessels flying the flag of or registered in the Member State referred to therein shall be prohibited from the date set out in that Annex. In particular it shall be prohibited to retain on board, relocate, tranship or land fish from that stock caught by those vessels after that date.

<sup>(1)</sup> OJ L 343, 22.12.2009, p. 1.

<sup>(2)</sup> Council Regulation (EU) No 43/2014 of 20 January 2014 fixing for 2014 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, to Union vessels, in certain non-Union waters (OJ L 24, 28.1.2014, p. 1).

*Article 3***Entry into force**

This Regulation shall enter into force on the day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 23 October 2014.

*For the Commission,  
On behalf of the President,  
Lowri EVANS  
Director-General for Maritime Affairs and Fisheries*

## ANNEX

No	21/TQ43
Member State	Belgium
Stock	HAD/7X7A34
Species	Haddock ( <i>Melanogrammus aeglefinus</i> )
Zone	VIIb-k, VIII, IX and X; Union waters of CECAF 34.1.1
Closing date	30.7.2014

**COMMISSION REGULATION (EU) No 1135/2014**  
**of 24 October 2014**  
**on the authorisation of a health claim made on foods and referring to the reduction of disease risk**  
**(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods <sup>(1)</sup>, and in particular Article 17(3) thereof,

Whereas:

- (1) Pursuant to Regulation (EC) No 1924/2006 health claims made on foods are prohibited unless they are authorised by the Commission in accordance with that Regulation and included in a list of permitted claims.
- (2) Regulation (EC) No 1924/2006 also provides that applications for authorisations of health claims may be submitted by food business operators to the national competent authority of a Member State. The national competent authority is to forward valid applications to the European Food Safety Authority (EFSA), hereinafter referred to as 'the Authority'.
- (3) Following receipt of an application the Authority is to inform without delay the other Member States and the Commission thereof, and to deliver an opinion on the health claim concerned.
- (4) The Commission is to decide on the authorisation of health claims taking into account the opinion delivered by the Authority.
- (5) Following an application from Rank Nutrition Ltd, submitted pursuant to Article 14(1)(a) of Regulation (EC) No 1924/2006, the Authority was asked to deliver an opinion on a health claim related to 'Increasing maternal folate status by supplemental folate intake and reduced risk of neural tube defects.' (Question No EFSA-Q-2013-00265) <sup>(2)</sup>. The claim proposed by the applicant was worded as follows: 'Folic acid supplementation raises maternal red blood cell folate. Low maternal red blood cell folate is a risk factor for neural tube defects in the developing foetus'.
- (6) On the basis of the data presented, the Authority concluded in its opinion received by the Commission and the Member States on 26 July 2013 that a cause and effect relationship had been established between increasing maternal folate status by supplemental folate intake and a reduced risk of neural tube defects (NTDs). Accordingly, a health claim reflecting this conclusion should be considered as complying with the requirements of Regulation (EC) No 1924/2006, and should be included in the Union list of permitted claims.
- (7) Article 16(4) of Regulation (EC) No 1924/2006 provides that an opinion in favour of authorising a health claim is to include certain particulars. Accordingly, those particulars should be set out in the Annex to this Regulation as regards the authorised claim and include, as the case may be, the revised wording of the claim, specific conditions of use of the claim, and, where applicable, conditions or restrictions of use of the food and/or an additional statement or warning, in accordance with the rules laid down in Regulation (EC) No 1924/2006 and in line with the opinion of the Authority.
- (8) One of the objectives of Regulation (EC) No 1924/2006 is to ensure that health claims are truthful, clear and reliable and useful to the consumer, and that wording and presentation are taken into account in that respect. Therefore where the wording of claims has the same meaning for consumers as that of an authorised health claim, because they demonstrate the same relationship that exists between a food category, a food or one of its constituents and health, they should be subject to the same conditions of use indicated in the Annex to this Regulation.
- (9) The measures provided for in this Regulation are in accordance with the opinion of the Standing Committee on the Food Chain and Animal Health,

<sup>(1)</sup> OJL 404, 30.12.2006, p. 9.

<sup>(2)</sup> EFSA Journal 2013; 11(7):3328.

HAS ADOPTED THIS REGULATION:

*Article 1*

1. The health claim listed in the Annex to this Regulation may be made on foods placed on the Union market in compliance with the conditions laid down in that Annex.
2. The health claim referred to in paragraph 1 shall be included in the Union list of permitted claims as provided for in Article 14(1) of Regulation (EC) No 1924/2006.

*Article 2*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 24 October 2014.

*For the Commission*  
*The President*  
José Manuel BARROSO

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## ANNEX

## PERMITTED HEALTH CLAIM

Application — Relevant provisions of Regulation (EC) No 1924/2006	Applicant — Address	Nutrient, substance, food or food category	Claim	Conditions of use of the claim	Conditions and/or restrictions of use of the food and/or additional statement or warning	EFSA opinion reference
Article 14(1)(a) health claim referring to a reduction of a disease risk	Rank Nutrition Ltd, Long Barn, Etchden Court, Bethersden, Kent, TN26 3DP, United Kingdom.	Folic acid	Supplemental folic acid intake increases maternal folate status. Low maternal folate status is a risk factor in the development of neural tube defects in the developing foetus.	The claim may be used only for food supplements which provide at least 400 µg of folic acid per daily portion.  Information shall be provided to the consumer that the target population is women of child-bearing age and the beneficial effect is obtained with a supple- mental folic acid daily intake of 400 µg for at least one month before and up to three months after conception.		Q-2013-00265

**COMMISSION REGULATION (EU) No 1136/2014****of 24 October 2014****amending Regulation (EU) No 283/2013 as regards the transitional measures applying to procedures concerning plant protection products****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC <sup>(1)</sup>, and in particular Article 78(1)(b) thereof,

Whereas:

- (1) Commission Regulation (EU) No 283/2013 <sup>(2)</sup> repealed Commission Regulation (EU) No 544/2011 <sup>(3)</sup> and laid down new data requirements for active substances.
- (2) In order to permit Member States and the interested parties to prepare themselves to meet those new requirements, Regulation (EU) No 283/2013 sets transitional measures concerning both submission of data for applications for the approval, renewal of approval or amendment to the approval of active substances and submission of data for applications for authorisation, renewal of authorisation or amendment to the authorisation of plant protection products.
- (3) In order to allow, in certain cases, the submission of data concerning the active substances in applications for authorisation or for amendment of the authorisation of plant protection products in accordance with the data requirements in force at the time of their approval or renewal, the transitional measures as regards procedures concerning the authorisation of plant protection products should be amended. The reason for such change is to prevent the occurrence of disparities in the assessment of data generated in accordance with the new data requirements by Member States belonging to different zones and, accordingly, to preserve a uniform and harmonized approach to the assessment of those data through their evaluation at Union level.
- (4) The measures provided for in this Regulation are in accordance with the opinion of the Standing Committee on the Food Chain and Animal Health,

HAS ADOPTED THIS REGULATION:

*Article 1*

Article 4(1) of Regulation (EU) No 283/2013 is replaced by the following:

‘1. In case of applications for authorisation, as referred to in Article 28 of Regulation (EC) No 1107/2009, which concern plant protection products containing one or more active substances for which the dossiers have been submitted in compliance with Article 3 or for which the approval has not been renewed in accordance with Article 14 of Regulation (EC) No 1107/2009 and in accordance with Commission Implementing Regulation (EU) No 844/2012 <sup>(\*)</sup>, Regulation (EU) No 544/2011 shall continue to apply to the submission of data concerning this (these) active substance(s).

<sup>(\*)</sup> Commission Implementing Regulation (EU) No 844/2012 of 18 September 2012 setting out the provisions necessary for the implementation of the renewal procedure for active substances, as provided for in Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market (OJ L 252, 19.9.2012, p. 26).’

<sup>(1)</sup> OJ L 309, 24.11.2009, p. 1.

<sup>(2)</sup> Commission Regulation (EU) No 283/2013 of 1 March 2013 setting out the data requirements for active substances, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market (OJ L 93, 3.4.2013, p. 1).

<sup>(3)</sup> Commission Regulation (EU) No 544/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the data requirements for active substances (OJ L 155, 11.6.2011, p. 1).

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*Article 2*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 24 October 2014.

*For the Commission*  
*The President*  
José Manuel BARROSO

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**COMMISSION REGULATION (EU) No 1137/2014****of 27 October 2014****amending Annex III of Regulation (EC) No 853/2004 of the European Parliament and of the Council as regards the handling of certain offal from animals intended for human consumption****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin <sup>(1)</sup>, and in particular Article 10(1) thereof,

Whereas:

- (1) Regulation (EC) No 853/2004 lays down specific rules on the hygiene of food of animal origin for food business operators. That Regulation provides that food business operators are to ensure compliance with specific requirements for the further handling of offal such as stomachs of ruminants and feet of ungulates.
- (2) In accordance with Annex III to that Regulation, prior to being transported to another establishment, feet of ungulates destined for further handling are to be skinned or scalded and depilated and stomachs of ruminants must be scalded or cleaned within the slaughterhouse.
- (3) The equipment necessary to perform the skinning or scalding and depilating requires a high investment. Therefore, small and medium-size slaughterhouses in particular are not able to handle feet destined for human consumption themselves in a cost-effective way.
- (4) While technological developments allow the valorisation of feet of ungulates into food thereby reducing food waste, in particular small and medium-size slaughterhouses are facing practical consequences, hindering such valorisation.
- (5) Rennet is refined for the production of cheese and is obtained from stomachs of young ruminants in dedicated establishments. Scalding or cleaning of stomachs substantially reduces the yield of rennet from these stomachs while it does not contribute to the safety of the rennet, being highly refined afterwards.
- (6) To promote better regulation and competitiveness a high level of food safety must be maintained, while offering a level-playing field for operators, which is also sustainable for small and medium-size slaughterhouses.
- (7) Stomachs of ruminants and feet of ungulates are included in the definition of offal in Annex I to Regulation (EC) No 853/2004. The requirements for handling of offal in that Regulation, including the temperature requirements during storage and transport, ensure that these products can be safely handled and transported to an establishment outside the slaughterhouse, collected from different slaughterhouses and valorised. The transport to another establishment of non-skinned or non-scalded and non-depilated feet of ungulates should therefore be allowed by the competent authority.
- (8) Annex III to Regulation (EC) No 853/2004 should therefore be amended accordingly.
- (9) The measures provided for in this Regulation are in accordance with the opinion of the Standing Committee on the Food Chain and Animal Health,

<sup>(1)</sup> OJ L 139, 30.4.2004, p. 55.

HAS ADOPTED THIS REGULATION:

*Article 1*

In Annex III to Regulation (EC) No 853/2004, point 18 of Chapter IV of Section I is replaced by the following:

'18. When destined for further handling:

- (a) stomachs must be scalded or cleaned; however, in the case of stomachs of young ruminants intended for rennet production, the stomachs need only be emptied;
- (b) intestines must be emptied and cleaned;
- (c) heads and feet must be skinned or scalded and depilated; however, when authorised by the competent authority, visibly clean feet may be transported to and skinned or scalded and depilated in an approved establishment further handling the feet for processing into food.'

*Article 2*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 27 October 2014.

*For the Commission*  
*The President*  
José Manuel BARROSO

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**COMMISSION IMPLEMENTING REGULATION (EU) No 1138/2014****of 27 October 2014****concerning the authorisation of a preparation of endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 as a feed additive for sows (holder of the authorisation Adisseo France S.A.S.)****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition <sup>(1)</sup>, and in particular Article 9(2) thereof,

Whereas:

- (1) In accordance with Article 7 of Regulation (EC) No 1831/2003 an application was submitted for the authorisation of a preparation of endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by *Talaromyces versatilis* sp. nov. IMI CC 378536. That application was accompanied by the particulars and documents required under Article 7(3) of Regulation (EC) No 1831/2003.
- (2) That application concerns the authorisation of a preparation of endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 as a feed additive for sows to be classified in the additive category 'zootechnical additives'.
- (3) A preparation of endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 was authorised for 10 years for poultry, weaned piglets and pigs for fattening by Commission Implementing Regulation (EU) No 290/2014 <sup>(2)</sup>.
- (4) The European Food Safety Authority ('the Authority') concluded in its opinion of 20 May 2014 <sup>(3)</sup> that, under the proposed conditions of use, the preparation of endo-1,4-beta-xylanase EC 3.2.1.8 and endo-1,3(4)-beta-glucanase EC 3.2.1.6 produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 does not have an adverse effect on animal health, human health or the environment. The Authority does not consider that there is a need for specific requirements of post-market monitoring. It also verified the report on the method of analysis of the feed additive in feed submitted by the Reference Laboratory set up by Regulation (EC) No 1831/2003.
- (5) The Authority also determined that the results of the meta-analysis showed that supplementing sows' diets with the additive at the recommended dose resulted in a statistically significant lower body weight loss of the sows during lactation, without affecting the other parameters evaluated. Since the low level of weight reduction, questioned by the Authority because of lack of biological/physiological relevance, was judged a significant zootechnical parameter, it was considered that the provided *in vivo* studies meet the conditions for the demonstration of the efficacy in lactating sows.
- (6) The assessment of the preparation of endo-1,4-beta-xylanase EC 3.2.1.8 and endo-1,3(4)-beta-glucanase EC 3.2.1.6 produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 shows that the conditions for authorisation, as provided for in Article 5 of Regulation (EC) No 1831/2003, are satisfied. Accordingly, the use of that preparation should be authorised as specified in the Annex to this Regulation.
- (7) The measures provided for in this Regulation are in accordance with the opinion of the Standing Committee on Plants, Animals, Food and Feed,

<sup>(1)</sup> OJ L 268, 18.10.2003, p. 29.

<sup>(2)</sup> Commission Implementing Regulation (EU) No 290/2014 of 21 March 2014 concerning the authorisation of a preparation of endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by *Talaromyces versatilis* sp. nov. IMI CC 378536 as a feed additive for poultry, weaned piglets and pigs for fattening and amending Regulations (EC) No 1259/2004, (EC) No 943/2005, (EC) No 1206/2005 and (EC) No 322/2009 (holder of the authorisation Adisseo France S.A.S.) (OJ L 87, 22.3.2014, p. 84).

<sup>(3)</sup> EFSA Journal 2014; 12(6):3722.

HAS ADOPTED THIS REGULATION:

*Article 1*

**Authorisation**

The preparation specified in the Annex, belonging to the additive category 'zootechnical additives' and to the functional group 'digestibility enhancers', is authorised as an additive in animal nutrition, subject to the conditions laid down in that Annex.

*Article 2*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 27 October 2014.

*For the Commission*

*The President*

José Manuel BARROSO

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## ANNEX

Identification number of the additive	Name of the holder of authorisation	Additive	Composition, chemical formula, description, analytical method	Species or category of animal	Maximum age	Minimum content	Maximum content	Other provisions	End of period of authorisation
						Units of activity/kg of complete feedingstuff with a moisture content of 12 %			

## Category of zootechnical additives. Functional group: digestibility enhancers

4a1604i	Adisseo France S.A.S.	Endo-1,3(4)-beta-glucanase EC 3.2.1.6 Endo-1,4-beta-xylanase EC 3.2.1.8	<p><i>Additive composition</i></p> <p>Preparation of endo-1,3(4)-beta-glucanase and endo-1,4-beta-xylanase produced by <i>Talaromyces versatilis</i> sp. nov. IMI CC 378536 having a minimum activity of:</p> <p>— solid form: endo-1,3(4)-beta-glucanase 30 000 VU/g<sup>(1)</sup> and endo-1,4-beta-xylanase 22 000 VU/g;</p> <p>— liquid form: endo-1,3(4)-beta-glucanase activity of 7 500 VU/ml and endo-1,4-beta-xylanase activity of 5 500 VU/ml.</p> <p><i>Characterisation of the active substance</i></p> <p>endo-1,4-beta-xylanase and endo-1,3(4)-beta-glucanase produced by <i>Talaromyces versatilis</i> sp. nov. IMI CC 378536.</p> <p><i>Analytical method</i> <sup>(2)</sup></p> <p>For the quantification of endo-1,3(4)-beta-glucanase activity:</p> <p>— viscosimetric method based on decrease in viscosity produced by action of endo-1,3(4)-beta-glucanase on the glucan substrate barley beta-glucan at pH = 5,5 and 30 °C.</p>	Sows	—	endo-1,3(4)-beta-glucanase 1 500 VU  endo-1,4-beta-xylanase 1 100 VU	—	<ol style="list-style-type: none"> <li>1. In the directions for use of the additive and premixture, indicate the storage conditions and stability to pelleting.</li> <li>2. For use in sows from one week before farrowing to whole lactation period.</li> <li>3. For safety: breathing protection, glasses and gloves shall be used during handling.</li> </ol>	17 November 2024
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Identification number of the additive	Name of the holder of authorisation	Additive	Composition, chemical formula, description, analytical method	Species or category of animal	Maximum age	Minimum content	Maximum content	Other provisions	End of period of authorisation
						Units of activity/kg of complete feedingstuff with a moisture content of 12 %			
			For the quantification of endo-1,4-beta-xylanase activity: — viscosimetric method based on decrease in viscosity produced by action of endo-1,4-beta-xylanase on the xylan containing substrate (wheat arabinoxylan).						

(<sup>1</sup>) 1 VU (viscosimetry unit) is the amount of enzyme which hydrolyzes the substrate (barley beta-glucan and wheat arabinoxylan, respectively), reducing the viscosity of the solution, to give a change in relative fluidity of 1 (dimensionless unit)/min at 30 °C and pH 5,5.

(<sup>2</sup>) Details of the analytical methods are available at the following address of the Reference Laboratory: <https://ec.europa.eu/jrc/en/eurl/feed-additives/evaluation-reports>

**COMMISSION IMPLEMENTING REGULATION (EU) No 1139/2014****of 27 October 2014****amending Implementing Regulation (EU) No 543/2011 as regards the trigger levels for additional duties on artichokes, courgettes, oranges, clementines, mandarins and satsumas, lemons, apples and pears**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007 <sup>(1)</sup>, and in particular Article 183(b) thereof,

Whereas:

- (1) Commission Implementing Regulation (EU) No 543/2011 <sup>(2)</sup> provides for the surveillance of the imports of the products listed in Annex XVIII thereto. That surveillance is to be carried out in accordance with the rules laid down in Article 308d of Commission Regulation (EEC) No 2454/93 <sup>(3)</sup>.
- (2) For the purposes of Article 5(4) of the Agreement on Agriculture <sup>(4)</sup> concluded during the Uruguay Round of multilateral trade negotiations and in the light of the latest data available for 2011, 2012 and 2013, the trigger levels for additional duties should be adjusted from 1 November 2014 for artichokes, clementines, mandarins and satsumas, from 1 December 2014 for oranges and from 1 January 2015 for courgettes, lemons, apples and pears.
- (3) Implementing Regulation (EU) No 543/2011 should therefore be amended accordingly. For reasons of readability, Annex XVIII to this Regulation should be replaced in its entirety.
- (4) Given the need to ensure that this measure applies as soon as possible after the updated data have been made available, this Regulation should enter into force on the day of its publication,

HAS ADOPTED THIS REGULATION:

*Article 1*

In Annex XVIII to Implementing Regulation (EU) No 543/2011, the trigger levels for additional duties on artichokes, courgettes, oranges, clementines, mandarins and satsumas, lemons, apples and pears shall be replaced by the trigger levels in the corresponding column of this Annex as set out in the Annex to this Regulation.

*Article 2*

This Regulation shall enter into force on the day of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 27 October 2014.

*For the Commission*  
*The President*  
José Manuel BARROSO

<sup>(1)</sup> OJ L 347, 20.12.2013, p. 671.

<sup>(2)</sup> Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors (OJ L 157, 15.6.2011, p. 1).

<sup>(3)</sup> Commission Regulation (EEC) No 2454/93 of 2 July 1993 laying down provisions for the implementation of Council Regulation (EEC) No 2913/92 establishing the Community Customs Code (OJ L 253, 11.10.1993, p. 1).

<sup>(4)</sup> OJ L 336, 23.12.1994, p. 22.

## ANNEX

## ANNEX XVIII

## ADDITIONAL IMPORT DUTIES: TITLE IV, CHAPTER I, SECTION 2

Without prejudice to the rules governing the interpretation of the Combined Nomenclature, the description of the products is deemed to be indicative only. The scope of the additional duties for the purposes of this Annex is determined by the scope of the CN codes as they stand at the time of the adoption of this Regulation.

Order number	CN code	Description of products	Period of application	Trigger level (tonnes)
78.0015	0702 00 00	Tomatoes	From 1 October to 31 May	445 127
78.0020			From 1 June to 30 September	27 287
78.0065	0707 00 05	Cucumbers	From 1 May to 31 October	12 678
78.0075			From 1 November to 30 April	12 677
78.0085	0709 91 00	Artichokes	From 1 November to 30 June	7 421
78.0100	0709 93 10	Courgettes	From 1 January to 31 December	263 359
78.0110	0805 10 20	Oranges	From 1 December to 31 May	251 798
78.0120	0805 20 10	Clementines	From 1 November to end of February	81 399
78.0130	0805 20 30 0805 20 50 0805 20 70 0805 20 90	Mandarins (including tangerines and satsumas); wilkings and similar citrus hybrids	From 1 November to end of February	101 160
78.0155	0805 50 10	Lemons	From 1 June to 31 December	302 950
78.0160			From 1 January to 31 May	41 410
78.0170	0806 10 10	Table grapes	From 21 July to 20 November	69 907
78.0175	0808 10 80	Apples	From 1 January to 31 August	558 203
78.0180			From 1 September to 31 December	464 902
78.0220	0808 30 90	Pears	From 1 January to 30 April	184 269
78.0235			From 1 July to 31 December	235 468
78.0250	0809 10 00	Apricots	From 1 June to 31 July	5 630
78.0265	0809 29 00	Cherries, other than sour	From 21 May to 10 August	32 371
78.0270	0809 30	Peaches, including nectarines	From 11 June to 30 September	3 146
78.0280	0809 40 05	Plums	From 11 June to 30 September	16 404'

**COMMISSION IMPLEMENTING REGULATION (EU) No 1140/2014****of 27 October 2014****establishing the standard import values for determining the entry price of certain fruit and vegetables**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007 <sup>(1)</sup>,

Having regard to Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors <sup>(2)</sup>, and in particular Article 136(1) thereof,

Whereas:

- (1) Implementing Regulation (EU) No 543/2011 lays down, pursuant to the outcome of the Uruguay Round multilateral trade negotiations, the criteria whereby the Commission fixes the standard values for imports from third countries, in respect of the products and periods stipulated in Annex XVI, Part A thereto.
- (2) The standard import value is calculated each working day, in accordance with Article 136(1) of Implementing Regulation (EU) No 543/2011, taking into account variable daily data. Therefore this Regulation should enter into force on the day of its publication in the *Official Journal of the European Union*,

HAS ADOPTED THIS REGULATION:

*Article 1*

The standard import values referred to in Article 136 of Implementing Regulation (EU) No 543/2011 are fixed in the Annex to this Regulation.

*Article 2*

This Regulation shall enter into force on the day of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 27 October 2014.

*For the Commission,  
On behalf of the President,  
Jerzy PLEWA*

*Director-General for Agriculture and Rural Development*

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<sup>(1)</sup> OJ L 347, 20.12.2013, p. 671.

<sup>(2)</sup> OJ L 157, 15.6.2011, p. 1.

## ANNEX

## Standard import values for determining the entry price of certain fruit and vegetables

(EUR/100 kg)		
CN code	Third country code <sup>(1)</sup>	Standard import value
0702 00 00	AL	55,3
	MA	105,2
	MK	84,3
	ZZ	81,6
0707 00 05	AL	59,9
	MK	80,7
	TR	133,3
	ZZ	91,3
0709 93 10	MA	99,6
	TR	108,6
	ZZ	104,1
0805 50 10	AR	78,7
	TR	99,7
	UY	86,1
	ZA	84,3
	ZZ	87,2
0806 10 10	BR	278,9
	MD	39,0
	PE	350,2
	TR	147,0
	ZZ	203,8
0808 10 80	BR	53,3
	CL	86,3
	CN	117,7
	MD	27,7
	NZ	148,8
	US	191,0
	ZA	157,5
	ZZ	111,8
0808 30 90	CN	106,3
	TR	114,2
	ZZ	110,3

<sup>(1)</sup> Nomenclature of countries laid down by Commission Regulation (EU) No 1106/2012 of 27 November 2012 implementing Regulation (EC) No 471/2009 of the European Parliament and of the Council on Community statistics relating to external trade with non-member countries, as regards the update of the nomenclature of countries and territories (OJ L 328, 28.11.2012, p. 7). Code 'ZZ' stands for 'of other origin'.

# DECISIONS

## COMMISSION IMPLEMENTING DECISION

of 9 October 2014

**establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions, for the refining of mineral oil and gas**

*(notified under document C(2014) 7155)*

**(Text with EEA relevance)**

(2014/738/EU)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) <sup>(1)</sup>, and in particular Article 13(5) thereof,

Whereas:

- (1) Article 13(1) of Directive 2010/75/EU requires the Commission to organise an exchange of information on industrial emissions between it and Member States, the industries concerned and non-governmental organisations promoting environmental protection in order to facilitate the drawing up of best available techniques (BAT) reference documents as defined in Article 3(11) of that Directive.
- (2) In accordance with Article 13(2) of Directive 2010/75/EU, the exchange of information is to address the performance of installations and techniques in terms of emissions, expressed as short- and long-term averages, where appropriate, and the associated reference conditions, consumption and nature of raw materials, water consumption, use of energy and generation of waste and the techniques used, associated monitoring, cross-media effects, economic and technical viability and developments therein and best available techniques and emerging techniques identified after considering the issues mentioned in points (a) and (b) of Article 13(2) of that Directive.
- (3) 'BAT conclusions' as defined in Article 3(12) of Directive 2010/75/EU are the key element of BAT reference documents and lay down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures.
- (4) In accordance with Article 14(3) of Directive 2010/75/EU, BAT conclusions are to be the reference for setting permit conditions for installations covered by Chapter II of that Directive.
- (5) Article 15(3) of Directive 2010/75/EU requires the competent authority to set emission limit values that ensure that, under normal operating conditions, emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions referred to in Article 13(5) of Directive 2010/75/EU.
- (6) Article 15(4) of Directive 2010/75/EU provides for derogations from the requirement laid down in Article 15(3) only where the costs associated with the achievement of the emission levels associated with the BAT disproportionately outweigh the environmental benefits due to the geographical location, the local environmental conditions or the technical characteristics of the installation concerned.
- (7) Article 16(1) of Directive 2010/75/EU provides that the monitoring requirements in the permit referred to in point (c) of Article 14(1) of the Directive are to be based on the conclusions on monitoring as described in the BAT conclusions.

<sup>(1)</sup> OJ L 334, 17.12.2010, p. 17.

- (8) In accordance with Article 21(3) of Directive 2010/75/EU, within 4 years of publication of decisions on BAT conclusions, the competent authority is to reconsider and, if necessary, update all the permit conditions and ensure that the installation complies with those permit conditions.
- (9) The Commission established a forum composed of representatives of Member States, the industries concerned and non-governmental organisations promoting environmental protection by Decision of 16 May 2011 establishing a forum for the exchange of information pursuant to Article 13 of Directive 2010/75/EU on industrial emissions <sup>(1)</sup>.
- (10) In accordance with Article 13(4) of Directive 2010/75/EU, the Commission obtained the opinion of the forum, established by Decision of 16 May 2011, on the proposed content of the BAT reference document for the refining of mineral oil and gas on 20 September 2013 and made it publicly available.
- (11) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 75(1) of Directive 2010/75/EU,

HAS ADOPTED THIS DECISION:

*Article 1*

The BAT conclusions for the refining of mineral oil and gas, as set out in the Annex, are adopted.

*Article 2*

This Decision is addressed to the Member States.

Done at Brussels, 9 October 2014.

*For the Commission*  
Janez POTOČNIK  
*Member of the Commission*

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<sup>(1)</sup> OJ C 146, 17.5.2011, p. 3.

## ANNEX

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## SCOPE

These BAT conclusions cover certain industrial activities specified in Section 1.2 of Annex I to Directive 2010/75/EU, namely '1.2. Refining of mineral oil and gas'.

In particular, these BAT conclusions cover the following processes and activities:

Activity	Subactivities or processes included in activity
Alkylation	All alkylation processes: hydrofluoric acid (HF), sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ) and solid-acid
Base oil production	Deasphalting, aromatic extraction, wax processing and lubricant oil hydrofinishing
Bitumen production	All techniques from storage to final product additives
Catalytic cracking	All types of catalytic cracking units such as fluid catalytic cracking
Catalytic reforming	Continuous, cyclic and semi-regenerative catalytic reforming
Coking	Delayed and fluid coking processes. Coke calcination
Cooling	Cooling techniques applied in refineries
Desalting	Desalting of crude oil
Combustion units for energy production	Combustion units burning refinery fuels, excluding units using only conventional or commercial fuels

Activity	Subactivities or processes included in activity
Etherification	Production of chemicals (e.g. alcohols and ethers such as MTBE, ETBE and TAME) used as motor fuels additives
Gas separation	Separation of light fractions of the crude oil e.g. refinery fuel gas (RFG), liquefied petroleum gas (LPG)
Hydrogen consuming processes	Hydrocracking, hydrorefining, hydrotreatments, hydroconversion, hydroprocessing and hydrogenation processes
Hydrogen production	Partial oxidation, steam reforming, gas heated reforming and hydrogen purification
Isomerisation	Isomerisation of hydrocarbon compounds C <sub>4</sub> , C <sub>5</sub> and C <sub>6</sub>
Natural gas plants	Natural gas (NG) processing including liquefaction of NG
Polymerisation	Polymerisation, dimerisation and condensation
Primary distillation	Atmospheric and vacuum distillation
Product treatments	Sweetening and final product treatments
Storage and handling of refinery materials	Storage, blending, loading and unloading of refinery materials
Visbreaking and other thermal conversions	Thermal treatments such as visbreaking or thermal gas oil process
Waste gas treatment	Techniques to reduce or abate emissions to air
Waste water treatment	Techniques to treat waste water prior to release
Waste management	Techniques to prevent or reduce the generation of waste

These BAT conclusions do not address the following activities or processes:

- the exploration and production of crude oil and natural gas;
- the transportation of crude oil and natural gas;
- the marketing and distribution of products.

Other reference documents which may be relevant for the activities covered by these BAT conclusions are the following:

Reference document	Subject
Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW)	Waste water management and treatment techniques
Industrial Cooling Systems (ICS)	Cooling processes
Economics and Cross-media Effects (ECM)	Economics and cross-media effects of techniques

Reference document	Subject
Emissions from Storage (EFS)	Storage, blending, loading and unloading of refinery materials
Energy Efficiency (ENE)	Energy efficiency and integrated refinery management
Large Combustion Plants (LCP)	Combustion of conventional and commercial fuels
Large Volume Inorganic Chemicals — Ammonia, Acids and Fertilisers Industries (LVIC-AAF)	Steam reforming and hydrogen purification
Large Volume Organic Chemical Industry (LVOC)	Etherification process (MTBE, ETBE and TAME production)
Waste Incineration (WI)	Waste incineration
Waste Treatment (WT)	Waste treatment
General Principles of Monitoring (MON)	Monitoring of emissions to air and water

#### GENERAL CONSIDERATIONS

The techniques listed and described in these BAT conclusions are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.

Unless otherwise stated, these BAT conclusions are generally applicable.

#### Averaging periods and reference conditions for emissions to air

Unless stated otherwise, emission levels associated with the best available techniques (BAT-AELs) for emissions to air given in these BAT conclusions refer to concentrations, expressed as mass of emitted substance per volume of waste gas under the following standard conditions: dry gas, temperature of 273,15 K, pressure of 101,3 kPa.

For continuous measurements	BAT-AELs refer to monthly average values, which are the averages of all valid hourly average values measured over a period of one month
For periodic measurements	BAT-AELs refer to the average value of three spot samples of at least 30 minutes each

For combustion units, catalytic cracking processes, and waste gas sulphur recovery units, reference conditions for oxygen are shown in Table 1.

Table 1

#### Reference conditions for BAT-AELs concerning emissions to air

Activities	Unit	Oxygen reference conditions
Combustion unit using liquid or gaseous fuels with the exception of gas turbines and engines	mg/Nm <sup>3</sup>	3 % oxygen by volume
Combustion unit using solid fuels	mg/Nm <sup>3</sup>	6 % oxygen by volume

Activities	Unit	Oxygen reference conditions
Gas turbines (including combined cycle gas turbines — CCGT) and engines	mg/Nm <sup>3</sup>	15 % oxygen by volume
Catalytic cracking process (regenerator)	mg/Nm <sup>3</sup>	3 % oxygen by volume
Waste gas sulphur recovery unit <sup>(1)</sup>	mg/Nm <sup>3</sup>	3 % oxygen by volume

<sup>(1)</sup> In case of applying BAT 58.

#### Conversion of emissions concentration to reference oxygen level

The formula for calculating the emissions concentration at a reference oxygen level (see Table 1) is shown below.

$$E_R = \frac{21 - O_R}{21 - O_M} \times E_M$$

Where:

$E_R$  (mg/Nm<sup>3</sup>): emissions concentration referred to the reference oxygen level  $O_R$

$O_R$  (vol %): reference oxygen level

$E_M$  (mg/Nm<sup>3</sup>): emissions concentration referred to the measured oxygen level  $O_M$

$O_M$  (vol %): measured oxygen level.

#### Averaging periods and reference conditions for emissions to water

Unless stated otherwise, emission levels associated with the best available techniques (BAT-AELs) for emissions to water given in these BAT conclusions refer to values of concentration (mass of emitted substances per volume of water) expressed in mg/l.

Unless stated otherwise, the averaging periods associated with the BAT-AELs are defined as follows:

Daily average	Average over a sampling period of 24 hours taken as a flow-proportional composite sample or, provided that sufficient flow stability is demonstrated, from a time-proportional sample
Yearly/Monthly average	Average of all daily averages obtained within a year/month, weighted according to the daily flows

#### DEFINITIONS

For the purpose of these BAT conclusions, the following definitions apply:

Term used	Definition
Unit	A segment/subpart of the installation in which a specific processing operation is conducted
New unit	A unit first permitted on the site of the installation following the publication of these BAT conclusions or a complete replacement of a unit on the existing foundations of the installation following the publication of these BAT conclusions
Existing unit	A unit which is not a new unit

Term used	Definition
Process off-gas	The collected gas generated by a process which must be treated e.g. in an acid gas removal unit and a sulphur recovery unit (SRU)
Flue-gas	The exhaust gas exiting a unit after an oxidation step, generally combustion (e.g. regenerator, Claus unit)
Tail gas	Common name of the exhaust gas from an SRU (generally Claus process)
VOC	Volatile organic compounds as defined in Article 3(45) of Directive 2010/75/EU
NM VOC	VOC excluding methane
Diffuse VOC emissions	Non-channelled VOC emissions that are not released via specific emission points such as stacks. They can result from 'area' sources (e.g. tanks) or 'point' sources (e.g. pipe flanges)
NO <sub>x</sub> expressed as NO <sub>2</sub>	The sum of nitrogen oxide (NO) and nitrogen dioxide (NO <sub>2</sub> ) expressed as NO <sub>2</sub>
SO <sub>x</sub> expressed as SO <sub>2</sub>	The sum of sulphur dioxide (SO <sub>2</sub> ) and sulphur trioxide (SO <sub>3</sub> ) expressed as SO <sub>2</sub>
H <sub>2</sub> S	Hydrogen sulphide. Carbonyl sulphide and mercaptan are not included
Hydrogen chloride expressed as HCl	All gaseous chlorides expressed as HCl
Hydrogen fluoride expressed as HF	All gaseous fluorides expressed as HF
FCC unit	Fluid catalytic cracking: a conversion process for upgrading heavy hydrocarbons, using heat and a catalyst to break larger hydrocarbon molecules into lighter molecules
SRU	Sulphur recovery unit. See definition in Section 1.20.3
Refinery fuel	Solid, liquid or gaseous combustible material from the distillation and conversion steps of the refining of crude oil. Examples are refinery fuel gas (RFG), syngas and refinery oils, pet coke
RFG	Refinery fuel gas: off-gases from distillation or conversion units used as a fuel
Combustion unit	Unit burning refinery fuels alone or with other fuels for the production of energy at the refinery site, such as boilers (except CO boilers), furnaces, and gas turbines.
Continuous measurement	Measurement using an 'automated measuring system' (AMS) or a 'continuous emission monitoring system' (CEMS) permanently installed on site
Periodic measurement	Determination of a measurand at specified time intervals using manual or automated reference methods
Indirect monitoring of emissions to air	Estimation of the emissions concentration in the flue-gas of a pollutant obtained through an appropriate combination of measurements of surrogate parameters (such as O <sub>2</sub> content, sulphur or nitrogen content in the feed/fuel), calculations and periodic stack measurements. The use of emission ratios based on S content in the fuel is one example of indirect monitoring. Another example of indirect monitoring is the use of PEMS

Term used	Definition
Predictive Emissions monitoring system (PEMS)	System to determine the emissions concentration of a pollutant based on its relationship with a number of characteristic continuously monitored process parameters (e.g. fuel-gas consumption, air/fuel ratio) and fuel or feed quality data (e.g. the sulphur content) of an emission source
Volatile liquid hydrocarbon compounds	Petroleum derivatives with a Reid vapour pressure (RVP) of more than 4 kPa, such as naphtha and aromatics
Recovery rate	Percentage of NMVOC recovered from the streams conveyed into a vapour recovery unit (VRU)

### 1.1. General BAT conclusions for the refining of mineral oil and gas

The process-specific BAT conclusions included in Sections 1.2 to 1.19 apply in addition to the general BAT conclusions mentioned in this section.

#### 1.1.1. Environmental management systems

BAT 1. In order to improve the overall environmental performance of plants for the refining of mineral oil and gas, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:

- (i) commitment of the management, including senior management;
- (ii) definition of an environmental policy that includes the continuous improvement for the installation by the management;
- (iii) planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;
- (iv) implementation of the procedures paying particular attention to:
  - (a) structure and responsibility
  - (b) training, awareness and competence
  - (c) communication
  - (d) employee involvement
  - (e) documentation
  - (f) efficient process control
  - (g) maintenance programmes
  - (h) emergency preparedness and response
  - (i) safeguarding compliance with environmental legislation.
- (v) checking performance and taking corrective action, paying particular attention to:
  - (a) monitoring and measurement (see also the reference document on the General Principles of Monitoring)
  - (b) corrective and preventive action
  - (c) maintenance of records
  - (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;

- (vi) review of the EMS and its continuing suitability, adequacy and effectiveness by senior management;
- (vii) following the development of cleaner technologies;
- (viii) consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life;
- (ix) application of sectoral benchmarking on a regular basis.

#### Applicability

The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.

#### 1.1.2. Energy efficiency

BAT 2. In order to use energy efficiently, BAT is to use an appropriate combination of the techniques given below.

Technique	Description
(i) Design techniques	
a. Pinch analysis	Methodology based on a systematic calculation of thermodynamic targets for minimising energy consumption of processes. Used as a tool for the evaluation of total systems designs
b. Heat integration	Heat integration of process systems ensures that a substantial proportion of the heat required in various processes is provided by exchanging heat between streams to be heated and streams to be cooled
c. Heat and power recovery	Use of energy recovery devices e.g.: <ul style="list-style-type: none"> <li>— waste heat boilers</li> <li>— expanders/power recovery in the FCC unit</li> <li>— use of waste heat in district heating</li> </ul>
(ii) Process control and maintenance techniques	
a. Process optimisation	Automated controlled combustion in order to lower the fuel consumption per tonne of feed processed, often combined with heat integration for improving furnace efficiency
b. Management and reduction of steam consumption	Systematic mapping of drain valve systems in order to reduce steam consumption and optimise its use
c. Use of energy benchmark	Participation in ranking and benchmarking activities in order to achieve continuous improvement by learning from best practice
(iii) Energy-efficient production techniques	
a. Use of combined heat and power	System designed for the co-production (or the cogeneration) of heat (e.g. steam) and electric power from the same fuel
b. Integrated gasification combined cycle (IGCC)	Technique whose purpose is to produce steam, hydrogen (optional) and electric power from a variety of fuel types (e.g. heavy fuel oil or coke) with a high conversion efficiency

1.1.3. *Solid materials storage and handling*

BAT 3. In order to prevent or, where that is not practicable, to reduce dust emissions from the storage and handling of dusty materials, BAT is to use one or a combination of the techniques given below:

- (i) store bulk powder materials in enclosed silos equipped with a dust abatement system (e.g. fabric filter);
- (ii) store fine materials in enclosed containers or sealed bags;
- (iii) keep stockpiles of coarse dusty material wetted, stabilise the surface with crusting agents, or store under cover in stockpiles;
- (iv) use road cleaning vehicles.

1.1.4. *Monitoring of emissions to air and key process parameters*

BAT 4. BAT is to monitor emissions to air by using the monitoring techniques with at least the minimum frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Description	Unit	Minimum frequency	Monitoring technique
(i) SO <sub>x</sub> , NO <sub>x</sub> , and dust emissions	Catalytic cracking	Continuous <sup>(1)</sup> <sup>(2)</sup>	Direct measurement
	Combustion units ≥ 100 MW <sup>(3)</sup> and calcining units	Continuous <sup>(1)</sup> <sup>(2)</sup>	Direct measurement <sup>(4)</sup>
	Combustion units of 50 to 100 MW <sup>(3)</sup>	Continuous <sup>(1)</sup> <sup>(2)</sup>	Direct measurement or indirect monitoring
	Combustion units < 50 MW <sup>(3)</sup>	Once a year and after significant fuel changes <sup>(5)</sup>	Direct measurement or indirect monitoring
	Sulphur recovery units (SRU)	Continuous for SO <sub>2</sub> only	Direct measurement or indirect monitoring <sup>(6)</sup>
(ii) NH <sub>3</sub> emissions	All units equipped with SCR or SNCR	Continuous	Direct measurement
(iii) CO emissions	Catalytic cracking and combustion units ≥ 100 MW <sup>(3)</sup>	Continuous	Direct measurement
	Other combustion units	Once every 6 months <sup>(5)</sup>	Direct measurement
(iv) Metals emissions: Nickel (Ni), Anti- mony (Sb) <sup>(7)</sup> , Vana- dium (V)	Catalytic cracking	Once every 6 months and after significant changes to the unit <sup>(5)</sup>	Direct measurement or analysis based on metals content in the catalyst fines and in the fuel
	Combustion units <sup>(8)</sup>		

Description	Unit	Minimum frequency	Monitoring technique
(v) Polychlorinated dibenzodioxins/furans (PCDD/F) emissions	Catalytic reformer	Once a year or once a regeneration, whichever is longer	Direct measurement

- (<sup>1</sup>) Continuous measurement of SO<sub>2</sub> emissions may be replaced by calculations based on measurements of the sulphur content of the fuel or the feed; where it can be demonstrated that this leads to an equivalent level of accuracy.
- (<sup>2</sup>) Regarding SO<sub>x</sub>, only SO<sub>2</sub> is continuously measured, while SO<sub>3</sub> is only periodically measured (e.g. during calibration of the SO<sub>2</sub> monitoring system).
- (<sup>3</sup>) Refers to the total rated thermal input of all combustion units connected to the stack where emissions occur.
- (<sup>4</sup>) Or indirect monitoring of SO<sub>x</sub>.
- (<sup>5</sup>) Monitoring frequencies may be adapted if, after a period of one year, the data series clearly demonstrate a sufficient stability.
- (<sup>6</sup>) SO<sub>2</sub> emissions measurements from SRU may be replaced by a continuous material balance or other relevant process parameter monitoring, provided appropriate measurements of SRU efficiency are based on periodic (e.g. once every 2 years) plant performance tests.
- (<sup>7</sup>) Antimony (Sb) is monitored only in catalytic cracking units when Sb injection is used in the process (e.g. for metals passivation).
- (<sup>8</sup>) With the exception of combustion units firing only gaseous fuels.

BAT 5. BAT is to monitor the relevant process parameters linked to pollutant emissions, at catalytic cracking and combustion units by using appropriate techniques and with at least the frequency given below.

Description	Minimum frequency
Monitoring of parameters linked to pollutant emissions, e.g. O <sub>2</sub> content in flue-gas, N and S content in fuel or feed ( <sup>1</sup> )	Continuous for O <sub>2</sub> content. For N and S content, periodic at a frequency based on significant fuel/feed changes

(<sup>1</sup>) N and S monitoring in fuel or feed may not be necessary when continuous emission measurements of NO<sub>x</sub> and SO<sub>2</sub> are carried out at the stack.

BAT 6. BAT is to monitor diffuse VOC emissions to air from the entire site by using all of the following techniques:

- (i) sniffing methods associated with correlation curves for key equipment;
- (ii) optical gas imaging techniques;
- (iii) calculations of chronic emissions based on emissions factors periodically (e.g. once every two years) validated by measurements.

The screening and quantification of site emissions by periodic campaigns with optical absorption-based techniques, such as differential absorption light detection and ranging (DIAL) or solar occultation flux (SOF) is a useful complementary technique.

Description

See Section 1.20.6.

#### 1.1.5. Operation of waste gas treatment systems

BAT 7. In order to prevent or reduce emissions to air, BAT is to operate the acid gas removal units, sulphur recovery units and all other waste gas treatment systems with a high availability and at optimal capacity.

## Description

Special procedures can be defined for other than normal operating conditions, in particular:

- (i) during start-up and shutdown operations;
- (ii) during other circumstances that could affect the proper functioning of the systems (e.g. regular and extraordinary maintenance work and cleaning operations of the units and/or of the waste gas treatment system);
- (iii) in case of insufficient waste gas flow or temperature which prevents the use of the waste gas treatment system at full capacity.

BAT 8. In order to prevent and reduce ammonia (NH<sub>3</sub>) emissions to air when applying selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) techniques, BAT is to maintain suitable operating conditions of the SCR or SNCR waste gas treatment systems, with the aim of limiting emissions of unreacted NH<sub>3</sub>.

BAT-associated emission levels: See Table 2.

Table 2

**BAT-associated emission levels for ammonia (NH<sub>3</sub>) emissions to air for a combustion or process unit where SCR or SNCR techniques are used**

Parameter	BAT-AEL z(monthly average) mg/Nm <sup>3</sup>
Ammonia expressed as NH <sub>3</sub>	< 5 – 15 <sup>(1)</sup> <sup>(2)</sup>

<sup>(1)</sup> The higher end of the range is associated with higher inlet NO<sub>x</sub> concentrations, higher NO<sub>x</sub> reduction rates and the ageing of the catalyst.

<sup>(2)</sup> The lower end of the range is associated with the use of the SCR technique.

BAT 9. In order to prevent and reduce emissions to air when using a sour water steam stripping unit, BAT is to route the acid off-gases from this unit to an SRU or any equivalent gas treatment system.

It is not BAT to directly incinerate the untreated sour water stripping gases.

1.1.6. *Monitoring of emissions to water*

BAT 10. BAT is to monitor emissions to water by using the monitoring techniques with at least the frequency given in Table 3) and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

1.1.7. *Emissions to water*

BAT 11. In order to reduce water consumption and the volume of contaminated water, BAT is to use all of the techniques given below.

Technique	Description	Applicability
(i) Water stream integration	Reduction of process water produced at the unit level prior to discharge by the internal reuse of water streams from e.g. cooling, condensates, especially for use in crude desalting	Generally applicable for new units. For existing units, applicability may require a complete rebuilding of the unit or the installation

Technique	Description	Applicability
(ii) Water and drainage system for segregation of contaminated water streams	Design of an industrial site to optimise water management, where each stream is treated as appropriate, by e.g. routing generated sour water (from distillation, cracking, coking units, etc.) to appropriate pretreatment, such as a stripping unit	Generally applicable for new units. For existing units, applicability may require a complete rebuilding of the unit or the installation
(iii) Segregation of non-contaminated water streams (e.g. once-through cooling, rain water)	Design of a site in order to avoid sending non-contaminated water to general waste water treatment and to have a separate release after possible reuse for this type of stream	Generally applicable for new units. For existing units, applicability may require a complete rebuilding of the unit or the installation
(iv) Prevention of spillages and leaks	Practices that include the utilisation of special procedures and/or temporary equipment to maintain performances when necessary to manage special circumstances such as spills, loss of containment, etc.	Generally applicable

BAT 12. In order to reduce the emission load of pollutants in the waste water discharge to the receiving water body, BAT is to remove insoluble and soluble polluting substances by using all of the techniques given below.

Technique	Description	Applicability
(i) Removal of insoluble substances by recovering oil	See Section 1.21.2	Generally applicable
(ii) Removal of insoluble substances by recovering suspended solids and dispersed oil	See Section 1.21.2	Generally applicable
(iii) Removal of soluble substances including biological treatment and clarification	See Section 1.21.2	Generally applicable

BAT-associated emission levels: See Table 3.

BAT 13. When further removal of organic substances or nitrogen is needed, BAT is to use an additional treatment step as described in Section 1.21.2.

Table 3

**BAT-associated emission levels for direct waste water discharges from the refining of mineral oil and gas and monitoring frequencies associated with BAT <sup>(1)</sup>**

Parameter	Unit	BAT-AEL (yearly average)	Monitoring <sup>(2)</sup> frequency and analytical method (standard)
Hydrocarbon oil index (HOI)	mg/l	0,1-2,5	Daily EN 9377- 2 <sup>(3)</sup>
Total suspended solids (TSS)	mg/l	5-25	Daily
Chemical oxygen demand (COD) <sup>(4)</sup>	mg/l	30-125	Daily

Parameter	Unit	BAT-AEL (yearly average)	Monitoring <sup>(2)</sup> frequency and analytical method (standard)
BOD <sub>5</sub>	mg/l	No BAT-AEL	Weekly
Total nitrogen <sup>(3)</sup> , expressed as N	mg/l	1-25 <sup>(6)</sup>	Daily
Lead, expressed as Pb	mg/l	0,005-0,030	Quarterly
Cadmium, expressed as Cd	mg/l	0,002-0,008	Quarterly
Nickel, expressed as Ni	mg/l	0,005-0,100	Quarterly
Mercury, expressed as Hg	mg/l	0,0001-0,001	Quarterly
Vanadium	mg/l	No BAT-AEL	Quarterly
Phenol Index	mg/l	No BAT-AEL	Monthly EN 14402
Benzene, toluene, ethyl benzene, xylene (BTEX)	mg/l	Benzene: 0,001-0,050 No BAT-AEL for T, E, X	Monthly

(1) Not all parameters and sampling frequencies are applicable to effluent from gas refining sites.

(2) Refers to a flow-proportional composite sample taken over a period of 24 hours or, provided that sufficient flow stability is demonstrated, a time-proportional sample.

(3) Moving from the current method to EN 9377-2 may require an adaptation period.

(4) Where on-site correlation is available, COD may be replaced by TOC. The correlation between COD and TOC should be elaborated on a case-by-case basis. TOC monitoring would be the preferred option because it does not rely on the use of very toxic compounds.

(5) Where total-nitrogen is the sum of total Kjeldahl nitrogen (TKN), nitrates and nitrites.

(6) When nitrification/denitrification is used, levels below 15 mg/l can be achieved.

#### 1.1.8. Waste generation and management

BAT 14. In order to prevent or, where that is not practicable, to reduce waste generation, BAT is to adopt and implement a waste management plan that, in order of priority, ensures that waste is prepared for reuse, recycling, recovery or disposal.

BAT 15. In order to reduce the amount of sludge to be treated or disposed of, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Sludge pretreatment	Prior to final treatment (e.g. in a fluidised bed incinerator), the sludges are dewatered and/or de-oiled (by e.g. centrifugal decanters or steam dryers) to reduce their volume and to recover oil from slop equipment	Generally applicable
(ii) Reuse of sludge in process units	Certain types of sludge (e.g. oily sludge) can be processed in units (e.g. coking) as part of the feed due to their oil content	Applicability is restricted to sludges that can fulfil the requirements to be processed in units with appropriate treatment

BAT 16. In order to reduce the generation of spent solid catalyst waste, BAT is to use one or a combination of the techniques given below.

Technique	Description
(i) Spent solid catalyst management	Scheduled and safe handling of the materials used as catalyst (e.g. by contractors) in order to recover or reuse them in off-site facilities. These operations depend on the type of catalyst and process
(ii) Removal of catalyst from slurry decant oil	Decanted oil sludge from process units (e.g. FCC unit) can contain significant concentrations of catalyst fines. These fines need to be separated prior to the reuse of decant oil as a feedstock

#### 1.1.9. Noise

BAT 17. In order to prevent or reduce noise, BAT is to use one or a combination of the techniques given below:

- (i) make an environmental noise assessment and formulate a noise management plan as appropriate to the local environment;
- (ii) enclose noisy equipment/operation in a separate structure/unit;
- (iii) use embankments to screen the source of noise;
- (iv) use noise protection walls.

#### 1.1.10. BAT conclusions for integrated refinery management

BAT 18. In order to prevent or reduce diffuse VOC emissions, BAT is to apply the techniques given below.

Technique	Description	Applicability
I. Techniques related to plant design	(i) limiting the number of potential emission sources (ii) maximising inherent process containment features (iii) selecting high integrity equipment (iv) facilitating monitoring and maintenance activities by ensuring access to potentially leaking components	Applicability may be limited for existing units
II. Techniques related to plant installation and commissioning	(i) well-defined procedures for construction and assembly (ii) robust commissioning and hand-over procedures to ensure that the plant is installed in line with the design requirements	Applicability may be limited for existing units
III. Techniques related to plant operation	Use of a risk-based leak detection and repair (LDAR) programme in order to identify leaking components, and to repair these leaks. See Section 1.20.6	Generally applicable

## 1.2. BAT conclusions for the alkylation process

### 1.2.1. Hydrofluoric acid alkylation process

BAT 19. In order to prevent hydrofluoric acid (HF) emissions to air from the hydrofluoric acid alkylation process, BAT is to use wet scrubbing with alkaline solution to treat incondensable gas streams prior to venting to flare.

#### Description

See Section 1.20.3.

#### Applicability:

The technique is generally applicable. Safety requirements, due to the hazardous nature of hydrofluoric acid, are to be considered

BAT 20. In order to reduce emissions to water from the hydrofluoric acid alkylation process, BAT is to use a combination of the techniques given below.

Technique	Description	Applicability
(i) Precipitation/Neutralisation step	Precipitation (with, e.g. calcium or aluminium-based additives) or neutralisation (where the effluent is indirectly neutralised with potassium hydroxide (KOH))	Generally applicable. Safety requirements due to the hazardous nature of hydrofluoric acid (HF) are to be considered
(ii) Separation step	The insoluble compounds produced at the first step (e.g. $\text{CaF}_2$ or $\text{AlF}_3$ ) are separated in e.g. a settlement basin	Generally applicable

### 1.2.2. Sulphuric acid alkylation process

BAT 21. In order to reduce the emissions to water from the sulphuric acid alkylation process, BAT is to reduce the use of sulphuric acid by regenerating the spent acid and to neutralise the waste water generated by this process before routing to waste water treatment.

## 1.3. BAT conclusions for base oil production processes

BAT 22. In order to prevent and reduce the emissions of hazardous substances to air and water from base oil production processes, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Closed process with a solvent recovery	Process where the solvent, after being used during base oil manufacturing (e.g. in extraction, dewaxing units), is recovered through distillation and stripping steps. See Section 1.20.7	Generally applicable
(ii) Multi-effect extraction solvent-based process	Solvent extraction process including several stages of evaporation (e.g. double or triple effect) for a lower loss of containment	Generally applicable to new units. The use of a triple effect process may be restricted to non-fouling feed stocks

Technique	Description	Applicability
(iii) Extraction unit processes using less hazardous substances	Design (new plants) or implement changes (into existing) so that the plant operates a solvent extraction process with the use of a less hazardous solvent: e.g. converting furfural or phenol extraction into the n-methylpyrrolidone (NMP) process	Generally applicable to new units. Converting existing units to another solvent-based process with different physico-chemical properties may require substantial modifications
(iv) Catalytic processes based on hydrogenation	Processes based on conversion of undesired compounds via catalytic hydrogenation similar to hydrotreatment. See Section 1.20.3 (Hydrotreatment)	Generally applicable to new units

#### 1.4. BAT conclusions for the bitumen production process

BAT 23. In order to prevent and reduce emissions to air from the bitumen production process, BAT is to treat the gaseous overhead by using one of the techniques given below.

Technique	Description	Applicability
(i) Thermal oxidation of gaseous overhead over 800 °C	See Section 1.20.6	Generally applicable for the bitumen blowing unit
(ii) Wet scrubbing of gaseous overhead	See Section 1.20.3	Generally applicable for the bitumen blowing unit

#### 1.5. BAT conclusions for the fluid catalytic cracking process

BAT 24. In order to prevent or reduce NO<sub>x</sub> emissions to air from the catalytic cracking process (regenerator), BAT is to use one or a combination of the techniques given below.

I. Primary or process-related techniques, such as:

Technique	Description	Applicability
Process optimisation and use of promoters or additives		
(i) Process optimisation	Combination of operating conditions or practices aimed at reducing NO <sub>x</sub> formation, e.g. lowering the excess oxygen in the flue-gas in full combustion mode, air staging of the CO boiler in partial combustion mode, provided that the CO boiler is appropriately designed	Generally applicable
(ii) Low-NO <sub>x</sub> CO oxidation promoters	Use of a substance that selectively promotes the combustion of CO only and prevents the oxidation of the nitrogen that contains intermediates to NO <sub>x</sub> ; e.g. non-platinum promoters	Applicable only in full combustion mode for the substitution of platinum-based CO promoters. Appropriate distribution of air in the regenerator may be required to obtain the maximum benefit

Technique	Description	Applicability
(iii) Specific additives for NO <sub>x</sub> reduction	Use of specific catalytic additives for enhancing the reduction of NO by CO	Applicable only in full combustion mode in an appropriate design and with achievable oxygen excess. The applicability of copper-based NO <sub>x</sub> reduction additives may be limited by the gas compressor capacity

II. Secondary or end-of-pipe techniques, such as:

Technique	Description	Applicability
(i) Selective catalytic reduction (SCR)	See Section 1.20.2	To avoid potential fouling downstream, additional filtering might be required upstream of the SCR. For existing units, the applicability may be limited by space availability
(ii) Selective non-catalytic reduction (SNCR)	See Section 1.20.2	For partial combustion FCCs with CO boilers, a sufficient residence time at the appropriate temperature is required. For full combustion FCCs without auxiliary boilers, additional fuel injection (e.g. hydrogen) may be required to match a lower temperature window
(iii) Low temperature oxidation	See Section 1.20.2	Need for additional scrubbing capacity. Ozone generation and the associated risk management need to be properly addressed. The applicability may be limited by the need for additional waste water treatment and related cross-media effects (e.g. nitrate emissions) and by an insufficient supply of liquid oxygen (for ozone generation). The applicability of the technique may be limited by space availability

BAT-associated emission levels: See Table 4.

Table 4

**BAT-associated emission levels for NO<sub>x</sub> emissions to air from the regenerator in the catalytic cracking process**

Parameter	Type of unit/combustion mode	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
NO <sub>x</sub> , expressed as NO <sub>2</sub>	New unit/all combustion mode	< 30-100
	Existing unit/full combustion mode	< 100-300 <sup>(1)</sup>
	Existing unit/partial combustion mode	100-400 <sup>(1)</sup>

<sup>(1)</sup> When antimony (Sb) injection is used for metal passivation, NO<sub>x</sub> levels up to 700 mg/Nm<sup>3</sup> may occur. The lower end of the range can be achieved by using the SCR technique.

The associated monitoring is in BAT 4.

BAT 25. In order to reduce dust and metals emissions to air from the catalytic cracking process (regenerator), BAT is to use one or a combination of the techniques given below.

I. Primary or process-related techniques, such as:

Technique	Description	Applicability
(i) Use of an attrition-resistant catalyst	Selection of catalyst substance that is able to resist abrasion and fragmentation in order to reduce dust emissions	Generally applicable provided the activity and selectivity of the catalyst are sufficient
(ii) Use of low sulphur feedstock (e.g. by feedstock selection or by hydro-treatment of feed)	Feedstock selection favours low sulphur feedstocks among the possible sources to be processed at the unit. Hydrotreatment aims at reducing the sulphur, nitrogen and metal contents of the feed. See Section 1.20.3	Requires sufficient availability of low sulphur feedstocks, hydrogen production and hydrogen sulphide (H <sub>2</sub> S) treatment capacity (e.g. amine and Claus units)

II. Secondary or end-of-pipe techniques, such as:

Technique	Description	Applicability
(i) Electrostatic precipitator (ESP)	See Section 1.20.1	For existing units, the applicability may be limited by space availability
(ii) Multistage cyclone separators	See Section 1.20.1	Generally applicable
(iii) Third stage blowback filter	See Section 1.20.1	Applicability may be restricted
(iv) Wet scrubbing	See Section 1.20.3	The applicability may be limited in arid areas and in the case where the by-products from treatment (including e.g. waste water with high level of salts) cannot be reused or appropriately disposed of. For existing units, the applicability may be limited by space availability

BAT-associated emission levels: See Table 5.

Table 5

**BAT-associated emission levels for dust emissions to air from the regenerator in the catalytic cracking process**

Parameter	Type of unit	BAT-AEL (monthly average) <sup>(1)</sup> mg/Nm <sup>3</sup>
Dust	New unit	10-25
	Existing unit	10-50 <sup>(2)</sup>

<sup>(1)</sup> Soot blowing in CO boiler and through the gas cooler is excluded.

<sup>(2)</sup> The lower end of the range can be achieved with a 4-field ESP.

The associated monitoring is in BAT 4.

BAT 26. In order to prevent or reduce SO<sub>x</sub> emissions to air from the catalytic cracking process (regenerator), BAT is to use one or a combination of the techniques given below.

I. Primary or process-related techniques, such as:

Technique	Description	Applicability
(i) Use of SO <sub>x</sub> reducing catalyst additives	Use of a substance that transfers the sulphur associated with coke from the regenerator back to the reactor. See description in 1.20.3	Applicability may be restricted by regenerator conditions design. Requires appropriate hydrogen sulphide abatement capacity (e.g. SRU)
(ii) Use of low sulphur feedstock (e.g. by feedstock selection or by hydro-treatment of the feed)	Feedstock selection favours low sulphur feedstocks among the possible sources to be processed at the unit. Hydrotreatment aims at reducing the sulphur, nitrogen and metal contents of the feed. See description in 1.20.3	Requires sufficient availability of low sulphur feedstocks, hydrogen production and hydrogen sulphide (H <sub>2</sub> S) treatment capacity (e.g. amine and Claus units)

II. Secondary or end-of-pipe techniques, such as:

Techniques	Description	Applicability
(i) Non-regenerative scrubbing	Wet scrubbing or seawater scrubbing. See Section 1.20.3	The applicability may be limited in arid areas and in the case where the by-products from treatment (including e.g. waste water with high level of salts) cannot be reused or appropriately disposed of. For existing units, the applicability may be limited by space availability
(ii) Regenerative scrubbing	Use of a specific SO <sub>x</sub> absorbing reagent (e.g. absorbing solution) which generally enables the recovery of sulphur as a by-product during a regenerating cycle where the reagent is reused. See Section 1.20.3	The applicability is limited to the case where regenerated by-products can be sold. For existing units, the applicability may be limited by the existing sulphur recovery capacity as well as by space availability

BAT-associated emission levels: See Table 6.

Table 6

**BAT-associated emission levels for SO<sub>2</sub> emissions to air from the regenerator in the catalytic cracking process**

Parameter	Type of units/mode	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
SO <sub>2</sub>	New units	≤ 300
	Existing units/full combustion	< 100-800 <sup>(1)</sup>
	Existing units/partial combustion	100-1 200 <sup>(1)</sup>

<sup>(1)</sup> Where selection of low sulphur (e.g. < 0,5 % w/w) feed (or hydrotreatment) and/or scrubbing is applicable, for all combustion modes: the upper end of the BAT-AEL range is ≤ 600 mg/Nm<sup>3</sup>.

The associated monitoring is in BAT 4.

BAT 27. In order to reduce carbon monoxide (CO) emissions to air from the catalytic cracking process (regenerator), BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Combustion operation control	See Section 1.20.5	Generally applicable
(ii) Catalysts with carbon monoxide (CO) oxidation promoters	See Section 1.20.5	Generally applicable only for full combustion mode
(iii) Carbon monoxide (CO) boiler	See Section 1.20.5	Generally applicable only for partial combustion mode

BAT-associated emission levels: See Table 7.

Table 7

**BAT-associated emission levels for carbon monoxide emissions to air from the regenerator in the catalytic cracking process for partial combustion mode**

Parameter	Combustion mode	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
Carbon monoxide, expressed as CO	Partial combustion mode	≤ 100 <sup>(1)</sup>

<sup>(1)</sup> May not be achievable when not operating the CO boiler at full load.

The associated monitoring is in BAT 4.

**1.6. BAT conclusions for the catalytic reforming process**

BAT 28. In order to reduce emissions of polychlorinated dibenzodioxins/furans (PCDD/F) to air from the catalytic reforming unit, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Choice of the catalyst promoter	Use of catalyst promoter in order to minimise polychlorinated dibenzodioxins/furans (PCDD/F) formation during regeneration. See Section 1.20.7	Generally applicable
(ii) Treatment of the regeneration flue-gas		
a. Regeneration gas recycling loop with adsorption bed	Waste gas from the regeneration step is treated to remove chlorinated compounds (e.g. dioxins)	Generally applicable to new units. For existing units the applicability may depend on the current regeneration unit design
b. Wet scrubbing	See Section 1.20.3	Not applicable to semi-regenerative reformers
c. Electrostatic precipitator (ESP)	See Section 1.20.1	Not applicable to semi-regenerative reformers

#### 1.7. BAT conclusions for the coking processes

BAT 29. In order to reduce emissions to air from the coking production processes, BAT is to use one or a combination of the techniques given below:

Primary or process-related techniques, such as:

Technique	Description	Applicability
(i) Collection and recycling of coke fines	Systematic collection and recycling of coke fines generated during the whole coking process (drilling, handling, crushing, cooling, etc.)	Generally applicable
(ii) Handling and storage of coke according to BAT 3	See BAT 3	Generally applicable
(iii) Use of a closed blow-down system	Arrestment system for pressure relief from the coke drums	Generally applicable
(iv) Recovery of gas (including the venting prior to the drum being opened to atmosphere) as a component of refinery fuel gas (RFG)	Carrying venting from the coke drum to the gas compressor to recover as RFG, rather than flaring. For the flexicoking process, a conversion step (to convert the carbonyl sulphide (COS) into H <sub>2</sub> S) is needed prior to treating the gas from the coking unit	For existing units, the applicability of the techniques may be limited by space availability

BAT 30. In order to reduce NO<sub>x</sub> emissions to air from the calcining of green coke process, BAT is to use selective non-catalytic reduction (SNCR).

## Description

See Section 1.20.2.

## Applicability

The applicability of the SNCR technique (especially with respect to residence time and temperature window) may be restricted due to the specificity of the calcining process.

BAT 31. In order to reduce SO<sub>x</sub> emissions to air from the calcining of green coke process, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Non-regenerative scrubbing	Wet scrubbing or seawater scrubbing. See Section 1.20.3	The applicability may be limited in arid areas and in the case where the by-products from treatment (including e.g. waste water with high level of salts) cannot be reused or appropriately disposed of.  For existing units, the applicability may be limited by space availability
(ii) Regenerative scrubbing	Use of a specific SO <sub>x</sub> absorbing reagent (e.g. absorbing solution) which generally enables the recovery of sulphur as a by-product during a regenerating cycle where the reagent is reused.  See Section 1.20.3	The applicability is limited to the case where regenerated by-products can be sold.  For existing units, the applicability may be limited by the existing sulphur recovery capacity as well as by space availability

BAT 32. In order to reduce dust emissions to air from the calcining of green coke process, BAT is to use a combination of the techniques given below.

Technique	Description	Applicability
(i) Electrostatic precipitator (ESP)	See Section 1.20.1	For existing units, the applicability may be limited by space availability.  For graphite and anode coke calcining production, the applicability may be restricted due to the high resistivity of the coke particles
(ii) Multistage cyclone separators	See Section 1.20.1	Generally applicable

BAT-associated emission levels: See Table 8

Table 8

**BAT-associated emission levels for dust emissions to air from a unit for the calcining of green coke**

Parameter	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
Dust	10-50 <sup>(1)</sup> <sup>(2)</sup>

<sup>(1)</sup> The lower end of the range can be achieved with a 4-field ESP.

<sup>(2)</sup> When an ESP is not applicable, values of up to 150 mg/Nm<sup>3</sup> may occur.

The associated monitoring is in BAT 4.

#### 1.8. BAT conclusions for the desalting process

BAT 33. In order to reduce water consumption and emissions to water from the desalting process, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Recycling water and optimisation of the desalting process	An ensemble of good desalting practices aiming at increasing the efficiency of the desalter and reducing wash water usage e.g. using low shear mixing devices, low water pressure. It includes the management of key parameters for washing (e.g. good mixing) and separation (e.g. pH, density, viscosity, electric field potential for coalescence) steps	Generally applicable
(ii) Multistage desalter	Multistage desalters operate with water addition and dehydration, repeated through two stages or more for achieving a better efficiency in the separation and therefore less corrosion in further processes	Applicable for new units
(iii) Additional separation step	An additional enhanced oil/water and solid/water separation designed for reducing the charge of oil to the waste water treatment plant and recycling it to the process. This includes, e.g. settling drum, the use of optimum interface level controllers	Generally applicable

#### 1.9. BAT conclusions for the combustion units

BAT 34. In order to prevent or reduce NO<sub>x</sub> emissions to air from the combustion units, BAT is to use one or a combination of the techniques given below.

I. Primary or process-related techniques, such as:

Technique	Description	Applicability
(i) Selection or treatment of fuel		
(a) Use of gas to replace liquid fuel	Gas generally contains less nitrogen than liquid and its combustion leads to a lower level of NO <sub>x</sub> emissions. See Section 1.20.3	The applicability may be limited by the constraints associated with the availability of low sulphur gas fuels, which may be impacted by the energy policy of the Member State
(b) Use of low nitrogen refinery fuel oil (RFO) e.g. by RFO selection or by hydrotreatment of RFO	Refinery fuel oil selection favours low nitrogen liquid fuels among the possible sources to be used at the unit. Hydrotreatment aims at reducing the sulphur, nitrogen and metal contents of the fuel. See Section 1.20.3	Applicability is limited by the availability of low nitrogen liquid fuels, hydrogen production and hydrogen sulphide (H <sub>2</sub> S) treatment capacity (e.g. amine and Claus units)

Technique	Description	Applicability
(ii) Combustion modifications		
(a) Staged combustion: — air staging — fuel staging	See Section 1.20.2	Fuel staging for mixed or liquid firing may require a specific burner design
(b) Optimisation of combustion	See Section 1.20.2	Generally applicable
(c) Flue-gas recirculation	See Section 1.20.2	Applicable through the use of specific burners with internal recirculation of the flue-gas. The applicability may be restricted to retrofitting external flue-gas recirculation to units with a forced/induced draught mode of operation
(d) Diluent injection	See Section 1.20.2	Generally applicable for gas turbines where appropriate inert diluents are available
(e) Use of low-NO <sub>x</sub> burners (LNB)	See Section 1.20.2	Generally applicable for new units taking into account, the fuel-specific limitation (e.g. for heavy oil). For existing units, applicability may be restricted by the complexity caused by site-specific conditions e.g. furnaces design, surrounding devices. In very specific cases, substantial modifications may be required. The applicability may be restricted for furnaces in the delayed coking process, due to possible coke generation in the furnaces. In gas turbines, the applicability is restricted to low hydrogen content fuels (generally < 10 %)

II. Secondary or end-of-pipe techniques, such as:

Technique	Description	Applicability
(i) Selective catalytic reduction (SCR)	See Section 1.20.2	Generally applicable for new units. For existing units, the applicability may be constrained due to the requirements for significant space and optimal reactant injection
(ii) Selective non-catalytic reduction (SNCR)	See Section 1.20.2	Generally applicable for new units. For existing units, the applicability may be constrained by the requirement for the temperature window and the residence time to be reached by reactant injection

Technique	Description	Applicability
(iii) Low temperature oxidation	See Section 1.20.2	The applicability may be limited by the need for additional scrubbing capacity and by the fact that ozone generation and the associated risk management need to be properly addressed.  The applicability may be limited by the need for additional waste water treatment and related cross-media effects (e.g. nitrate emissions) and by an insufficient supply of liquid oxygen (for ozone generation).  For existing units, the applicability of the technique may be limited by space availability
(iv) SNO <sub>x</sub> combined technique	See Section 1.20.4	Applicable only for high flue-gas (e.g. > 800 000 Nm <sup>3</sup> /h) flow and when combined NO <sub>x</sub> and SO <sub>x</sub> abatement is needed

BAT-associated emission levels: See Table 9, Table 10 and Table 11.

Table 9

**BAT-associated emission levels for NO<sub>x</sub> emissions to air from a gas turbine**

Parameter	Type of equipment	BAT-AEL <sup>(1)</sup> (monthly average) mg/Nm <sup>3</sup> at 15 % O <sub>2</sub>
NO <sub>x</sub> expressed as NO <sub>2</sub>	Gas turbine (including combined cycle gas turbine — CCGT) and integrated gasification combined cycle turbine (IGCC)	40-120 (existing turbine)
		20-50 (new turbine) <sup>(2)</sup>

<sup>(1)</sup> BAT-AEL refers to combined emissions from the gas turbine and the supplementary firing recovery boiler, where present.

<sup>(2)</sup> For fuel with high H<sub>2</sub> content (i.e. above 10 %), the upper end of the range is 75 mg/Nm<sup>3</sup>.

The associated monitoring is in BAT 4.

Table 10

**BAT-associated emission levels for NO<sub>x</sub> emissions to air from a gas-fired combustion unit, with the exception of gas turbines**

Parameter	Type of combustion	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
NO <sub>x</sub> expressed as NO <sub>2</sub>	Gas firing	30-150 for existing unit <sup>(1)</sup>
		30-100 for new unit

<sup>(1)</sup> For an existing unit using high air pre-heat (i.e. > 200 °C) or with H<sub>2</sub> content in the fuel gas higher than 50 %, the upper end of the BAT-AEL range is 200 mg/Nm<sup>3</sup>.

The associated monitoring is in BAT 4.

Table 11

**BAT-associated emission levels for NO<sub>x</sub> emissions to air from a multi-fuel fired combustion unit with the exception of gas turbines**

Parameter	Type of combustion	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
NO <sub>x</sub> expressed as NO <sub>2</sub>	Multi-fuel fired combustion unit	30-300 for existing unit <sup>(1)</sup> <sup>(2)</sup>

<sup>(1)</sup> For existing units < 100 MW firing fuel oil with a nitrogen content higher than 0,5 % (w/w) or with liquid firing > 50 % or using air preheating, values up to 450 mg/Nm<sup>3</sup> may occur.

<sup>(2)</sup> The lower end of the range can be achieved by using the SCR technique.

The associated monitoring is in BAT 4.

BAT 35. In order to prevent or reduce dust and metal emissions to air from the combustion units, BAT is to use one or a combination of the techniques given below.

I. Primary or process-related techniques, such as:

Technique	Description	Applicability
(i) Selection or treatment of fuel		
(a) Use of gas to replace liquid fuel	Gas instead of liquid combustion leads to lower level of dust emissions See Section 1.20.3	The applicability may be limited by the constraints associated with the availability of low sulphur fuels such as natural gas, which may be impacted by the energy policy of the Member State
(b) Use of low sulphur refinery fuel oil (RFO) e.g. by RFO selection or by hydrotreatment of RFO	Refinery fuel oil selection favours low sulphur liquid fuels among the possible sources to be used at the unit. Hydrotreatment aims at reducing the sulphur, nitrogen and metal contents of the fuel. See Section 1.20.3	The applicability may be limited by the availability of low sulphur liquid fuels, hydrogen production and the hydrogen sulphide (H <sub>2</sub> S) treatment capacity (e.g. amine and Claus units)
(ii) Combustion modifications		
(a) Optimisation of combustion	See Section 1.20.2	Generally applicable to all types of combustion
(b) Atomisation of liquid fuel	Use of high pressure to reduce the droplet size of liquid fuel. Recent optimal burner designs generally include steam atomisation	Generally applicable to liquid fuel firing

## II. Secondary or end-of-pipe techniques, such as:

Technique	Description	Applicability
(i) Electrostatic precipitator (ESP)	See Section 1.20.1	For existing units, the applicability may be limited by space availability
(ii) Third stage blowback filter	See Section 1.20.1	Generally applicable
(iii) Wet scrubbing	See Section 1.20.3	The applicability may be limited in arid areas and in the case where the by-products from treatment (including e.g. waste water with a high level of salt) cannot be reused or appropriately disposed of. For existing units, the applicability of the technique may be limited by space availability
(iv) Centrifugal washers	See Section 1.20.1	Generally applicable

BAT-associated emission levels: See Table 12.

Table 12

**BAT-associated emission levels for dust emissions to air from a multi-fuel fired combustion unit with the exception of gas turbines**

Parameter	Type of combustion	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
Dust	Multi-fuel firing	5-50 for existing unit <sup>(1)</sup> <sup>(2)</sup>
		5-25 for new unit < 50 MW

<sup>(1)</sup> The lower end of the range is achievable for units with the use of end-of-pipe techniques.

<sup>(2)</sup> The upper end of the range refers to the use of a high percentage of oil burning and where only primary techniques are applicable.

The associated monitoring is in BAT 4.

BAT 36. In order to prevent or reduce SO<sub>x</sub> emissions to air from the combustion units, BAT is to use one or a combination of the techniques given below.

## I. Primary or process-related techniques based on a selection or a treatment of the fuel, such as:

Technique	Description	Applicability
(i) Use of gas to replace liquid fuel	See Section 1.20.3	The applicability may be limited by the constraints associated with the availability of low sulphur fuels such as natural gas, which may be impacted by the energy policy of the Member State

Technique	Description	Applicability
(ii) Treatment of refinery fuel gas (RFG)	Residual H <sub>2</sub> S concentration in RFG depends on the treatment process parameter, e.g. the amine-scrubbing pressure. See Section 1.20.3	For low calorific gas containing carbonyl sulphide (COS) e.g. from coking units, a converter may be required prior to H <sub>2</sub> S removal
(iii) Use of low sulphur refinery fuel oil (RFO) e.g. by RFO selection or by hydrotreatment of RFO	Refinery fuel oil selection favours low sulphur liquid fuels among the possible sources to be used at the unit. Hydrotreatment aims at reducing the sulphur, nitrogen and metal contents of the fuel. See Section 1.20.3	The applicability is limited by the availability of low sulphur liquid fuels, hydrogen production and the hydrogen sulphide (H <sub>2</sub> S) treatment capacity (e.g. amine and Claus units)

## II. Secondary or end-of-pipe techniques:

Technique	Description	Applicability
(i) Non-regenerative scrubbing	Wet scrubbing or seawater scrubbing. See Section 1.20.3	The applicability may be limited in arid areas and in the case where the by-products from treatment (including e.g. waste water with high level of salts) cannot be reused or appropriately disposed of. For existing units, the applicability of the technique may be limited by space availability
(ii) Regenerative scrubbing	Use of a specific SO <sub>x</sub> absorbing reagent (e.g. absorbing solution) which generally enables the recovery of sulphur as a by-product during a regenerating cycle where the reagent is reused. See Section 1.20.3	The applicability is limited to the case where regenerated by-products can be sold. Retrofitting to existing units may be limited by the existing sulphur recovery capacity. For existing units, the applicability of the technique may be limited by space availability
(iii) SNO <sub>x</sub> combined technique	See Section 1.20.4	Applicable only for high flue-gas (e.g. > 800 000 Nm <sup>3</sup> /h) flow and when combined NO <sub>x</sub> and SO <sub>x</sub> abatement is required

Table 13

**BAT-associated emission levels for SO<sub>2</sub> emissions to air from a combustion unit firing refinery fuel gas (RFG), with the exception of gas turbines**

Parameter	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
SO <sub>2</sub>	5-35 <sup>(1)</sup>

<sup>(1)</sup> In the specific configuration of RFG treatment with a low scrubber operative pressure and with a refinery fuel gas with an H/C molar ratio above 5, the upper end of the BAT-AEL range can be as high as 45 mg/Nm<sup>3</sup>.

The associated monitoring is in BAT 4.

Table 14

**BAT-associated emission levels for SO<sub>2</sub> emissions to air from multi-fuel fired combustion units, with the exception of gas turbines and stationary gas engines**

This BAT-AEL refers to the weighted average emissions from existing multi-fuel fired combustion units within the refinery, with the exception of gas turbines and stationary gas engines.

Parameter	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
SO <sub>2</sub>	35-600

The associated monitoring is in BAT 4.

BAT 37. In order to reduce carbon monoxide (CO) emissions to air from the combustion units, BAT is to use a combustion operation control.

Description

See Section 1.20.5.

BAT-associated emission levels: See Table 15.

Table 15

**BAT-associated emission levels for carbon monoxide emissions to air from a combustion unit**

Parameter	BAT-AEL (monthly average) mg/Nm <sup>3</sup>
Carbon monoxide, expressed as CO	≤ 100

The associated monitoring is in BAT 4.

**1.10. BAT conclusions for the etherification process**

BAT 38. In order to reduce emissions to air from the etherification process, BAT is to ensure the appropriate treatment of process off-gases by routing them to the refinery fuel gas system.

BAT 39. In order to prevent upset of the biotreatment, BAT is to use a storage tank and an appropriate unit production plan management to control the toxic components dissolved content (e.g. methanol, formic acid, ethers) of the waste water stream prior to final treatment.

**1.11. BAT conclusions for the isomerisation process**

BAT 40. In order to reduce emissions to air of chlorinated compounds, BAT is to optimise the use of chlorinated organic compounds used to maintain catalyst activity when such a process is in place or to use non-chlorinated catalytic systems.

**1.12. BAT conclusions for the natural gas refinery**

BAT 41. In order to reduce sulphur dioxide emissions to air from the natural gas plant, BAT is to apply BAT 54.

BAT 42. In order to reduce nitrogen oxides (NO<sub>x</sub>) emissions to air from the natural gas plant, BAT is to apply BAT 34

BAT 43. In order to prevent emissions of mercury when present in raw natural gas, BAT is to remove the mercury and recover the mercury-containing sludge for waste disposal.

**1.13. BAT conclusions for the distillation process**

BAT 44. In order to prevent or reduce waste water flow generation from the distillation process, BAT is to use liquid ring vacuum pumps or surface condensers.

**Applicability**

May not be applicable in some retrofit cases. For new units, vacuum pumps, either in or not in combination with steam ejectors, may be needed to achieve a high vacuum (10 mm Hg). Also, a spare should be available in case the vacuum pump fails.

BAT 45. In order to prevent or reduce water pollution from the distillation process, BAT is to route sour water to the stripping unit.

BAT 46. In order to prevent or reduce emissions to air from distillation units, BAT is to ensure the appropriate treatment of process off-gases, especially incondensable off-gases, by acid gas removal prior to further use.

**Applicability**

Generally applicable for crude and vacuum distillation units. May not be applicable for stand-alone lubricant and bitumen refineries with emissions of less than 1 t/d of sulphur compounds. In specific refinery configurations, applicability may be restricted, due to the need for e.g. large piping, compressors or additional amine treating capacity.

**1.14. BAT conclusions for the products treatment process**

BAT 47. In order to reduce emissions to air from the products treatment process, BAT is to ensure the appropriate disposal of off-gases, especially odorous spent air from sweetening units, by routing them to destruction, e.g. by incineration.

**Applicability**

Generally applicable to products treatment processes where the gas streams can be safely processed to the destruction units. May not be applicable to sweetening units, due to safety reasons.

BAT 48. In order to reduce waste and waste water generation when a products treatment process using caustic is in place, BAT is to use cascading caustic solution and a global management of spent caustic, including recycling after appropriate treatment, e.g. by stripping.

1.15. **BAT conclusions for storage and handling processes**

BAT 49. In order to reduce VOC emissions to air from the storage of volatile liquid hydrocarbon compounds, BAT is to use floating roof storage tanks equipped with high efficiency seals or a fixed roof tank connected to a vapour recovery system.

## Description

High efficiency seals are specific devices for limiting losses of vapour, e.g. improved primary seals, additional multiple (secondary or tertiary) seals (according to quantity emitted).

## Applicability

The applicability of high efficiency seals may be restricted for retrofitting tertiary seals in existing tanks.

BAT 50. In order to reduce VOC emissions to air from the storage of volatile liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Manual crude oil tank cleaning	Oil tank cleaning is performed by workers entering the tank and removing sludge manually	Generally applicable
(ii) Use of a closed-loop system	For internal inspections, tanks are periodically emptied, cleaned and rendered gas-free. This cleaning includes dissolving the tank bottom. Closed-loop systems that can be combined with end-of-pipe mobile abatement techniques prevent or reduce VOC emissions	The applicability may be limited by e.g. the type of residues, tank roof construction or tank materials

BAT 51. In order to prevent or reduce emissions to soil and groundwater from the storage of liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given below.

Technique	Description	Applicability
(i) Maintenance programme including corrosion monitoring, prevention and control	A management system including leak detection and operational controls to prevent overfilling, inventory control and risk-based inspection procedures on tanks at intervals to prove their integrity, and maintenance to improve tank containment. It also includes a system response to spill consequences to act before spills can reach the groundwater. To be especially reinforced during maintenance periods	Generally applicable
(ii) Double bottomed tanks	A second impervious bottom that provides a measure of protection against releases from the first material	Generally applicable for new tanks and after overhaul of existing tanks <sup>(1)</sup>
(iii) Impervious membrane liners	A continuous leak barrier under the entire bottom surface of the tank	Generally applicable for new tanks and after an overhaul of existing tanks <sup>(1)</sup>

Technique	Description	Applicability
(iv) Sufficient tank farm bund containment	A tank farm bund is designed to contain large spills potentially caused by a shell rupture or overfilling (for both environmental and safety reasons). Size and associated building rules are generally defined by local regulations	Generally applicable

(<sup>1</sup>) Techniques ii and iii may not be generally applicable where tanks are dedicated to products that require heat for liquid handling (e.g. bitumen), and where no leak is likely because of solidification.

BAT 52. In order to prevent or reduce VOC emissions to air from loading and unloading operations of volatile liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given below to achieve a recovery rate of at least 95 %.

Technique	Description	Applicability ( <sup>1</sup> )
Vapour recovery by: (i) Condensation (ii) Absorption (iii) Adsorption (iv) Membrane separation (v) Hybrid systems	See Section 1.20.6	Generally applicable to loading/unloading operations where annual throughput is > 5 000 m <sup>3</sup> /yr. Not applicable to loading/unloading operations for sea-going vessels with an annual throughput < 1 million m <sup>3</sup> /yr

(<sup>1</sup>) A vapour destruction unit (e.g. by incineration) may be substituted for a vapour recovery unit, if vapour recovery is unsafe or technically impossible because of the volume of return vapour.

BAT-associated emission levels: See Table 16.

Table 16

**BAT-associated emission levels for non-methane VOC and benzene emissions to air from loading and unloading operations of volatile liquid hydrocarbon compounds**

Parameter	BAT-AEL (hourly average) ( <sup>1</sup> )
NMVOC	0,15-10 g/Nm <sup>3</sup> ( <sup>2</sup> ) ( <sup>3</sup> )
Benzene ( <sup>3</sup> )	< 1 mg/Nm <sup>3</sup>

(<sup>1</sup>) Hourly values in continuous operation expressed and measured according to European Parliament and Council Directive 94/63/EC (OJ L 365, 31.12.1994, p. 24).

(<sup>2</sup>) Lower value achievable with two-stage hybrid systems. Upper value achievable with single-stage adsorption or membrane system.

(<sup>3</sup>) Benzene monitoring may not be necessary where emissions of NMVOC are at the lower end of the range.

1.16. **BAT conclusions for visbreaking and other thermal processes**

BAT 53. In order to reduce emissions to water from visbreaking and other thermal processes, BAT is to ensure the appropriate treatment of waste water streams by applying the techniques of BAT 11.

1.17. **BAT conclusions for waste gas sulphur treatment**

BAT 54. In order to reduce sulphur emissions to air from off-gases containing hydrogen sulphides (H<sub>2</sub>S), BAT is to use all of the techniques given below.

Technique	Description	Applicability <sup>(1)</sup>
(i) Acid gas removal e.g. by amine treating	See Section 1.20.3	Generally applicable
(ii) Sulphur recovery unit (SRU), e.g. by Claus process	See Section 1.20.3	Generally applicable
(iii) Tail gas treatment unit (TGTU)	See Section 1.20.3	For retrofitting existing SRU, the applicability may be limited by the SRU size and configuration of the units and the type of sulphur recovery process already in place

<sup>(1)</sup> May not be applicable for stand-alone lubricant or bitumen refineries with a release of sulphur compounds of less than 1 t/d

BAT-associated environmental performance levels (BAT-AEPL): See Table 17.

Table 17

**BAT-associated environmental performance levels for a waste gas sulphur (H<sub>2</sub>S) recovery system**

	BAT-associated environmental performance level (monthly average)
Acid gas removal	Achieve hydrogen sulphides (H <sub>2</sub> S) removal in the treated RFG in order to meet gas firing BAT-AEL for BAT 36
Sulphur recovery efficiency <sup>(1)</sup>	New unit: 99,5 – > 99,9 %
	Existing unit: ≥ 98,5 %

<sup>(1)</sup> Sulphur recovery efficiency is calculated over the whole treatment chain (including SRU and TGTU) as the fraction of sulphur in the feed that is recovered in the sulphur stream routed to the collection pits.  
When the applied technique does not include a recovery of sulphur (e.g. seawater scrubber), it refers to the sulphur removal efficiency, as the % of sulphur removed by the whole treatment chain.

The associated monitoring is described in BAT 4.

1.18. **BAT conclusions for flares**

BAT 55. In order to prevent emissions to air from flares, BAT is to use flaring only for safety reasons or for non-routine operational conditions (e.g. start-ups, shutdown).

BAT 56. In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the techniques given below.

Technique	Description	Applicability
(i) Correct plant design	See Section 1.20.7	Applicable to new units. Flare gas recovery system may be retrofitted in existing units
(ii) Plant management	See Section 1.20.7	Generally applicable
(iii) Correct flaring devices design	See Section 1.20.7	Applicable to new units
(iv) Monitoring and reporting	See Section 1.20.7	Generally applicable

#### 1.19. BAT conclusions for integrated emission management

BAT 57. In order to achieve an overall reduction of NO<sub>x</sub> emissions to air from combustion units and fluid catalytic cracking (FCC) units, BAT is to use an integrated emission management technique as an alternative to applying BAT 24 and BAT 34.

##### Description

The technique consists of managing NO<sub>x</sub> emissions from several or all combustion units and FCC units on a refinery site in an integrated manner, by implementing and operating the most appropriate combination of BAT across the different units concerned and monitoring the effectiveness thereof, in such a way that the resulting total emissions are equal to or lower than the emissions that would be achieved through a unit-by-unit application of the BAT-AELs referred to in BAT 24 and BAT 34.

This technique is especially suitable to oil refining sites:

- with a recognised site complexity, multiplicity of combustion and process units interlinked in terms of their feedstock and energy supply;
- with frequent process adjustments required in function of the quality of the crude received;
- with a technical necessity to use a part of process residues as internal fuels, causing frequent adjustments of the fuel mix according to process requirements.

BAT-associated emission levels: See Table 18.

In addition, for each new combustion unit or new FCC unit included in the integrated emission management system, the BAT-AELs set out under BAT 24 and BAT 34 remain applicable.

Table 18

#### BAT-associated emission levels for NO<sub>x</sub> emissions to air when applying BAT 57

The BAT-AEL for NO<sub>x</sub> emissions from the units concerned by BAT 57, expressed in mg/Nm<sup>3</sup> as a monthly average value, is equal to or less than the weighted average of the NO<sub>x</sub> concentrations (expressed in mg/Nm<sup>3</sup> as a monthly average) that would be achieved by applying in practice at each of those units techniques that would enable the units concerned to meet the following:

- (a) for catalytic cracking process (regenerator) units: the BAT-AEL range set out in Table 4 (BAT 24);
- (b) for combustion units burning refinery fuels alone or simultaneously with other fuels: the BAT-AEL ranges set out in Tables 9, 10 and 11 (BAT 34).

This BAT-AEL is expressed by the following formula:

$$\frac{\sum [(flue\ gas\ flow\ rate\ of\ the\ unit\ concerned) \times (NO_x\ concentration\ that\ would\ be\ achieved\ for\ that\ unit)]}{\sum (flue\ gas\ flow\ rate\ of\ all\ units\ concerned)}$$

Notes:

1. The applicable reference conditions for oxygen are those specified in Table 1.
2. The weighing of the emission levels of the individual units is done on the basis of the flue-gas flow rate of the unit concerned, expressed as a monthly average value (Nm<sup>3</sup>/hour), which is representative for the normal operation of that unit within the refinery installation (applying the reference conditions under Note 1).
3. In case of substantial and structural fuel changes which are affecting the applicable BAT-AEL for a unit or other substantial and structural changes in the nature or functioning of the units concerned, or in case of their replacement or extension or the addition of combustion units or FCC units, the BAT-AEL defined in Table 18 needs to be adjusted accordingly.

Monitoring associated with BAT 57

BAT for monitoring emissions of NO<sub>x</sub> under an integrated emission management technique is as in BAT 4, complemented with the following:

- a monitoring plan including a description of the processes monitored, a list of the emission sources and source streams (products, waste gases) monitored for each process and a description of the methodology (calculations, measurements) used and the underlying assumptions and associated level of confidence;
- continuous monitoring of the flue-gas flow rates of the units concerned, either through direct measurement or by an equivalent method;
- a data management system for collecting, processing and reporting all monitoring data needed to determine the emissions from the sources covered by the integrated emission management technique.

BAT 58. In order to achieve an overall reduction of SO<sub>2</sub> emissions to air from combustion units, fluid catalytic cracking (FCC) units and waste gas sulphur recovery units, BAT is to use an integrated emission management technique as an alternative to applying BAT 26, BAT 36 and BAT 54.

Description

The technique consists of managing SO<sub>2</sub> emissions from several or all combustion units, FCC units and waste gas sulphur recovery units on a refinery site in an integrated manner, by implementing and operating the most appropriate combination of BAT across the different units concerned and monitoring the effectiveness thereof, in such a way that the resulting total emissions are equal to or lower than the emissions that would be achieved through a unit-by-unit application of the BAT-AELs referred to in BAT 26 and BAT 36 as well as the BAT-AEPL set out under BAT 54.

This technique is especially suitable to oil refining sites:

- with a recognised site complexity, multiplicity of combustion and process units interlinked in terms of their feedstock and energy supply;
- with frequent process adjustments required in function of the quality of the crude received;
- with a technical necessity to use a part of process residues as internal fuels, causing frequent adjustments of the fuel mix according to process requirements.

BAT associated emission level: See Table 19.

In addition, for each new combustion unit, new FCC unit or new waste gas sulphur recovery unit included in the integrated emission management system, the BAT-AELs set out under BAT 26 and BAT 36 and the BAT-AEPL set out under BAT 54 remain applicable.

Table 19

**BAT-associated emission levels for SO<sub>2</sub> emissions to air when applying BAT 58**

The BAT-AEL for SO<sub>2</sub> emissions from the units concerned by BAT 58, expressed in mg/Nm<sup>3</sup> as a monthly average value, is equal to or less than the weighted average of the SO<sub>2</sub> concentrations (expressed in mg/Nm<sup>3</sup> as a monthly average) that would be achieved by applying in practice at each of those units techniques that would enable the units concerned to meet the following:

- (a) for catalytic cracking process (regenerator) units: the BAT-AEL ranges set out in Table 6 (BAT 26);
- (b) for combustion units burning refinery fuels alone or simultaneously with other fuels: the BAT-AEL ranges set out in Table 13 and in Table 14 (BAT 36); and
- (c) for waste gas sulphur recovery units: the BAT-AEPL ranges set out in Table 17 (BAT 54).

This BAT-AEL is expressed by the following formula:

$$\frac{\Sigma [( \text{flue gas flow rate of the unit concerned} ) \times ( \text{SO}_2 \text{ concentration that would be achieved for that unit} )]}{\Sigma (\text{flue gas flow rate of all units concerned})}$$

Notes:

1. The applicable reference conditions for oxygen are those specified in Table 1.
2. The weighing of the emission levels of the individual units is done on the basis of the flue-gas flow rate of the unit concerned, expressed as the monthly average value (Nm<sup>3</sup>/hour), which is representative for the normal operation of that unit within the refinery installation (applying the reference conditions under Note 1).
3. In case of substantial and structural fuel changes which are affecting the applicable BAT-AEL for a unit or other substantial and structural changes in the nature or functioning of the units concerned, or in case of their replacement, extension or the addition of combustion, FCC, or waste gas sulphur recovery units, the BAT-AEL defined in Table 19 needs to be adjusted accordingly.

Monitoring associated with BAT 58

BAT for monitoring emissions of SO<sub>2</sub> under an integrated emission management approach is as in BAT 4, complemented with the following:

- a monitoring plan including a description of the processes monitored, a list of the emission sources and source streams (products, waste gases) monitored for each process and a description of the methodology (calculations, measurements) used and the underlying assumptions and associated level of confidence;
- continuous monitoring of the flue-gas flow rates of the units concerned, either through direct measurement or by an equivalent method;
- a data management system for collecting, processing and reporting all monitoring data needed to determine the emissions from the sources covered by the integrated emission management technique.

## GLOSSARY

1.20. **Description of techniques for the prevention and control of emissions to air**1.20.1. *Dust*

Technique	Description
Electrostatic precipitator (ESP)	Electrostatic precipitators operate such that particles are charged and separated under the influence of an electrical field. Electrostatic precipitators are capable of operating under a wide range of conditions.

Technique	Description
	<p>Abatement efficiency may depend on the number of fields, residence time (size), catalyst properties and upstream particles removal devices.</p> <p>At FCC units, 3-field ESPs and 4-field ESPs are commonly used.</p> <p>ESPs may be used on a dry mode or with ammonia injection to improve the particle collection.</p> <p>For the calcining of green coke, the ESP capture efficiency may be reduced due to the difficulty for coke particles to be electrically charged</p>
Multistage cyclone separators	Cyclonic collection device or system installed following the two stages of cyclones. Generally known as a third stage separator, common configuration consists of a single vessel containing many conventional cyclones or improved swirl-tube technology. For FCC, performance mainly depends on the particle concentration and size distribution of the catalyst fines downstream of the regenerator internal cyclones
Centrifugal washers	Centrifugal washers combine the cyclone principle and an intensive contact with water e.g. venturi washer
Third stage blowback filter	Reverse flow (blowback) ceramic or sintered metal filters where, after retention at the surface as a cake, the solids are dislodged by initiating a reverse flow. The dislodged solids are then purged from the filter system

1.20.2. Nitrogen oxides (NO<sub>x</sub>)

Technique	Description
Combustion modifications	
Staged combustion	<ul style="list-style-type: none"> <li>— Air staging — involves substoichiometric firing in a first step and the subsequent addition of the remaining air or oxygen into the furnace to complete combustion</li> <li>— Fuel staging — a low impulse primary flame is developed in the port neck; a secondary flame covers the root of the primary flame reducing its core temperature</li> </ul>
Flue-gas recirculation	<p>Reinjection of waste gas from the furnace into the flame to reduce the oxygen content and therefore the temperature of the flame.</p> <p>Special burners using the internal recirculation of combustion gases to cool the root of the flames and reduce the oxygen content in the hottest part of the flames</p>
Use of low-NO <sub>x</sub> burners (LNB)	The technique (including ultra-low-NO <sub>x</sub> burners) is based on the principles of reducing peak flame temperatures, delaying but completing the combustion and increasing the heat transfer (increased emissivity of the flame). It may be associated with a modified design of the furnace combustion chamber. The design of ultra-low-NO <sub>x</sub> burners (ULNB) includes combustion staging (air/fuel) and flue-gas recirculation. Dry low-NO <sub>x</sub> burners (DLNB) are used for gas turbines
Optimisation of combustion	Based on permanent monitoring of appropriate combustion parameters (e.g. O <sub>2</sub> , CO content, fuel to air (or oxygen) ratio, unburnt components), the technique uses control technology for achieving the best combustion conditions

Technique	Description
Diluent injection	Inert diluents, e.g. flue-gas, steam, water, nitrogen added to combustion equipment reduce the flame temperature and consequently the concentration of NO <sub>x</sub> in the flue-gases
Selective catalytic reduction (SCR)	The technique is based on the reduction of NO <sub>x</sub> to nitrogen in a catalytic bed by reaction with ammonia (in general aqueous solution) at an optimum operating temperature of around 300-450 °C. One or two layers of catalyst may be applied. A higher NO <sub>x</sub> reduction is achieved with the use of higher amounts of catalyst (two layers)
Selective non-catalytic reduction (SNCR)	The technique is based on the reduction of NO <sub>x</sub> to nitrogen by reaction with ammonia or urea at a high temperature. The operating temperature window must be maintained between 900 °C and 1 050 °C for optimal reaction
Low temperature NO <sub>x</sub> oxidation	The low temperature oxidation process injects ozone into a flue-gas stream at optimal temperatures below 150 °C, to oxidise insoluble NO and NO <sub>2</sub> to highly soluble N <sub>2</sub> O <sub>5</sub> . The N <sub>2</sub> O <sub>5</sub> is removed in a wet scrubber by forming dilute nitric acid waste water that can be used in plant processes or neutralised for release and may need additional nitrogen removal

### 1.20.3. Sulphur oxides (SO<sub>x</sub>)

Technique	Description
Treatment of refinery fuel gas (RFG)	Some refinery fuel gases may be sulphur-free at source (e.g. from catalytic reforming and isomerisation processes) but most other processes produce sulphur-containing gases (e.g. off-gases from the visbreaker, hydrotreater or catalytic cracking units). These gas streams require an appropriate treatment for gas desulphurisation (e.g. by acid gas removal — see below — to remove H <sub>2</sub> S) before being released to the refinery fuel gas system
Refinery fuel oil (RFO) desulphurisation by hydrotreatment	In addition to selection of low-sulphur crude, fuel desulphurisation is achieved by the hydrotreatment process (see below) where hydrogenation reactions take place and lead to a reduction in sulphur content
Use of gas to replace liquid fuel	Decrease the use of liquid refinery fuel (generally heavy fuel oil containing sulphur, nitrogen, metals, etc.) by replacing it with on-site Liquefied Petroleum Gas (LPG) or refinery fuel gas (RFG) or by externally supplied gaseous fuel (e.g. natural gas) with a low level of sulphur and other undesirable substances. At the individual combustion unit level, under multi-fuel firing, a minimum level of liquid firing is necessary to ensure flame stability
Use of SO <sub>x</sub> reducing catalysts additives	Use of a substance (e.g. metallic oxides catalyst) that transfers the sulphur associated with coke from the regenerator back to the reactor. It operates most efficiently in full combustion mode rather than in deep partial-combustion mode. NB: SO <sub>x</sub> reducing catalysts additives might have a detrimental effect on dust emissions by increasing catalyst losses due to attrition, and on NO <sub>x</sub> emissions by participating in CO promotion, together with the oxidation of SO <sub>2</sub> to SO <sub>3</sub>

Technique	Description
Hydrotreatment	Based on hydrogenation reactions, hydrotreatment aims mainly at producing low-sulphur fuels (e.g. 10 ppm gasoline and diesel) and optimising the process configuration (heavy residue conversion and middle distillate production). It reduces the sulphur, nitrogen and metal content of the feed. As hydrogen is required, sufficient production capacity is needed. As the technique transfer sulphur from the feed to hydrogen sulphide (H <sub>2</sub> S) in the process gas, treatment capacity (e.g. amine and Claus units) is also a possible bottleneck
Acid gas removal e.g. by amine treating	Separation of acid gas (mainly hydrogen sulphide) from the fuel gases by dissolving it in a chemical solvent (absorption). The commonly used solvents are amines. This is generally the first step treatment needed before elemental sulphur can be recovered in the SRU
Sulphur recovery unit (SRU)	Specific unit that generally consists of a Claus process for sulphur removal of hydrogen sulphide (H <sub>2</sub> S)-rich gas streams from amine treating units and sour water strippers. SRU is generally followed by a tail gas treatment unit (TGTU) for remaining H <sub>2</sub> S removal
Tail gas treatment unit (TGTU)	A family of techniques, additional to the SRU in order to enhance the removal of sulphur compounds. They can be divided into four categories according to the principles applied: <ul style="list-style-type: none"> <li>— direct oxidation to sulphur</li> <li>— continuation of the Claus reaction (sub-dewpoint conditions)</li> <li>— oxidation to SO<sub>2</sub> and recovering sulphur from SO<sub>2</sub></li> <li>— reduction to H<sub>2</sub>S and recovery of sulphur from this H<sub>2</sub>S (e.g. amine process)</li> </ul>
Wet scrubbing	In the wet scrubbing process, gaseous compounds are dissolved in a suitable liquid (water or alkaline solution). Simultaneous removal of solid and gaseous compounds may be achieved. Downstream of the wet scrubber, the flue-gases are saturated with water and a separation of the droplets is required before discharging the flue-gases. The resulting liquid has to be treated by a waste water process and the insoluble matter is collected by sedimentation or filtration According to the type of scrubbing solution, it can be: <ul style="list-style-type: none"> <li>— a non-regenerative technique (e.g. sodium or magnesium-based)</li> <li>— a regenerative technique (e.g. amine or soda solution)</li> </ul> According to the contact method, the various techniques may require e.g.: <ul style="list-style-type: none"> <li>— Venturi using the energy from inlet gas by spraying it with the liquid</li> <li>— packed towers, plate towers, spray chambers.</li> </ul> Where scrubbers are mainly intended for SO <sub>x</sub> removal, a suitable design is needed to also efficiently remove dust. The typical indicative SO <sub>x</sub> removal efficiency is in the range 85-98 %.
Non-regenerative scrubbing	Sodium or magnesium-based solution is used as alkaline reagent to absorb SO <sub>x</sub> generally as sulphates. Techniques are based on e.g.: <ul style="list-style-type: none"> <li>— wet limestone</li> <li>— aqueous ammonia</li> <li>— seawater (see infra)</li> </ul>

Technique	Description
Seawater scrubbing	A specific type of non-regenerative scrubbing using the alkalinity of the seawater as solvent. Generally requires an upstream abatement of dust
Regenerative scrubbing	Use of specific SO <sub>x</sub> absorbing reagent (e.g. absorbing solution) that generally enables the recovery of sulphur as a by-product during a regenerating cycle where the reagent is reused

1.20.4. *Combined techniques (SO<sub>x</sub>, NO<sub>x</sub> and dust)*

Technique	Description
Wet scrubbing	See Section 1.20.3
SNO <sub>x</sub> combined technique	<p>Combined technique to remove SO<sub>x</sub>, NO<sub>x</sub> and dust where a first dust removal stage (ESP) takes place followed by some specific catalytic processes. The sulphur compounds are recovered as commercial-grade concentrated sulphuric acid, while NO<sub>x</sub> is reduced to N<sub>2</sub>.</p> <p>Overall SO<sub>x</sub> removal is in the range: 94-96,6 %.</p> <p>Overall NO<sub>x</sub> removal is in the range: 87-90 %</p>

1.20.5. *Carbon monoxide (CO)*

Technique	Description
Combustion operation control	The increase in CO emissions due to the application of combustion modifications (primary techniques) for the reduction of NO <sub>x</sub> emissions can be limited by a careful control of the operational parameters
Catalysts with carbon monoxide (CO) oxidation promoters	Use of a substance which selectively promotes the oxidation of CO into CO <sub>2</sub> (combustion)
Carbon monoxide (CO) boiler	<p>Specific post-combustion device where CO present in the flue-gas is consumed downstream of the catalyst regenerator to recover the energy</p> <p>It is usually used only with partial-combustion FCC units</p>

1.20.6. *Volatile organic compounds (VOC)*

Vapour recovery	<p>Volatile organic compounds emissions from loading and unloading operations of most volatile products, especially crude oil and lighter products, can be abated by various techniques e.g.:</p> <ul style="list-style-type: none"> <li>— Absorption: the vapour molecules dissolve in a suitable absorption liquid (e.g. glycols or mineral oil fractions such as kerosene or reformat). The loaded scrubbing solution is desorbed by reheating in a further step. The desorbed gases must either be condensed, further processed, and incinerated or re-absorbed in an appropriate stream (e.g. of the product being recovered)</li> </ul>
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	<ul style="list-style-type: none"> <li>— Adsorption: the vapour molecules are retained by activate sites on the surface of adsorbent solid materials, e.g. activated carbon (AC) or zeolite. The adsorbent is periodically regenerated. The resulting desorbate is then absorbed in a circulating stream of the product being recovered in a down-stream wash column. Residual gas from wash column is sent to further treatment</li> <li>— Membrane <b>gas separation</b>: the vapour molecules are processed through selective membranes to separate the vapour/air mixture into a hydrocarbon-enriched phase (permeate), which is subsequently condensed or absorbed, and a hydrocarbon-depleted phase (retentate).</li> <li>— Two-stage <b>refrigeration/condensation</b>: by cooling of the vapour/gas mixture the vapour molecules condense and are separated as a liquid. As the humidity leads to the icing-up of the heat exchanger, a two-stage condensation process providing for alternate operation is required.</li> <li>— Hybrid <b>systems</b>: combinations of available techniques</li> </ul> <p>NB Absorption and adsorption processes cannot notably reduce methane emissions.</p>
Vapour destruction	<p>Destruction of VOCs can be achieved through e.g. <b>thermal oxidation</b> (incineration) or <b>catalytic oxidation</b> when recovery is not easily feasible. Safety requirements (e.g. flame arrestors) are needed to prevent explosion.</p> <p><b>Thermal oxidation</b> occurs typically in single chamber, refractory-lined oxidisers equipped with gas burner and a stack. If gasoline is present, heat exchanger efficiency is limited and preheat temperatures are maintained below 180 °C to reduce ignition risk. Operating temperatures range from 760 °C to 870 °C and residence times are typically 1 second. When a specific incinerator is not available for this purpose, an existing furnace may be used to provide the required temperature and residence times.</p> <p><b>Catalytic oxidation</b> requires a catalyst to accelerate the rate of oxidation by adsorbing the oxygen and the VOCs on its surface The catalyst enables the oxidation reaction to occur at lower temperature than required by thermal oxidation: typically ranging from 320 °C to 540 °C. A first preheating step (electrically or with gas) takes place to reach a temperature necessary to initiate the VOCs catalytic oxidation. An oxidation step occurs when the air is passed through a bed of solid catalysts</p>
LDAR (leak detection and repair) programme	<p>An LDAR (leak detection and repair) programme is a structured approach to reduce fugitive VOC emissions by detection and subsequent repair or replacement of leaking components. Currently, sniffing (described by EN 15446) and optical gas imaging methods are available for the identification of the leaks.</p> <p><b>Sniffing method</b>: The first step is the detection using hand-held VOC analysers measuring the concentration adjacent to the equipment (e.g. by using flame ionisation or photo-ionisation). The second step consists of bagging the component to carry out a direct measurement at the source of emission. This second step is sometimes replaced by mathematical correlation curves derived from statistical results obtained from a large number of previous measurements made on similar components.</p> <p><b>Optical gas imaging methods</b>: Optical imaging uses small lightweight hand-held cameras which enable the visualisation of gas leaks in real time, so that they appear as 'smoke' on a video recorder together with the normal image of the component concerned to easily and rapidly locate significant VOC leaks. Active systems produce an image with a back-scattered infrared laser light reflected on the component and its surroundings. Passive systems are based on the natural infrared radiation of the equipment and its surroundings</p>

VOC diffuse emissions monitoring	<p>Full screening and quantification of site emissions can be undertaken with an appropriate combination of complementary methods, e.g. Solar occultation flux (SOF) or differential absorption lidar (DIAL) campaigns. These results can be used for trend evaluation in time, cross checking and updating/validation of the ongoing LDAR programme.</p> <p><b>Solar occultation flux (SOF):</b> The technique is based on the recording and spectrometric Fourier Transform analysis of a broadband infrared or ultraviolet/visible sunlight spectrum along a given geographical itinerary, crossing the wind direction and cutting through VOC plumes.</p> <p><b>Differential absorption LIDAR (DIAL):</b> DIAL is a laser-based technique using differential adsorption LIDAR (light detection and ranging) which is the optical analogue of sonic radio wave-based RADAR. The technique relies on the back-scattering of laser beam pulses by atmospheric aerosols, and the analysis of spectral properties of the returned light collected with a telescope</p>
High-integrity equipment	<p>High-integrity equipment includes e.g.:</p> <ul style="list-style-type: none"> <li>— valves with double packing seals</li> <li>— magnetically driven pumps/compressors/agitators</li> <li>— pumps/compressors/agitators fitted with mechanical seals instead of packing</li> <li>— high-integrity gaskets (such as spiral wound, ring joints) for critical applications</li> </ul>

## 1.20.7. Other techniques

Techniques to prevent or reduce emissions from flaring	<p><b>Correct plant design:</b> includes sufficient flare gas recovery system capacity, the use of high-integrity relief valves and other measures to use flaring only as a safety system for other than normal operations (start-up, shutdown, emergency).</p> <p><b>Plant management:</b> includes organisational and control measures to reduce flaring events by balancing RFG system, using advanced process control, etc.</p> <p><b>Flaring devices design:</b> includes height, pressure, assistance by steam, air or gas, type of flare tips, etc. It aims at enabling smokeless and reliable operations and ensuring an efficient combustion of excess gases when flaring from non-routine operations.</p> <p><b>Monitoring and reporting:</b> Continuous monitoring (measurements of gas flow and estimations of other parameters) of gas sent to flaring and associated parameters of combustion (e.g. flow gas mixture and heat content, ratio of assistance, velocity, purge gas flow rate, pollutant emissions). Reporting of flaring events makes it possible to use flaring ratio as a requirement included in the EMS and to prevent future events. Visual remote monitoring of the flare can also be carried out by using colour TV monitors during flare events</p>
Choice of the catalyst promoter to avoid dioxins formation	<p>During the regeneration of the reformer catalyst, organic chloride is generally needed for effective reforming catalyst performance (to re-establish the proper chloride balance in the catalyst and to assure the correct dispersion of the metals). The choice of the appropriate chlorinated compound will have an influence on the possibility of emissions of dioxins and furans</p>

Solvent recovery for base oil production processes	<p>The <b>solvent recovery</b> unit consists of a distillation step where the solvents are recovered from the oil stream and a stripping step (with steam or an inert gas) in a fractionator.</p> <p>The solvents used may be a mixture (DiMe) of 1,2-dichloroethane (DCE) and dichloromethane (DCM).</p> <p>In wax-processing units, solvent recovery (e.g. for DCE) is carried out using two systems: one for the deoiled wax and another one for the soft wax. Both consist of heat-integrated flashdrums and a vacuum stripper. Streams from the dewaxed oil and waxes product are stripped for removal of traces of solvents</p>
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## 1.21. Description of techniques for the prevention and control of emissions to water

### 1.21.1. Waste water pretreatment

Pretreatment of sour water streams before reuse or treatment	Send generated sour water (e.g. from distillation, cracking, coking units) to appropriate pretreatment (e.g. stripper unit)
Pretreatment of other waste water streams prior to treatment	To maintain treatment performance, appropriate pretreatment may be required

### 1.21.2. Waste water treatment

Removal of insoluble substances by recovering oil.	<p>These techniques generally include:</p> <ul style="list-style-type: none"> <li>— API Separators (APIs)</li> <li>— Corrugated Plate Interceptors (CPIs)</li> <li>— Parallel Plate Interceptors (PPIs)</li> <li>— Tilted Plate Interceptors (TPIs)</li> <li>— Buffer and/or equalisation tanks</li> </ul>
Removal of insoluble substances by recovering suspended solid and dispersed oil	<p>These techniques generally include:</p> <ul style="list-style-type: none"> <li>— Dissolved Gas Flotation (DGF)</li> <li>— Induced Gas Flotation (IGF)</li> <li>— Sand Filtration</li> </ul>
Removal of soluble substances including biological treatment and clarification	<p>Biological treatment techniques may include:</p> <ul style="list-style-type: none"> <li>— Fixed bed systems</li> <li>— Suspended bed systems.</li> </ul> <p>One of the most commonly used suspended bed system in refineries WWTP is the activated sludge process. Fixed bed systems may include a biofilter or trickling filter</p>
Additional treatment step	A specific waste water treatment intended to complement the previous treatment steps e.g. for further reducing nitrogen or carbon compounds. Generally used where specific local requirements for water preservation exist.







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