VDA | German Association of the Automotive Industry

Comments on PFAS restriction proposal

VDA 2023

#wirsindbereit

The German Association of the Automotive Industry (VDA) consolidates about 650 manufacturers and suppliers under one roof. The members develop and produce cars and trucks, software, trailers, superstructures, buses, parts and accessories as well as new mobility offers. We represent the interests of the automotive industry and stand for modern, future-oriented multimodal mobility on the way to climate neutrality. The VDA represents the interests of its members in politics, the media, and social groups. We work for electric mobility, climate-neutral drives, the implementation of climate targets, securing raw materials, digitization and networking as well as German engineering. We are committed to a competitive business and innovation location. Our industry ensures prosperity in Germany: More than 780,000 people are directly employed in the German automotive industry. The VDA is the organizer of the largest international mobility platform IAA MOBILITY and of IAA TRANSPORTATION, the world's most important platform for the future of the commercial vehicle industry.

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Executive Summary

On February 7th, 2023, the European Chemicals Agency (ECHA) published a proposal to restrict the manufacture, placing on the market and use of at least 10,000 per- and polyfluoroalkyl substances (PFAS). The proposed restriction was prepared by authorities in Denmark, Germany, the Netherlands, Norway, and Sweden in accordance with the EU chemicals act REACH.

The chemical substance group of PFAS ranges from gases to polymers with greatly varying classifications in terms of risks to the environment and public health. A homogeneous substance group of PFAS – as assumed in the restriction proposal – does not exist in the various products and materials.

Due to their unique characteristics, PFAS are utilized in the automotive industry: from lithium-ion accumulators to electronics, elastomers, lubricants and means in tire production processes.

The vast majority of PFAS parts used in the automotive industry are made of fluoropolymers which are classified by the OECD as ‘polymers of low concern’ (PLC), as they do not lead to a hazardous risk for human health and the environment. However, despite the classification as PLC’s, these fluoropolymers are intended to become subject to the extensive restriction with regard to manufacture, placing on the market and use by the present restriction proposal.

Emissions or spillage of polymeric PFAS into the environment, in particular ground water, during their utilization in the automotive industry can be ruled out extensively and limited to malfunctions and accidents only. During the manufacture of components from polymeric PFAS, the substances are treated exclusively in closed manufacturing facilities. When installed in vehicles and operating in the traffic, they are embedded in a material matrix with a strong chemical bonding not allowing any exposure, and after end-of-life treatment decomposed into volatile fluorine compounds, which are extracted from exhaust gas via e.g. gas scrubbers. This prevents uncontrolled release of polymeric PFAS into the environment.

The spare parts market for current vehicles as well as future vehicle technologies (e.g. E-Mobility) and production technology are unthinkable without these PFAS products or materials according to the current state of technology.

The automotive industry is working continuously to minimise the environmental impact of PFAS and, in the case of those considered hazardous, to switch as quickly as technically possible if a substitute – identified by a continuous review process – is available and if it is economically feasible. These changes - in almost any case - have numerous implications on technologies being applied, quality, lifetime constraints and design of the systems being involved. Due to these implications sufficient lead-time for analysis, research and development and conversion to potential new solutions is required and has to be taken into account to balance technology changes and environmental benefit. Unfortunately, this balanced approach is not applied in the published proposal.

In several cases, there is no technical solution for a substitute now available and there is no foreseeable in the near or midterm future. If technically feasible at all, such substitutes are generally only be implementable on a long-term basis. PFAS will have to be used in the

future in order not to jeopardize future technologies as E-Mobility, e. g. the lithium-ion battery as a centre element for a CO_2-neutral transformation of the automotive industry.

Also, a ban with an impact on the spare part business for current vehicles could lead to a high number of scrapping vehicles, as a repair would no longer be possible.

The broad, undifferentiated restriction of PFAS as currently proposed would severely impact the utilization of alternative drivetrains required for the goal of the European Green Deal (EGD). In addition, the actual approach would endanger the private and public investments to build up essential value chains for climate technologies. Without hazardous risk-based exceptions and modifications, the actual proposal would endanger achieving the goals of climate protection under the EGD in the European Union.

It must also be noted that the automotive industry is in a difficult phase of transformation towards alternative drive technologies. Due to the CO2-fleet regulation, cars and vans with combustion engines including plug-in hybrids will be phased out anyway. Large investments in vehicles with combustion engines forced by a PFAS-phase out as proposed are not economically justifiable and disproportionate in view of the remaining short runtime and the required phase-in time of PFAS-free ICE-cars.

Also must be noted that high investments are already needed to implement the EU 7 emissions standard to further reduce emissions significantly. All major investments into ICE technology are at the expense of electrification and the development of the associated charging infrastructures. For this reason, it must be ensured that additional regulations for vehicles with combustion engines are reduced to an absolute minimum and required exceptions for the combustion engine and drivetrain are considered.

In our assessment, it is strongly recommended that the PFAS substances receive individual risk-based assessments. As stated already today in Article 68 (1) of the REACH regulation (EC/1907/2006) the criteria of “unacceptable risk to human health and the environment” will have to be thoroughly investigated for each substance (see chapter 2).

A socio-economic study in 2023 on lithium-ion batteries, fuel cells and power electronics conducted by Vindelici Advisors AG on behalf of the German Association of the Automotive Industry comes to the conclusion that in 2027 alone, a 3-digit billion amount euro of added value in the EU will be lost if the proposed restriction would be effective and in force without exceptions, reasonable lead-time and other adjustments.

Against this background, the automotive industry advocates for a reasonable, responsible, sophisticated and risk-balanced handling of PFAS and proposes the following **5 steps as staged approach**:

- **1. Phase-out roadmap**: PFAS that possibly pose **high risks for humans and the environment** and for which substitutes with comparable characteristics are available today, can and should be continuously substituted – as it is already the current practice (see chapter 5). Lead-time requirements for redesign and new developments should be taken into account.

- **2. Review process**: PFAS that cannot yet be substituted as there is **no state of the art or technology** available. Here, we campaign for a review process defined by the legislator, as is successfully conducted by the industry within the framework of the end-of-life vehicle directive with heavy metals such as lead (see chapter 3.1).

- **3. Exemption for fluoropolymers**: Fluoropolymers required for the fulfilment of the **EGD**, which are used, for example, in lithium-ion accumulators, fuel cells and electronics or existing powertrain technologies, shall be completely exempted from the restriction due to the low concerns associated with them (see chapter 2).

- **4. Exemption for spare parts relevant for transport vehicles and machinery as well as remanufactured parts:** an exemption for spare parts according to the ‘repair as produced’ principle, which is widely accepted in the European Union, and the possibility of re-marketing of used vehicles, machines and their parts is of decisive importance in view of the European waste hierarchy (see chapter 3.2).

- **5. Openness to innovation**: Within a defined process utilization of PFAS in future technologies and applications shall be enabled if it is essential for the society and risks can be adequately controlled (see chapter 3.1.1).

1 Introduction

A wide variety of different chemicals like Per- and polyfluorinated alkyl substances (PFAS) is required along the supply chains for the manufacture, maintenance and repair of automobiles.
In order to meet today's and tomorrow's requirements for automobiles in terms of climate, environment and health protection as well as recyclability, quality and reliability, many PFAS are indispensable due to their unique chemical and physical properties.

Climate, environment, and health protection
Undisputable, the protection of the climate and environment are two sides of the same coin and has a positive impact of the health of humans. The IPCC-reports have already worked out, that climate change has tipping points that trigger mechanisms that can no longer be stopped and have far-reaching effects on the environment. Scientists speak of tipping points or tipping elements. The higher the global temperature increase, the more the climate system is affected, so that after a certain point, despite great efforts, a reversal process is no longer possible. Examples of tipping points are the melting of ice, the death of coral reefs and the thawing of permafrost, loss of forests in the tropics and the north as well as the loss of biodiversity. These changes in climate and environment would have huge impact on the health of humans. Therefore, the world community put climate protection on the top of environment policy agenda to strengthen its efforts to reduce the emission of greenhouse gases. In this context, the German automotive industry is also taking up the challenge of climate protection. Our goal is to achieve climate-neutral mobility in Europe by 2050 at the latest - in line with the Paris climate protection agreement. This should stay the top priority.
Chemicals for high-tech applications, like some PFAS, will be used more often to succeed the transition to electric mobility. At the same time, the bans, restrictions and communication requirements for the use of chemical substances are increasing which could jeopardize or at least significantly hinder the transition to a climate-friendly mobility.

Design for sustainability
The automotive industry is committed to resource-saving and to reducing the carbon footprint of vehicles. In order to comply with this obligation, the widest possible variety of substances must be available. PFAS in particular play a decisive role here due to their outstanding properties.

The main focus in reducing the carbon footprint of a vehicle over its life cycle is the use phase. A passenger car is used for 15-22 years and driven an average of 200,000 km. During this time, the largest amount of CO2 is emitted by a classic combustion engine vehicle. The reduction of CO2 emissions in the use phase can only be achieved by using CO2-neutral energy. Battery electric vehicles have the greatest potential for CO2 reduction due to their high efficiency and increasing availability of renewable electricity from wind and solar energy.

In the coming years, the introduction of alternative drive technologies based on the use of renewable energies will lead to a shift in the CO2 hotspot from the use phase to the production and material supply chain of a vehicle with its approximately 7,000 components and parts.

The German automotive industry's strategy for reducing its carbon footprint therefore goes far beyond the product's use phase and considers the entire life cycle of a vehicle, from raw materials to manufacturing and recycling. This holistic view of all stages of the value chain and their environmental impact is reflected in the automotive industry's "design for sustainability" strategies. Vehicles are manufactured in a resource-conserving way, emit less and less emissions during their lifetime, can be used for a long time, can be repaired during the lifetime and can be recycled in an environment-friendly manner after the lifetime.

Quality and reliability
Due to the public focus on the transformation to electric mobility, the importance of quality and reliability important are often underestimated. They are closely linked to durability and repairability and are a key element in the described sustainability strategy.

The trend for repair work has been declining for many years, from 0.86 in 2002 to 0.40 in 2022. This is not only due to the lower mileage, but also to the ever-improving quality of transport vehicles. In 2022, just under one third of all car owners had carried out a wear-and-tear repair.[1]

Especially fluoropolymers support to achieve these goals to increase the durability of transport vehicles and reduce maintenance costs. PFAS increases the reliability, as the unique properties comparatively produce less problems than alternatives.

[1] Deutsche Automobil Treuhand GmbH (DAT) (2023): DAT-Report 2023; p. 64, 80

2 General remarks on the scope of restriction regarding fluoropolymers

The scope of the proposed restriction comprises lots of fluoropolymers, such as PTFE or PVDF, which are classified as 'polymers of low concern' by the OECD. This institution admittedly defines the group of PFAS in accordance with the draft proposal but points out that 'the term PFAS is a broad, general, non-specific term, which does not inform whether a compound is harmful or not'[2]. The fluoropolymers which are classified as PLCs are not considered a hazard for public health or the environment. That means those PLCs do not meet the requirements defined by Article 68 (1) of the REACH regulation as empowering statute. The legal preconditions for a ban of fluoropolymers are not fulfilled.[3]

A scientific study[4] addressing blanket risk assessment of PFAS concludes that 'all PFAS should not be grouped together, persistence alone is not sufficient for grouping PFAS for the purposes of assessing human health risk, and that the definition of appropriate subgroups can only be defined on a case-by-case manner'.

Another study[5] about the fluoropolymers PTFE, ETFE, FEP and PFA illustrates that several of these substances are to be regarded as immobile, unable to be accumulated biologically, water-insoluble, and not toxic. Additionally, they exhibit a negligible concentration of monomers.

Furthermore, there is a study[6] showcasing that lots of fluoropolymers, such as PVDF and FKM, meet the PLC criteria implicating that utilizing them does not raise expectations of impact on public health or the environment.

Also dry and liquid Lubricants are containing Polymers of Low Concern (including PFPE Oils) and shall be completely exempted. Also often used PFPE Oils fulfil the criteria as Polymer of low concern. PFPE are high molecular weight polymers, molecules are bigger than 10.000 Da, it is not soluble in water, not bioavailable, not toxic and fall outside the definition of hazardous products, both for human and for the environment. On the other hand, such PFAS lubricants present an outstanding and benign value for the functioning, developing and protecting society, humans and the environment.

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[2] see OECD Publication: Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances: Recommendations and Practical Guidance Series on Risk Management No.61, 09.07.21

[3] According to Pache 2018 (In: Koch/Hofmann/Reese, Environmental Law, 5th edition 2018, sub. para 112) the material legal prerequisites for the adoption of new restrictions and the amendment of existing restrictions are regulated by Art. 68 (1) REACH Regulation. New restrictions shall be adopted or existing restrictions amended if the manufacture, use or placing on the market of a substance entails an unacceptable risk to human health or the environment that requires Union-wide management, taking into account the socio-economic impact of a restriction and the availability of alternatives. Whether a risk is no longer adequately controlled is determined in accordance with section 6.4 of Annex I to REACH, as in the authorisation decision. According to this, Union-wide treatment in the sense of risk reduction measures at EU level is required if, in addition to the measures already taken, effective protective measures for humans and the environment can only be taken through uniform provisions.

[4] "Grouping of PFAS for human health risk assessment: Findings from an independent panel of experts" J.K. Anderson et al., Regulatory Toxicology and Pharmacology, 2022

[5] "A Critical Review of the Application of Polymer of Low Concern and Regulatory Criteria to Fluoropolymers", Barbara J Henry et.al., 2017, Integrated Environmental Assessment and Management — Volume 14, Number 3—pp. 316–334

[6] "A Critical Review of the Application of Polymer of Low Concern Regulatory Criteria to Fluoro-polymers II: Fluoroplastics and Fluoroelastomers" S. H. Korzeniowski et.al., Integrated En-vironmental Assessment and Management · June 2022

Manufacturing of fluoropolymers
The fluoropolymer industry is committed to responsible manufacturing. Responsible Manufacturing is the specific answer to the concerns related to the potential emission risk related to the production process of PFAS. Several national and EU legislations set strict limit values and environmental standards, such as the European Union's Industrial Emissions Directive (IED) which effectively regulates emissions during the manufacture of fluoropolymers. From our point of view, the fluoropolymer industry is one of the most monitored industries in terms of environment and emissions. In the manufacturing process and in the management of environmental emissions, the most modern technologies are used, which are constantly being optimized and further developed on a voluntary basis by the industry. PFAS chemicals should be treated as safe, if used strictly in a manufacturing process where its occupational and environmental release can be controlled.

So-called polymerization aids are required to produce the fluoropolymers. There are also increasing numbers of PFAS-free polymerization aids available. But certain polymerization aids are still required on the basis of PFAS for a very small part of fluoropolymers, otherwise the final properties of the end product will not be achieved. Fluoropolymer companies continue investigating and developing R&D programs for the advancement of technologies allowing for a full transition away from using PFAS-based polymerization aids during fluoropolymer production. However, during this transition, for a very small part of fluoropolymers, it may be necessary to continue using fluorinated polymerization aids until non PFAS polymerization aids or new polymerization technologies are developed.

Vehicle production
An emission of fluoropolymers into the environment does not occur during the responsible manufacturing process of parts and vehicles in the automotive industry. This is limited to malfunctions and accidents.

Utilization
An emission of fluoropolymers into the environment does not occur during the appropriate use of the vehicles. This is limited to malfunctions and car accidents which will however generally not lead to the spillage of fluoropolymers into the environment.

Recycling
At the end of a vehicle's life cycle, the vehicles are dismantled and recycled in an environmentally sound manner. After acceptance of the end-of-life vehicles at a certified dismantling facility, the vehicles are drained of all liquids, collected and recycled properly. Subsequently, useable spare parts, the traction battery and components containing pollutants such as the starter battery are removed before the remaining body is pressed and taken to the shredding plant. After shredding the car bodies (along with other consumer items such as refrigerators), the materials are sorted and sent to the specific material loops. Materials that cannot be recycled (often plastics, rubber, glass) are thermally recycled. This is already regulated in different waste and recycling regulations in the EU.

The recycling process for machines and production systems takes place in a similar way: at the end of the life cycle of a production system, the machines are dismantled and recycled in an environmentally friendly manner. The machines are freed from all liquids by a certified dismantling company, which are then professionally recycled and then the dismantling begins. Usable spare parts and components containing harmful substances such as batteries are separated before the final scrap metal is removed and then professionally shredded. After shredding, the materials are sorted and fed into the respective material cycles. Materials that cannot be recycled are incinerate for energy recovery.

This ensures that components containing PFAS are also handled properly in the recycling phase. They are either properly disposed of and reprocessed, reused (e.g. as used spare parts) or completely decomposed due to the high temperatures in the thermal incinerators. The resulting fluorine compounds are removed via gas scrubbers.[7]

In addition, a chemical process already exists for fluoropolymers that can close the product cycle of the chemicals via upcycling. In this process, they are decomposed into gaseous monomers via pyrolysis. These can then be captured, purified and reused for the production of new polymers without any loss of quality.[8]

The blanket restriction of fluoropolymers is unjustified due to the classification as PLCs and the fact that normally no fluoropolymers or their fluorinated degradation products are emitted into the environment during their manufacture, utilization and energetic recovery. Therefore, the legal requirement of unacceptable risk to human health or the environment as specified in Article 68 (1) of REACH is not fulfilled.

For this reason, the German Association of the Automotive Industry demands an exemption from the PFAS restriction for all fluoropolymers that do not pose a risk for public health or the environment.

[7] Gehrmann et al. (2023): Pilot-Scale Fluoropolymer Incineration Study: Thermal Treatment of a Mixture of Fluoropolymers under Representative European Municipal Waste Combustor Conditions
[8] https://www.chemanager-online.com/news/cycling-von-vollfluorierten-polymeren (last access: 24.05.2023)

3 Automotive specific exemptions

3.1 Review of automotive specific exemption for Fluoropolymers

Text proposed by Annex XV Report	*Amendment*
No exemption The following potential exemption are marked for reconsideration after the Annex XV report consultation: 6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF]	6.o. applications affecting the proper functioning **or** safety of transport vehicles, **or** affecting the safety of operators, passengers, or goods**. This exemption shall apply perpetually but may be reviewed and reassessed by the Commission no later than** 13.5 years after EiF.

Justification (VDA):

In the Annex E 'impact assessment' of the draft restriction proposal of February 7th 2023, the authorities concluded on the relevance of the proper functioning of transport vehicles and the safety of passengers:

*"It is concluded that a 12 year derogation could be appropriate for PFAS use in transport (including automotive, aircraft, rail, marine, and aerospace industries) where the substances are needed to **ensure proper functioning and safety of the vehicles**, operators, passengers or goods."*

The relevance of a derogation for the automotive industry has been recognized. However, the formulation in the derogation dismissed the impacted "proper functioning" and left alone the safety part. It depends on further information provided by the automotive industry:

"A derogation might be proposed at a later stage if additional information on (eg.) the rationale for continued PFAS use in specific applications and the quantities of PFAS used in those applications is provided."

In the next paragraphs we want to give answers to this request:

Quantities of Fluoropolymers in transport vehicles

Based on the collected data of the declarable fluoropolymers and perfluoropolyether in the automotive industry, **we estimate that 15-20% of the parts in a vehicle are directly or indirectly affected, however quantities of these PFAS in the whole vehicle are estimated far below 0.03% in weight** excluding the specific topics towards the transformation of the automotive industry to electric vehicles such as battery and fuel cell, detailed in chapter 3. Normally no fluoropolymers or their fluorinated degradation products are emitted into the environment during the appropriate use of the vehicles.

This is limited to malfunctions and accidents. Details to the whole life-cycle of fluoropolymers are explained in chapter 2.1.

Function of Fluoropolymers in transport vehicles

A vehicle consists of around 5,000 to 7,000 parts and a much larger number of subcomponents which must meet high standards and satisfy high quality requirements. These include guaranteed vehicle safety, reliability under large temperature fluctuations, flame retardancy and high durability over the whole lifecycle of 15 to 22 years.

The airbag system is one example besides other for a safety-relevant component in the vehicle. Airbag modules contribute to the passive protection of the occupants. The central component of the airbag is the gas generator, which is responsible for the defined filling of the airbag. To trigger the gas generator, an igniter is required. In pyrotechnics, mixtures of specific fluoroelastomers are used as binders for the energetic components of pyrotechnics. Currently, there exists no PFAS-free pyrotechnics in the igniter.

Safety is not the only top priority; proper functioning also plays a major role in meeting these criteria for the vehicle's reliability and longevity.

It is important to highlight that proper functioning only related to safety is not sufficient as following examples show: Brakes could be seen as an safety issue in first place. However, the hydraulic hoses, which carry the brake fluid to the brakes, are connected to the brakes using PTFE seals. These seals must be stable with respect to brake fluid and withstand the high temperatures that can occur at the brakes. In addition, dirt must be prevented from entering and long-lasting durability must be guaranteed. This results more in an application that allows the proper functioning (of the brakes).

Also crash reducing elements can be seen as of safety relevance. However, how to judge on PTFE-containing laquers allowing the steering column to collapse in a controlled manner in the event of a frontal crash. This gliding property must continue to function even after many years and must not be affected by condensation and higher temperatures. If gliding capacity is insufficient or is lost, the steering column cannot collapse in the event of a crash, which results in a high risk of injury to the driver. But the PTFE-containing laquer in normal use case (without a crash) must be seen as application for the proper functioning.

A transport vehicle naturally includes many moving parts that must last many years under partly harsh climate conditions. Screws seem minor but play a major role with support of PFAS. For example, screw threads on the axle support are coated with PTFE. This prevents the accumulation of welding beads and welding slag and enables defined fixing (threshold torque & re-tensioning angle) of the screws. As a result of safety requirements, axle supports have the highest standards in terms of bolting quality. If dirt gets in and is not properly screwed, there is a risk of loosening of the screws and ultimately disintegration of the axle, which can lead to serious accidents. A replacement for the PTFE coating has not yet been found.

Also fuel hoses are coated with fluoropolymer at critical points (connection to the engine). Reason: Thermal stability even near the engine, chemical stability compared to fuel vapors, prevention of fuel vapor emissions (compliance with EVAP legislation). As potential alternatives, metal pipes have already been tested, but are not as flexible mechanically (cornering, braking, acceleration) and are therefore more susceptible to wear, acoustically insensitive and are also more easily damaged in the event of a crash than flexible plastic hoses. Also under normal conditions, the proper functioning together with the fulfillment of regulation stands at first place, safety is relevant in crash situation.
Again seals allow the proper functioning of moving parts such as the universal joint of the steering column. It must be properly protected against dirt and elevated temperatures in the area of the universal joint (engine waste heat, especially in the turbocharger and

exhaust system area of right-hand drive vehicles) to avoid any entire steering system immediately to block. Also, durable and tight seals are required on the transmission and output of the axle stabilizer, which do not become brittle and reliably prevent dirt from entering over many years. Because of the installation location, maintenance-free operation is required. If dirt gets into the stabilizer, its functionality is limited to such an extent that an average driver can barely keep the vehicle under control when cornering. Only fluoropolymers meet the requirements for these seals.

All these moving parts require the proper functioning under normal circumstances.

Requirement of monitoring and review period

Vehicles have to meet many requirements in terms of quality, comfort, legal requirements etc., which today can only be fulfilled with fluoropolymers. The quantity of fluoropolymers used in relation to the components is usually very small. However, a large number of components are affected, some with very specific functions.

The search for substitutes without serious loss of performance and durability is a time-consuming process and it is unlikely that many of them can be replaced.

Instead of a fixed restriction date, we propose, based on these principles of evidence-based policymaking (COM/2021/219 final)[9], to monitor and review frequently the fluoropolymers in transport vehicles with the aim to control fluoropolymers and prevent their release into the environment, to facilitate Circular Economy and to avoid the disposal of hazardous waste.

In particular, the manufacturing and use of materials and components, which contain PFAS, should be restricted, if there is a risk of release into the environment. For fluoropolymers, this danger does not usually exist. Before a strict ban on fluoropolymers in the automotive industry shall come into force, this should first be reviewed, as:

- their small amount (see ‘quantities of PFAS’),
- minor risk for environment and human (see ‘Function of Fluoropolymers in transport vehicles’)
- current lack of equivalent substitutes and (see specific examples below)
- social-economic consequences (see study ‘PFAS and Future Technologies: A Socio-Economic Impact Assessment’).

The applications in the automotive industry e.g. can be defined in a separate list and shall be regularly reviewed by the European Commission:

> The Commission shall review the defined applications from section 4 together with the automotive industry on a regular basis within 13,5 years after entry into force. The result of the review should be based on the availability of substitutes, an assessment of the risks of possible emissions into the environment and the socio-economic impact. For the identification of PFAS applications in the automotive industry existing monitoring processes e.g SCIP Database which can be extent to PFAS can be used.
>
> (i) as necessary, establish maximum concentration values up to which the existence of the substances in specific materials and components of vehicles shall be tolerated;
>
> (ii) exempt certain materials and components of vehicles if there is no risk of release into the environment.

[9] COM/2021/219 final (2019): COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Better regulation: Joining forces to make better laws

(iii) delete materials and components of vehicles from the list if the use of these substances is avoidable and if there is a risk of release into the environment. In cases in which the scrutinized process shows that development and industrialisation of alternatives cannot be achieved, the uses of these polymers of low concern should receive an unlimited derogation. The automotive industry has typical development cycles of 4-5 years and production cycles of 7-12 years and periods of use of machines and systems of 15 - 25 years. A review period latest 13.5 years is reasonable to monitor and review the technical progress.

3.1.1 Future uses of PFAS in new technologies

Text proposed by Annex XV report	*Amendment*
No exemption	5.ff. product and process orientated research and development 5.ff PFAS that represent new technologies with significant benefits if it can be demonstrated that no substitute is available and that the risk to human health and the environment is manageable in accordance with the requirements for the authorisation of substances. This exemption shall be reviewed and assessed by the Commission no later than 13.5 years after EiF
Justification (VDA): Due to the unique properties of PFAS, it cannot be ruled out that they may have further effectiveness and efficiency potentials in many applications. Due to the substance ban, it is to be expected that no more PFAS substances will be available within the supply chain for research and development activities and thus development activities will be hindered. Possible potentials can thus no longer be identified within the EU, which could be a stagnation or even regression for e.g. climate-relevant applications. A migration of all R&D activities to non-European countries is to be expected and Europe is in danger of excluding itself from technological progress.. Even if new technologies were then developed in non-European countries, they could not be used within the EU due to the PFAS substance ban. For this reason, a process must be described for new socially relevant applications of PFAS that evaluates and then legitimizes the benefits of the application, taking into account risks to the environment and human health.[10]	

[10] ECHA (2021): How to apply for authorisation. Source: How to apply for authorisation - ECHA (europa.eu) (last access: 1.8.2023)

3.2 General exemption of used vehicles and spare parts

3.2.1 Used vehicles

Text proposed by Annex XV report	*Amendment*
No exemption	5.xy. transport vehicles already placed on the market for the first time
Justification (VDA): The ECHA Q&A on the draft PFAS restriction on 5th of April 2023 answered the question 'Will the restriction apply to products that were in the market before the entry into force?' with 'No'. The proposed restriction relates to placing on the market and not to products already on the market. Consumers will not have to discard PFAS-containing products they already have. Companies will not have to get rid of equipment already used. It's important to note that second-hand products will fall under the restriction, if they are placed on the market.' This would mean that under the draft PFAS restriction a consumer would be allowed to sell his used car to another consumer (depending on whether this is not considered placing on the market, see ECHA reply), but a used car seller could no longer sell a used car to a consumer (second hand market). According to figures from the German DAT/KBA[11], 5.6 million cars were sold second hand at an average price of 18,800 € in 2022. Many consumers sell their car to the brand dealer when buying a new car (incl. cars from another brand). Thus, 38 % of used cars are sold by brand dealers, 36% by used car dealers and 26% are sold on the open market (consumer to consumer). Considering ECHA's response, at least 74% of the total market with a turnover of 106 billion € will be gone and millions of properly functioning cars (and other transport vehicles) would be ready to be dismantled/recycled.	

3.2.2 Spare Parts

Text proposed by Annex XV report	*Amendment*
No exemption	5.xy. spare parts and remanufactured parts, whenever placed on the market, for use in the maintenance and repair of transport vehicles already placed on the market for the first time
Justification (VDA): Maintenance and repair are important factors in a vehicle's life cycle of the 15 to 22 years. It is economically and technically not feasible to phase out the substances in Legacy Spare Parts. Spare parts for vehicles must meet the performance demands of the original part and function identically with associated systems and components to make sure that the function and safety of the vehicle is not adversely affected. The technical performance defined for these spare parts may be linked to their chemical composition. To guarantee the technical performance of the individual parts and interaction with other components an adverse chemical reaction should be avoided. The geometry of the spare parts needs to be identical to the original part	

[11] Deutsche Automobil Treuhand GmbH (DAT) (2023): DAT-Report 2023

in order for the components to physically fit into the required space. Interchangeability must be ensured.

Furthermore, the use of remanufactured components as spare parts is widely common in the automotive sector. Such parts are offered by vehicle manufacturers, automotive suppliers, and independent specialized remanufacturers. In practice, an entire ecosystem was established ensuring that worn-out or defect parts (product, sub-assembly or component / article), find their way back to remanufacturing plants via specialized logistic operators and parts selection centres. After an industrialised remanufacturing process consumers can enjoy affordable spare parts with full warranty while meeting all specifications as defined for the original part.

With a sales volume of €4.6 billion at supplier level remanufactured vehicle parts represent about 5% of the entire spare part market in the EU with about 800 kt CO2eq saved per annum compared to the production of new parts. With the increased shift to electric vehicles a much higher share of components for the repair of vehicles will be remanufactured. Electric propulsion systems consist of high value components with relevant raw material content which are predetermined for circular use via remanufacturing. This includes among others electric motors, inverters, and battery management systems.

Therefore, in the interest of a flourishing circular economy it is relevant that all products which are already in the market can be remanufactured without any restrictions or conflicts with other regulations. The current proposals for PFAS-Ban will no longer allow existing processes for remanufacturing with the consequence to make the circular use of components impossible or economically no longer feasible.

The issue of spare parts has been addressed in the End of life Vehicle Directive (2000/53/EC) in 2005 with the Council Decision 2005/438/EC. Preconsideration (2) states: “As product reuse, refurbishment and extension of lifetime are beneficial, spare parts need to be available for the repair of vehicles which were already put on the market on 1 July 2003”. Subsequently, all new material restrictions in the ELV Directive have a ‘repair as produced’ exemption for spare parts that were not originally designed to be compliant with the new material restrictions. This argumentation is widely accepted within authorities and has been used e.g. in the phthalate-restriction REACH Annex XVII Entry 51.

4 Review of specific applications for PFAS

As described in chapter 3.1 vehicles must meet many requirements in terms of quality, comfort, legal requirements. With the universal PFAS-Ban, proposed by the current Annex XV report many components are affected, some with very specific functions. The search for substitutes without serious loss of performance and durability is a time-consuming process and it is unlikely that many of them can be replaced.

Instead of a fixed restriction date, we propose, based on these principles of evidence-based policymaking (COM/2021/219 final)[12], to monitor and review frequently the fluoropolymers in transport vehicles with the aim to control fluoropolymers and prevent their release into the environment, to facilitate Circular Economy and to avoid the disposal of hazardous waste.

The Commission shall review the applications defined in this chapter together with the automotive industry on a regular basis within 13.5 years after entry into force.

The defined applications are:

- Lithium-ion batteries
- Fuel cell
- Electrical and electronic components
- Technical textiles
- Seals and hoses
- Lubricants
- Automotive Vents based on PTFE membranes
- Manufacturing processes

4.1 Lithium-Ion Batteries

Text proposed by Annex XV report	*Amendment*
No derogation	5.xy1. Additives for electrolytes for lithium-ion batteries for transport vehicles. This exemption shall apply perpetually, but may be reviewed and assessed by the Commission no later than 13.5 years after EiF 5.xy2. Batteries for transport vehicles for repurpose use e.g., as energy storage devices 6.xy. Applications for the production of lithium-ion batteries for transport vehicles, e.g., binder for the coatings of the electrodes. This exemption shall be reviewed and assessed by the Commission no later than 13.5 years after EiF

[12] COM/2021/219 final (2019): COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Better regulation: Joining forces to make better laws

Justification (VDA):
6.xy.
The cathode of a Lithium-ion battery (LIB) cell is produced with a metal oxide or phosphate powder (NMC, LFP) with the aid of a binder. All binders used in series production today consist of the fluoropolymer PVDF. Furthermore, PVDF is used as an adhesive layer to connect the separator and the electrodes. New, dry electrode coating processes that are conceivable in the future also require fluoropolymers (e.g. PTFE). Only fluoropolymers such as PVDF or PTFE have the necessary chemical, electrochemical and thermal stability to be used as a binder on the one hand and to meet the high requirements of a LIB cathode on the other hand. Scientific studies evaluating binders for lithium-ion batteries show that PFAS-free alternative binders lead to a significant deterioration in electrochemical overall performance with increasing cycle number.[13]
Sodium-based batteries that may be available in the future will also require PFAS-containing binders for the production of the cathode coating, as the chemistry and the requirements for the cathode are very similar to lithium-based batteries.

This is also mentioned in Annex E of the Annex XV dossier: "In several cases chemical stability in combination with higher temperature stability is requested, especially for battery and fuel cell venting and in automotive field."

The binder is removed together with the electrolyte components during recycling, usually thermally via pyrolysis, to produce the so-called blackmass (NMC). The resulting exhaust gas is purified, for example, in gas scrubbers. The step is necessary because organic components interfere with the subsequent hydrometallurgy. The undestroyed PVDF residues behave inert in the subsequent hydrometallurgy and thus end up in the filter cake, which consists mainly of graphite.
The filter cake is either further processed to recover the graphite or directly incinerated. In both cases, the binder is completely decomposed and the exhaust gases are cleaned by means of a gas scrubber.
In today´s LIB 15 – 50 g PVDF per kWh are used, depending on the power of the battery.

The planned short-term ban on fluoropolymers would make the required development of a competitive European battery production impossible and would hinder the rapid ramp-up of electric mobility.

The Socio-Economic Impact Assessment shows that, in case of a short-term ban by 2027, is expected to result in a net loss of roughly 144 billion Euros for the sales revenue of the automotive industry in Germany and 657 billion Euros for the European Union. These losses will continue to accumulate over time, reaching 1 trillion Euros in Germany and 6 trillion Euros in the European Union by 2035. By 2050, the projected losses should reach roughly 4 trillion Euros for Germany and staggering 18 trillion Euros across the European Union. These sales losses are associated with a corresponding massive loss of jobs in the automotive industry. The turnover and job losses in the case of temporary transitional periods depends on the length of the period and the success of the substitution of the PFAS.[14]

Fluoropolymers such as PVDF are relatively expensive materials and are only used where it is technically imperative. Their replacement is regularly reviewed by manufacturers for economic reasons. In the past, for example, the binder for the anode coating was changed from a fluoropolymer originally used to a cellulose-based system. Within the proposed review

[13] see Radloff et. al. (2022): Water-Based LiNi0.83Co0.12Mn0.05O2 Electrodes with Excellent Cycling Stability Fabricated Using Unconventional Binders. In: Journal of The Electrochemical Society Volume 169, Number 4 (source: open access; last access: 1.8.2023)
[14] VDA (2023): PFAS and Future Technologies. A Socio-Economic Impact Assessment (see confidential attachment)

period, the respective success of a substitution could be reviewed or reported to the authorities.

5.xy2.
While a battery's first life lasts for between 10-15 years, it still has a capacity of at least 75%. This means it can be repurposed for up to another 10 years in applications such as stationary energy storage. This is what is known as the battery's "second life".

If no exception is made for the re-use of used batteries as proposed in the battery regulation of the European Union, valuable resources and energy will be wasted and the principles of the circular economy will be violated[15].

5.xy1.
In the future, solid-state batteries using polymer electrolyte may become available as an alternative to today's LIBs for vehicles. But in medium term solid-state batteries for vehicles are a speculative technology and the material development is far from complete.
It is likely that PFAS, e.g. in polymer electrolytes, will also be needed for a good performance of the future solid-state batteries. LiTFSI, for example, is a promising substance for use as conducting salt in this polymer electrolytes.[16]
Ultimately, the testing of new materials to increase battery performance and secure competitive advantages for the fledgling production of batteries in Europe affects all types of vehicle batteries.
In today´s LIB 50 –150 g/kWh of the conducting salt $LiPF_6$ are used. At the present it is unclear whether this amount can be reduced when LiTFSI or Triflates are used.

In order to maintain the ability to innovate and thus make battery production in Europe possible, the use of new PFAS- applications, e.g. for additives, should continue to be permitted.
This exemption should be reviewed after a reasonable period. However, the period should be long enough, e.g. 13.5 years, to consolidate battery technology and battery production in Europe.

[15] Concerning the potential of used batteries for circular economy applications see for instance: Engel et. al (2019): Second-life EV batteries: The newest value pool in energy storage. In: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/second-life-ev-batteries-the-newest-value-pool-in-energy-storage (last access: 01.06.2023); Niese et. al. (2020): The Case for a Circular Economy in Electric Vehicle Batteries. In: https://www.bcg.com/publications/2020/case-for-circular-economy-in-electric-vehicle-batteries (las access: 01.06.2023); Iqbal et al. (2023): A survey of second-life batteries based on techno-economic perspective and applications-based analysis; Carbon Neutrality; open Access (last access: 01.06.2023)
[16] "Editors' Choice—Review—Innovative Polymeric Materials for Better Rechargeable Batteries: Strategies from CIC Energigune", Zhang et. al., 2019, Journal of the Electrochemical Society, IOPscience (last access: 24.05.2023)

4.2 Fuel Cell

Text proposed by Annex XV report	*Amendment*
6.e. proton-exchange membrane (PEM) fuel cells until 6.5 years after EiF;	6.xy. proton-exchange membrane (PEM) fuel cells, i.e. membrane electrode assembly (MEA), gas diffusion layer (GDL), microporous layers (MPL) and gaskets for the bipolar plates. This exemption shall apply perpetually, but may be reviewed and assessed by the Commission no later than 13.5 years after EiF

Justification (VDA):

The proposed derogation of 6.5 years is based on alleged substitutes for the membrane. While the proton conductivity of today's fluorine-free membranes is competitive for standard operation conditions, it is poor under dry operation compared to membranes using PFSA. The water transport rate of fluorine-free-membranes is reduced and thus strongly complicates adequate MEA wetting at the cathode inlet while electrode flooding might occur at the cathode outlet. Most important however is the mechanical durability over lifetime at standard operating temperatures which is far below the current material and a result of strong membrane swelling from water uptake and brittleness. Consequently, the membrane lifetime using substitute material is reduced 2-10 times. For mechanical reinforcement of membranes there is no substitute to ePTFE (expanded PTFE) yet. Only ePTFE has today the necessary mechanical durability, dimensional stability upon water uptake, and chemical inertness under highly acidic conditions and radical attack.

Binding the nanoscale active electrode materials and, at the same time, providing a porosity which guarantees the necessary pathways for water and gas transport and again chemical resistance are key requirements for the electrode materials. Especially the low gas permeability of fluorine-free ionomers causes performance losses compared to PFSA ionomers because oxygen cannot diffuse fast enough to the catalyst surface. Current substitutes show at least 30-40% lower performance (Cell voltage at 1.5 – 2 A/cm²).

The Gas Diffusion Layer (GDL) must guarantee the water, heat and gas transport in between bi-polar plates and catalyst coated membrane (CCM). The fine adjustment of hydrophobicity in the Micro Porous Layer (MPL) and Macro Porous Substrate (MPS) of the GDL realized by PTFE content, is a direct measure for the achievable current density of the fuel cell and thus the power density of the fuel cell stack. Recent research projects[17] pursued the goal to identify alternatives but found none.

Membrane, ionomer, electrodes and gas diffusion layer represent a systemic entity, that was developed to the current performance for more than 25 years. Substituting one component will involve the redesign of the complete systemic entity. Changes to the water and gas transport in the cell require a redesign of the balance of plant components. Therefore, no simple drop in substitutes exist.

A derogation of 6.5 years is shorter than a product life cycle for fuel cells. Research on HC-membrane material is ongoing for years (>15 years) and has not yielded satisfactory results. In case alternatives can be developed to TRL5 or TRL6 development to TRL9 will require at

[17] DOLPHIN 2019-2023, https://cordis.europa.eu/project/id/826204 (last access: 1.8.23)

least five years. Market readiness and industrialization with established supply chain structures will require roughly five more years. Fuel cell vehicles may represent the rare application where, due to membrane degradation, the release of PFAS substances into the environment during vehicle use cannot be completely ruled out. Emissions are low or even negligible, but a cross-industry measurement campaign to clarify this is about to start. To our knowledge there is no study quantifying the socio-economic impact of the PFAS restriction proposal on fuel cells only. The combined effect of the PFAS restriction for lithium-ion batteries, fuel cells and power electronics however has been analyzed in "PFAS and Future Technologies: A Socio-Economic Impact Assessment". In case of a short-term ban by 2027, is expected to result in a net loss of roughly 144 billion Euros for the sales revenue of the automotive industry in Germany and 657 billion Euros for the European Union. These losses will continue to accumulate over time, reaching 1 trillion Euros in Germany and 6 trillion Euros in the European Union by 2035. By 2050, the projected losses should reach roughly 4 trillion Euros for Germany and staggering 18 trillion Euros across the European Union. These sales losses are associated with a corresponding massive loss of jobs in the automotive industry.[18] Taking socio-economic impact and the timespans for substitutions into account we propose an exemption of the membrane electrode assembly (MEA), includes membrane, ionomer and electrodes, gas diffusion layer (GDL = MPL & MPS) and gaskets for the bipolar plates from the PFAS restriction. This exemption shall apply perpetually, but may be reviewed and assessed by the Commission no later than 13.5 years after EiF to ensure that progress in the development of substitutes is rightfully reflected.

4.3 Electrical and electronic components

Text proposed by Annex XV report	*Amendment*
No derogation	6.xy electrical and electronic components. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF
Justification (VDA): Automotive electronics is one of the most important components for today's mobility and the mobility of the future. Future trends such as e-mobility, autonomous driving, connectivity or networking of vehicles with each other, with devices or with the traffic infrastructure and also the increasing number of infotainment systems cannot be implemented without reliable and powerful electronics. And the digitization of vehicles can also make an active contribution to climate protection: A fifth of the traffic jams in Germany could be avoided through efficient networking. This alone could save 233 million liters of fuel and up to 60,000 tons of CO_2. A modern car is a complex network on wheels and the number of control units, sensors, actuators and communication devices is growing from vehicle generation to vehicle generation. Vehicles now have up to 150 control units. The cable harness consists of up to 5 km of cables and can therefore weigh over 50 kg. Up to 25 GB of data is exchanged over this huge network - per hour! Today's cable harnesses are the most complex technical products	

[18] VDA (2023): PFAS and Future Technologies. A Socio-Economic Impact Assessment (see confidential attachement)

and act as a central interface and are ultimately essential for a wide variety of functions (safety, control, assistance, comfort, communication, etc.).

PFAS and fluorpolymers are found in most electronic components in today's cars:
- Cables and cable harnesses for a wide range of applications, i.e. safety and sensor cables for e-mobility and vehicles with internal combustion engines, ignition cable for xenon headlights, high performance data cable
- Printed Circuit Boards (PCB): e.g. PTFE cores in high frequency radio and radar (ADAS) applications
- Semiconductors
- Brackets: E-Coat
- Fluoroalkyl acrylate (FAA) coating in touch panels
- PFAS in liquid crystal cells of LCD modules (displays)
- Perfluoroalkoxy resin in the wire of EM modules
- PTFE in aluminum electrolytic capacitor encapsulation
- PTFE in film capacitors
- Small electronic components:
- PTFE epoxy adhesive in microcontrollers/ICs.
- PTFE adhesive in SMI electronic components.
- Top layer of double layer capacitors.
- PTFE tubing in spools.
- PTFE as an insulator in SMD connectors.
- PTFE as Teflon tube in diodes.
- ETFE, FEP, PTFE protect tubes and lead wires in thermistors.
- PTFE foil in switches

In contrast to electronics in the consumer sector, the requirements for automotive electronics are significantly higher. For example, the electronics must work in a temperature range of -60 °C to +135 °C (reliable for 20 years) and withstand high shock and vibration loads. In addition, there is an increasing need for relatively high-bandwidth, broad-spectrum networks (from audio to 70 GHz radar operations - including GPS, Bluetooth, and wireless Ethernet). Today, these high demands on automotive electronics can only be guaranteed with the help of the special properties of PFAS and fluoropolymers. Fluoropolymers have the highest media resistance to aggressive media in combination with high mechanical, thermal, dielectric and long-term properties. There are no materials with comparable property profiles available on the market today. Up to now there have been no suitable alternatives with the same reliability and lifetime for automotive electronics.

4.4 Technical Textiles

A variety of technical textiles are used in vehicles. In addition to their use as membranes, e.g. in fuel cells (point 4.2) and automotive vents (point 4.7), technical textiles are also required for ignition protection, sound insulation and as filters in the fuel supply.

Due to the demanding operating conditions, materials containing PFAS are indispensable.

Text proposed by Annex XV report	*Amendment*
No derogation	5u. textiles used for ignition protection and noise and vibration insulation in vehicles. This exemption shall apply perpetually, but may be reviewed and reassessed by the

The following potential derogations are marked for reconsideration after the Annex XV report consultation: 5.u. [textiles for the use in engine bays for noise and vibration insulation used in the automotive industry until 13.5 years after EiF];	Commission no later than 13.5 years after EiF.
Justification (VDA): **Engine bay:** C6-treated nonwoven fabrics are used under the dashboard and the engine shield to protect the engine compartment, preventing fuel absorption due to its oil-repellent properties. This constitutes a key safety feature in case of accident. **Sound insulation**: C6 is used to provide strong fuel/oil-repellency and heat resistance to technical textiles and membranes used as sound insulation material not only in the engine bay but also under the engine shield as well as the underbody. This helps increase the safety of the vehicle by insulating the components and reducing noise, vibration and harshness (NVH).	

Text proposed by the Commission	*Amendment*
5. By way of derogation, paragraphs 1 and 2 shall not apply to: e. textiles for the use in filtration and separation media used in high performance air and liquid applications in industrial or professional settings that require a combination of water- and oil repellence until 6.5 years after EiF;	*5. By way of derogation, paragraphs 1 and 2 shall not apply to:* e. textiles for the use in filtration and separation media used in air and liquid applications in vehicles and industrial or professional settings that require a combination of water- and oil repellence. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.
Justification (VDA): **Fuel filtration:** C6-treated filtration media allow to remove dirt and dust particulates from the fuel before it reaches the fuel pump. Water and oil-repellent properties allow increasing fuel-cleanliness level, leading to increased fuel efficiency and reduced fuel consumption. **Diesel-water separation:** Modern car and truck engines require the removal of water, which is naturally dissolved in diesel and biodiesel. C6-treated filters allow to separate emulsified or finely dispersed water droplets from these fuels in order to avoid corrosion of pits and nozzles in the fuel injection system and cavitation effects during combustion.	

Further details and arguments can be found in the position paper for PFHxA[19] and PFAS of the Alliance for Telomer Chemistry Stewardship (ATCS).

4.5 Seals and Hoses

Text proposed by Annex XV report	*Amendment*
No derogation	6.xy Seals and hoses containing only PFAS Polymers of Low Concern. This exemption

[19] Alliance for Telomer Chemistry Stewardship's (2020): Response to ECHA Public Consultation. Source: acts-outline_pfhxa-public-consultation_13.05.2020_final.pdf (bayerische-chemieverbaende.de) (last access: 1.8.2023)

	shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.
	5.xy Seals and hoses where the use takes place under highly demanding conditions, or the use is needed for proper and safe functioning or safety of equipment. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.

Justification (VDA):

Fluoroelastomers such as FKM, FFKM and FVMQ as well as some other classes of fluorinated plastics such as PTFE or PVDF are used in demanding seal and hose applications. The materials are either used as bulk materials, or as single layers in multi-layer constructions or as coatings. While some applications will disappear with the end of ICE technology others are not related to ICEs and will remain important components also in e-powertrain vehicles. Also new products are currently being developed in the field of electric drives.

Examples for important seals and hoses used in current ICE technology made from or using Fluoroelastomers, PTFE or other fluorinated plastics are valve stem seals, crank shaft seals, fuel injector seals and generally the majority of seals used on the fuel circuit, intake manifold seals, oil seals and O-rings for engine and transmission, fuel pump seals, high temperature coolant seals, oil separation membranes, timing and drive belts, fuel hoses, turbo charger hoses, hose lines for DEF lines and DPF/GPF control lines. Components that are phasing out with the combustion engine cannot simply be converted. Due to the de facto phase out of combustion-engine vehicles in 2035[20] OEMs have no longer the testing capacity and the old development teams have already been disbanded.

Examples for important seals and hoses not related to ICE technology are seals for thermo management such as newly developped dielectric cooling fluids for active battery cooling, seals for compressors e.g., in air conditioning, air springs or fuel cells, oil seals and O-rings in e-engine and e-transmission, brake vacuum hoses and thrust washers.

Besides seals and hoses Fluoropolymers such as PTFE and PDVF are used as coatings or tribological additives also in thermoplastic bearings, electronic coolant distribution modules, dosing valves for AdBlue and electric actuators in gears and bearings.

Fluoropolymers are used in all the cases mentioned because of the following unique properties or combinations thereof: high temperature and media stability (fuels, acids, bases, high performance lubricants such as motor and gear box oils, hydraulic fluids), excellent wear resistance and low friction properties, corrosion resistance and permeation tightness.It is important to note that fluoropolymers are among the highest priced polymers and there is a significant gap to other classes of polymers. They are therefore only used today in applications for which there are no technical alternatives.

[20] REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition (pdf (europa.eu), last access: 27.6.23)

Replacing fluoroelastomers, PTFE or PVDF in sealing and hose applications with other polymer classes always comes with a loss of performance and/or a significantly reduced lifetime of the respective component. This loss of functionality easily leads to premature component failure, causing leakage and associated safety issues, as well as emissions of the respective fluids to the environment. Complex and expensive core systems such as the engine, transmission or the fuel system pose a high risk of serious damage if a seal or hose fails, which can result in the entire vehicle breaking down. Other polymer classes are more permeable to liquids and gases than fluoropolymers and therefore lead to emissions of functional fluids such as fuels, coolants or lubricants. Seals used in dynamic applications which renounce the use of fluoroelastomers and PTFE are subject to premature wear due to higher abrasion and cause increased fuel/energy consumption due to increased friction. Therefore, seals and hoses need to be replaced regularly as a preventive measure, necessitating frequent and expensive service intervals. In many cases, replacing a seal or hose is entirely not feasible. To ensure proper functioning, fundamental engineering changes on motor vehicles currently in production are based on type approval processes implemented by national transport authorities of EU member states. If possible, a single material change in such a scenario affords up to eight years in average from initial request to fully validated approval. Ensuring continuous production of proper functioning vehicles under such an extensive change regime requires a review no later than 13.5 years after EiF.

4.6 Lubricants

Text proposed by Annex XV report	*Amendment*
5s. lubricants where the use takes place under harsh conditions or the use is needed for safe functioning and safety of equipment until 13.5 years after EIF	5s. lubricants where the use takes place under harsh conditions or the use is needed for proper and safe functioning and safety of equipment. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. Such lubricants needed as spare parts may be sold as such or as a component of a spare part or system without limitation after EiF of the regulation.
<u>Justification (VDA):</u> **“Proper”** functioning needs to be included as PFAS lubricants including dry film lubricants play a vital role, for energy savings, emission reduction, resource saving durability and longevity (for-life-lubrication), uninterrupted operation of vehicles and machines needed for the proper functioning of the society. According to the Study "Influence of tribology on global energy consumption, costs and emissions"[21] 23 percent of the global energy consumption is caused due to friction and reconditioning of worn components. As a result of the study the potential to reduce energy losses in short term (8 years) of 18 percent and in long term (15 years) of 40 percent are possible if new technologies to reduce friction and protection against wear will be used. This will lead to a reduction of 1.460 million tons CO2 emissions in short	

[21] Kenneth Holmberg, Ali Erdemir (2017): Influence of tribology on global energy consumption, costs and emissions

term and a reduction of 3.140 million tons of CO2 emissions in long term. Lubricants containing PFAS Polymers of low concern play an important role in this reduction of CO2 Emissions what is a major goal in the European green deal.

To ensure proper functioning, fundamental engineering changes on motor vehicles currently in production are based on type approval processes implemented by national transport authorities of EU member states. One single material change in such a scenario affords three years in average from initial request to fully validated approval. A modern passenger vehicle has in order of 20 – 40 components containing PFAS-containing lubricants on board, depending on vehicle size and its functional complexity. Ensuring continuous production of proper functioning vehicles under such an extensive change regime in conjunction with the frameworks set by the transport authorities requires a minimum derogation of 13.5 years after EiF.

Spare parts: as the PFAS lubricants and components lubricated with such PFAS lubricants are used for vehicles and machines designed themselves for longevity and repairability it must be assured that spare parts are kept available and can be sold. Otherwise, non-availablity of minor PFAS spare parts may lead to scrapping of even large and resource-intensive equipment.

Dry lubricants are used as additives in surface coatings in order to obtain surfaces with specific properties (coefficients of friction) for automotive applications as well. Using the example of coating materials in the chassis area, which are undoubtedly relevant to safety, defined coefficients of friction (e.g. according to the VDA coefficient of friction window[22]) must be guaranteed. For example, screws must be easy to screw in and generate consistently high preload forces. On the other hand, they must not have too low a coefficient of friction so that they do not come loose while driving. Process-reliable screw connections are currently only possible with connecting elements whose surface coatings contain PFAS (e.g. PTFE) as a lubricant component. There is currently no alternative to the procedure. Due to the wide range of possible uses (other examples are pistons, bearing shells) in all practice-relevant application temperature ranges and the different materials of the counter surfaces (steel, aluminium, magnesium, painted and unpainted, plastics, etc.), a short-term changeover is not possible. Past experience with the Cr-6 conversion in 2006 (EU end-of-life vehicle directive) has shown that the development and approval of possible alternatives requires complex testing and approval processes lasting at least 5 to 7 years along the entire supply chain. In doing so, we assume that the investigations will show that an equivalent substitute material is suitable. Around 1,600 connecting elements (screws, nuts, etc.) are affected by the changeover to coatings containing lubricants in a medium-sized car, which are installed at around 10,000 points of use in the vehicle.

4.7 Automotive Vents based on PTFE Membranes

Text proposed by Annex XV report	*Amendment*
No derogation	6.xy Automotive vents based on PTFE membranes. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF
Justification (VDA):	

[22] see VDA 235-101

Automotive vents or pressure compensation elements are in all vehicle components or housings in which electronics, sensors, batteries, motors, liquids are located. Temperature fluctuations and temperature shocks caused by overpressure or underpressure during operation and by weather influences can deform electronics housings in automobiles and lead to leaks. Automotive vents ensure pressure equalization and protect housings and components in the automotive sector. They are gas-permeable, waterproof and oil-repellent at the same time and ensure reliable pressure equalization, reduce the formation of condensation and protect against the effects of the weather, liquid media and dirt. The main element of an automotive vent is a water- and oil-repellent and dust-proof, but air-permeable membrane. In particular, water and oil repellency can only be achieved through the properties of the fluoropolymer ePTFE (expanded PTFE). Only with ePTFE can maximum durability, reliability, quality and safety be guaranteed. Today there is no material that could substitute ePTFE with its special properties.

4.8 Manufacturing processes

4.8.1 Non-stick coating in tire manufacturing process

Text proposed by Annex XV report	*Amendment*
No derogation	6.xy Non-stick coating in the production of tires. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.

Justification (VDA):

Disclaimer: PFAS aren't used as a raw material in the production of tires even though they are essential as a releasing agent in the manufacturing process.

A wide variety of highly specialized machines are used in the manufacturing process of tires which come in direct contact with the sticky rubber. One example is the tire mold in which the tire is shaped and vulcanized. In these and comparable applications, a non-stick coating is necessary to be able to remove the vulcanized tire from the mold. This is even more difficult due to the thin and deep tread pattern of the tire.

Over the past years there has been progress in the development of PFAS free alternatives to be used as a semi-permanent releasing agent in the manufacturing process of general rubber goods. But till today no other substance or group of substances than PFAS have been found that show the required performance as a permanent non-stick and anti-friction coating in the tire manufacturing process. In addition to that the PFAS coated layer is very stable on the tire mold and won't stick to the tire surface which is essential to guarantee the safety performance of the tire.

In most cases PTFE is used as the non-sticking coating on tire molds. The PTFE layer has a thickness of only some µm and can be used to produce several hundreds of tires before the tire mold needs to be cleaned and the PTFE coating is renewed.
This coating is often applied with the methodology of chemical vapor deposition - in controlled conditions in an encapsulated chamber. These chambers do work under strictly controlled conditions on industrial sites only.

The ban of PFAS will negatively affect the tire manufacturing process in the EU and will lead to further relocation of the tire manufacturing industry to non-EU countries.

4.8.2 Semiconductor manufacturing process

Text proposed by Annex XV report	*Amendment*
No derogation The following potential derogations are marked for reconsideration after the Annex XV report consultation: 5.ee [the semiconductor manufacturing process until 13.5 year after EiF]	5.ee the semiconductor manufacturing process. This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF
<u>Justification (VDA):</u> Semiconductors are essential in today's automotive industry for controlling a wide variety of functions and machineries. Semiconductors are elementary components for control units (engine control, safety such as ABS, ESP, air conditioning, etc.), sensors (ultrasonic sensor, rain sensor, radar sensor, etc.), infotainment (navigation, multimedia, radio, etc.), actuators (windscreen wipers, windows, etc.) and, indispensable for the transformation of mobility, the so-called power electronics. For example, the future technology power electronics means everything that has to do with the control, conversion or switching of electrical energy with electronic components. This starts with a few 100 mA and a few volts, and goes up to several 100 kV and several 1000 A. For example, power electronics transfers the traction energy from the battery to the electric motor and converts the current from direct current to alternating current, and so in the case of recuperation the recovery of braking energy from alternating current to direct current (batteries store direct current and electric motors work with alternating current). Power electronics is a sub-area of electronics and the most important products are inverters, charging systems or switched-mode power supplies. The elementary and most important components of power electronics are the power semiconductors or semiconductors. Semiconductors used in today's electric cars are based on pure silicon. New developments for power electronics are semiconductors made of silicon carbide (SiC) or gallium nitride (GaN). One of the major advantages is that the same processes can be used for the production of the SiC and GaN and for their further processing as for commercially available semiconductors. Semiconductors in power electronics are therefore elementary and without them no competitive innovative e-mobility is possible. But a ban on PFAS jeopardizes that goal. The RINA study “The Impact of a Potential PFAS Restriction on the Semiconductor Sector” by the SIA (see Chapter 12 "Summary of findings") clarifies the whole problem: *"Given their unique properties, it is going to be extremely difficult, if not impossible in some instances, to find viable alternatives without stepping back decades in technological advancement."* PFAS are essential for the entire spectrum of the semiconductor industry (wet chemistry, photolithography, machinery and production equipment, coolants, etc.). Overall,	

semiconductor manufacturing is extremely sensitive and highly complex. The slightest fluctuations and changes, whether due to the process or the material, always have an impact on the performance of the semiconductor. The current state of the art, research and development is that in most places there are no adequate options for substitution. If alternatives are developed (if at all possible), up to 25 years and more depending on the field of application can be expected.

The future technology of power electronics should illustrate the problem of semiconductors as an example. Ultimately, all semiconductors in the automobile are affected, including those for the control units, sensors, actuators and infotainment. Innovation topics such as autonomous driving and the increasing number of car multimedia applications will be affected.

This is also in contrast to the EU's efforts to make Europe more independent of Asian manufacturers when it comes to semiconductors. The "European Chips Act" is intended to promote the expansion of the European microchip industry but will be jeopardized by a ban on PFAS and the loss of competitiveness.

5 Restriction of specific application for PFAS

5.1 F-Gases

The VDA refers to the first submission into the consultation of the European Automotive Industry Association ACEA on 24th May 2023 in essential aspects. Details and full argumentation can be found in this submission.

VDA'S key aspects on proposed PFAS refrigerant ban are:

- Light duty vehicles with ICE should receive an unlimited derogation due to the increasing transformation towards electric mobility and the decreasing volume of ICE[23].
- The proposed transition period for refrigerants in the Annex XV Restriction Report for electrified vehicles (BEV, FCEV) is much too short. It should differentiate between new vehicle types (NT) and new registrations (existing types, AT) and between light duty vehicles (PC and LCV) and trucks (HDV). A feasible timeframe for new types could be at least 7 years after entry into force for light duty vehicles and 10 years for heavy duty vehicles. Moreover, there should be an appropriate period between the NT and AT date as is common in other automotive regulations.
- European production for export should receive an unlimited derogation as alternatives are not suitable for all markets.
- Servicing of existing fleet must be untouched and remain possible without any time limit receiving an unlimited derogation.
- In addition, in line with the principles of better regulation, it should be respected that F-gases and their phase-out are also regulated by the F-Gas Regulation and the MAC Directive.

5.2 Hardchrome application

Text proposed by Annex XV report	*Amendment*
No derogation The following potential derogations are marked for reconsideration after the Annex XV report consultation: 5.v [hard chrome plating until 6.5 years after EiF]	5.v hard chrome plating until 13.5 years after EIF
<u>Justification (VDA):</u> Disclaimer: The mist suppressants do not enter the consumer product; it is a pure issue in terms emission reduction and workers safety in the plating industry. The use of PFAS in chrome plating is limited to mist suppressants in closed loop systems reducing emissions and increasing workers safety. Hardchrome plating is already extremely restricted, first by REACH Annex XIV, allowing only authorized applications for which no alternative exists. These applications had been	

[23] See REGULATION (EU) 2023/851

scrutinized by ECHA, MS and COMM resulting in some automotive applications with review periods up to 2032.

Secondly, mist reduction during hard chrome plating has been seen of high importance to allow derogation under the most restrictive prohibition order the EU POP regulation even for the harmful PFOS if no alternatives exist.
The industry has accepted the harmful properties of PFOS on the environment and developed alternatives based on incompletely fluorinated octane sulfonic acids as spray suppressant such as 6:2 Fluorotelomer sulfonic acid (6:2 FTS)

Low power yield at chrome plating leads to the remaining electricity to be used for the electrolysis of water. Spray mist is formed by gas bubbles that burst at the electrolyte surface of up to 10 m/s. Spray preventers reduce surface tension and prevent the formation of spray fog (gas bubbles that form is smaller and have fewer energy). The importance and alternativeness of PFAS has been scrutinized and accepted under the EU POP Regulation.

PFAS-free substitutes for mist suppressants are used in decorative chrome plating but not in hard chrome plating. The reason according to experts is found in the much higher current density and the much thicker layer structure in the hard chrome plating that causes the interference with these other mist suppressants or their degradation products. However, even when chromium (III) is used, PFAS cannot be substituted today with in the etching process that precedes decorative chrome plating.

Relevant components in the automotive industry: Fuel injectors, valves and piston rings are only relevant for ICE vehicles while brakes and piston rods are required for all type of vehicles including the electric vehicles, additionally the machinery producing the vehicles require hard chrome plated parts. This is recognized by authorities through the long review periods for hard chrome applications under the many granted REACH authorizations for chromium trioxide. Without any of these parts, a vehicle cannot be completed and e.g. without brakes not be sold.
A derogation influences the authorized hardchrome applications for the automotive industry with review periods up to 2032 and expected prolongation of these authorizations for several years.

Currently, the proposed restriction only considers hard chrome applications as potential derogation for consideration and 6.5 years estimated until 2031 (worst case).
The purpose of the derogation under the EU POP Regulation is emission reduction and workers safety by mist suppressant with the hazardous Substance PFOS. Nowadays, harmless alternatives such as 6: 2 FTE are available and already in use. Therefore, these recently introduced, alternative mist suppressants should be derogated for 13,5 years from the planned PFAS restriction to be in line with the authorized hard chrome uses under EU REACH and the EU POP regulation

6 Use, maintenance and repair of production systems

The automotive industry has the highest turnover of any sector in the German economy. In 2019, it generated revenue of over 435 billion € with a workforce of around 833,000 and built around 4.7 million passenger cars in Germany – not including commercial vehicles (trucks and buses). A large proportion of these vehicles is still being built in Germany, despite the significantly more dynamic growth in production in other countries. It is therefore vital to avoid any additional burdens hampering German competitiveness. Without machinery to build vehicles including the maintenance of this machinery, the entire vehicle production and labor force is at risk. The machinery is used throughout their whole lifetime in an industrial environment. These machineries last easily 15 to 30 years with a tendency to extend the lifetime with refurbishment wherever possible and will continue to be used on an important second-hand market. These positive effects should not be hindered, we request:

- A responsible use of machineries and equipment for the manufacturing process of parts and vehicles in the automotive industry should be exempt.
- Maintenance and repair of these machineries to produce transport vehicles and components under industrial settings should be exempt as repair is more beneficial as replacement. In 2022, the EU market had a volume of more than 700 billion Euro in machinery components and production systems according to VDMA, including a good portion of new production systems as well as maintenance and repair components for existing systems in the automotive sector.
- This must include original spare parts for machinery already placed on the market. This requirement is in line with the 'repair as produced' exemption for automotive spare parts under the ELV Directive as further explained in chapter 3.2.2.

Text proposed by Annex XV report	*Amendment*
No derogation	5.xy spare parts, whenever placed on the market, for use in the maintenance and repair of production systems in the automotive industry already placed on the market for the first time

- In addition, we support the proposed derogation on refilling of HVACR equipment already placed on the market. However, production systems on large production sites lasting up to 30 years, that are strongly implemented in the building structures, require longer transition periods than the proposed 13.5 years. A replacement with alternative gases in new HVACR equipment require an evaluation of the industrial setting as it might not be feasible depending on the industrial environment, e.g., a new equipment with R290 as flammable gas has limitations in some areas as well as a new equipment with R744 which requires higher pressure with high performance gaskets and sealings (nowadays typically made of fluoropolymers). In addition, development and market-availability of these new systems has to be considered with manufacturers of these production systems e.g., in the VDMA; we would expect that 18 months are not sufficient in below conditions for restriction.

Text proposed by Annex XV Report	*Amendment*
5.i. *maintenance and refilling of existing HVACR equipment put on the market before [18 months after EiF] and for which no drop-in alternative exist until 13.5 years after EiF;*	Additional entry: 5.ii. maintenance and refilling of existing HVACR equipment put on the market before [**36** months after EiF] **in professional or industrial settings** and for which no drop-in alternative exist. **This exemption shall apply perpetually, but may be reviewed and reassessed by the Commission no later than** 13.5 years after EiF.

- Trading of used machines and systems must continue to be possible without restrictions. The value of these machines and production systems is very high and further re-use is more beneficial than decommisioning. -the restriction has to consider this e.g. by restricting the placing on the market only if it is ‘for the first time’.

Text proposed by Annex XV report	*Amendment*
No derogation	5.xy. production systems in the automotive industry already placed on the market for the first time

- In the run-up to a PFAS ban to be pronounced, the automotive industry must be able to identify the proportion of PFAS in these components by means of a standardized declaration, both for machines and systems that have already been procured and for new ones to be procured and various process aids currently in use. For this purpose, appropriate measurement methods and declaration procedures must be defined and established across the entire component process in order to show the possibility of substitutions.

Further details and arguments can be found in the position paper of the German VDMA[24].

[24] VDMA (2023): Regulierung von PFAS im Rahmen der REACH Verordnung. Positionspapier. (last access: 01.06.2023)

7 Reporting Requirements for Mixtures

Reporting Requirements for Mixtures {./.}	
Text proposed by Annex XV report	*Amendment*
(4) Paragraph 7: Manufacturers and importers of PFASs or PFAS containing articles as well as formulators of PFAS containing mixtures making use of any of the derogations according to paragraphs 5 b)-d) and f) – t) [and u), w)-ee)],and 6 b)-d) and f) [and h)-o)], shall from (EiF + 18 months) provide by 31 March of each calendar year a report to the Agency containing: i. the derogation that the intended use belongs to; ii. the identity and quantity of the substances placed on the market in the previous year. The Agency shall forward the information to the Commission by 30 June every year;	(4) Paragraph 7: Manufacturers and importers of PFASs **or importers** of PFAS containing articles as well as formulators of PFAS containing mixtures making use of any of the derogations according to paragraphs 5 b)-d) and f) – t) [and u), w)-ee)],and 6 b)-d) and f) [and h)-o)], shall from (EiF + 18 months) provide by 31 March of each calendar year a report to the Agency containing: i. the derogation that the intended use belongs to; ii. the identity and quantity of the substances placed on the market in the previous year. The Agency shall forward the information to the Commission by 30 June every year;
<u>Justification (VDA):</u> In the Explanatory notes to paragraph 7, the Dossier Submitters point out that manufacturers and importers often only have lack detailed knowledge on the whole supply chain, in particular if these are very complex, like in the automotive industry. Furthermore, the Dossier Submitters are of the opinion that limiting the reporting obligation only to these actors might not provide sufficient use information to enable reviewing of the derogations. On the other hand, formulators are usually the first downstream users (DU) of a substance and already have a good knowledge of the remaining supply chain and the (end)uses of substance. The Dossier Submitters note that a reporting by all downstream users is not considered practical nor than useful for an effective monitor of changes of the uses and quantities of PFAS and to identify concerns in specific sectors. Due to the widespread use of PFAS it is nearly impossible to keep track with all the uses in relation to the proposed derogations. A disproportionate exchange of large volumes and even confidential information would absorb significant resources of the whole supply chain, especially for fluoropolymers and perfluoropolyether (PLC), which are not considered as hazard for the environment or the public health. Therefore, we believe that reporting requirements for PLCs are disproportionate and should be dropped completely. The monitoring obligations should be described more specifically and should be generally discussed when the final restriction proposal is formulated by RAC and SEAC.	

If you notice any errors, omissions or ambiguities in these recommendations, please contact VDA without delay so that these errors can be rectified.

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