W. L. Gore & Associates’ Comments on Dossier Submitters’ Draft EU REACH restriction on PFAS

Public consultation

Request for Derogation: Specialty Wires and Cables

June 2023

W. L. Gore & Associates (hereinafter "Gore") appreciates the opportunity offered by the public consultation process to provide comments on the Proposal for a Restriction of Per- and polyfluoroalkyl substances (PFAS) (hereinafter '**Restriction Proposal**').

With this statement, we would like to explain why we believe a derogation for **wires and cables affecting the testing or proper functioning of electronics and communications devices and critical infrastructure** (hereinafter '**specialty wires and cables'**) is needed and justified.

The conclusions from our statement are summarized as follows:

- Specialty wires and cables are critical for high performance signal transmission and power transmission applications while withstanding demanding physical or environmental operating conditions. In many cases, industrial uses need to seek out custom solutions to meet their performance requirements not available from mass produced wiring. It would be beneficial to create a sub-use for specialty wires and cables as these are not covered in the current sector analysis.
- Currently, **no alternative is available** that would provide a sufficient level of performance (low dielectric constant combined with physical properties to withstand harsh operating conditions) that would not require fluoropolymers.
- Without a derogation for testing equipment, accurate and precise testing of devices, modules, and systems to ensure robust R&D and productions will not be possible. In the absence of such robust testing, the systems' true capabilities in real-world applications are not guaranteed, which in turn, will lead to frequent field failures and a potential risk to human safety.
- Without a derogation for industrial applications, field failures are significantly more likely with a threat to transport infrastructure; human safety; and energy provision.

I. Derogation Request

Considering the arguments and evidence presented below, Gore respectfully requests to include the following application-specific derogation in Column 2, paragraph 5 of the proposed restriction:

> ***Wires and cables used in industrial applications and affecting the testing or proper functioning of electronics, communications devices and critical infrastructure***

II. Description of the End Use

1. *Industrial Cable Applications*

Specialty wire and cable products are essential in markets where harsh environmental conditions prevail. End uses require wire and cables to provide the combination of product properties which enable signal integrity; high flex durability over product lifetime; and performance under a variety of harsh conditions. Specialty wires and cables must have specific characteristics and perform in high temperature, and they must show flexure endurance, hydrolysis resistance, voltage endurance as well as compactness in regard to size and weight, which are enabling properties of cables in these environments.

Typical industrial cable applications in harsh environments include:

- Downhole sensor cables which are used in high pressure, high temperature wells for oil and gas production
- Control and power cables for marine and harbour cranes in high humidity, salinity, sunlight and all types of weather conditions while safely securing massive weights with flexibility, durability and efficiency
- Flexure endurant and durable robotics and industrial tool cables must withstand high mechanical stress, enduring millions of alternating bending cycles as well as tensile and torsional stress, varying temperatures while being resistant to oil and chemicals
- Magnet wire for downhole tooling must be exceptionally resistant to difficult conditions like chemicals, hydrolysis, and up to high pressure, high temperature (HPHT) environments

Detailed information on performance requirements needed in the different applications will be provided below in Section IV.1. below.

2. Microwave/RF Test Cable Assembly Applications

Microwave/RF test cable assemblies are a specific type of specialty wire and cable end use. They are used to confirm the performance of complex electronic systems after they are manufactured and before they are deployed to the end use. Accurately testing performance of these systems requires the ability to measure electrical performance with a high level of precision. R&D and high-throughput production require electrical, mechanical, and environmental testing to ensure reliable performance once these systems are put into service.

Typical microwave/RF test cable assembly applications include:

- Semiconductor aging testing
- Communication system testing (e.g. 5G networking equipment)
- Satellite thermal-vacuum testing
- Automotive autonomous driving testing
- Energy management testing
- Aerospace/defense system testing

Real-world conditions (e.g., thermal cycle/shock, mechanical vibration/shock, vacuum, highest/lowest microwave signal power, dynamic/static bends, contact with water/oil/chemical substances, pulling, crushing force, etc.) are simulated to ensure that the design specifications are met. In the absence of such robust testing, uniquely enabled by the use of fluoropolymers in the wire and cable assemblies, the systems' true capabilities in real-world applications are not confirmed. That can lead to frequent field failures that are not only expensive but can also lead to disruptions in critical communications and become a human safety risk.

For example, GPS satellites need to operate in space under extreme temperature cycles and high-vacuum conditions each day (-55 to +150 °C); otherwise, they might provide incorrect or no GPS signals which can cause safety risk to many applications such as maritime, aerospace, and automotive. Test cable assemblies using fluoropolymers are used to validate/inspect GPS satellites' true performance in the simulated extreme temperature cycles and high-vacuum conditions at ground level before launching them into space.

Figures A and B show the complex construction of cables including dielectric material insulation layers and protective jacketing layers.

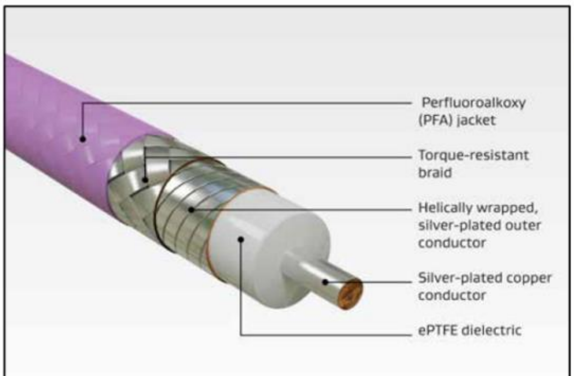


Fig. A: Construction of General Purpose Cable

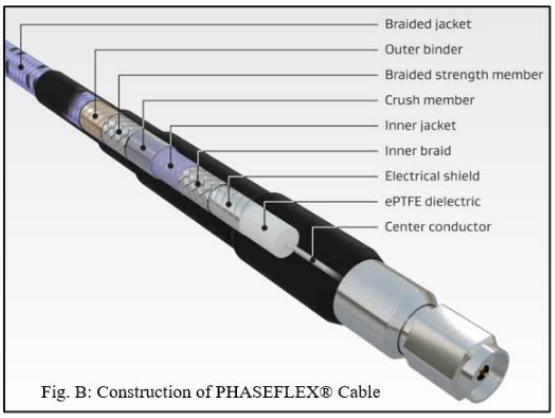
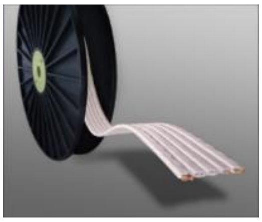
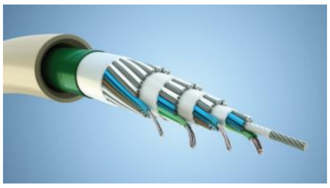
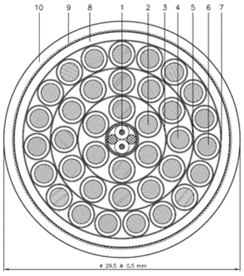


Fig. B: Construction of PHASEFLEX® Cable

To clearly define the proposed new sub-use, a detailed description of the type of products and their reliance on fluoropolymers is provided in Table 1. The product examples are all Gore products, as details of comparable products manufactured by other companies are not publicly available. We believe that these products are representative of products manufactured and placed on the EU market by other companies.

Based on the current proposal, none of the uses represented by the following Specialty Wires and Cables products would be covered by an existing derogation:

Table 1. Relevant Product Types

Product	Illustrations	Description
Microwave / RF Assemblies		Rugged, lightweight assemblies for testing in laboratory, production, and field test environments.
Round and Planar Cables conveying data and power for harsh environment industrial manufacturing and testing capital equipment.		Data cables, power cables, radio frequency cables, and hybrid cables for industrial manufacturing, harsh environments, and testing capital equipment.
High Density Sensor Cables		High density sensor cables provide reliable thermocouple technology to ensure accurate temperature measurement for downhole oil extraction at temperatures up to 300 °C in a small sized packaging
Round control and power cables used in marine and harbour cranes		Round reeling cables used in marine and harbour cranes are equipped with gliding layers providing robust and durable operation under continuous flexure in critical logistical operations and transport infrastructure
Robotics and tooling cables		Robotics and tooling cables used in assembly lines of the automotive industry, provide a small, with gliding layers equipped and therefore durable solution for demanding flexure, torsion and bend radii

These products are made using fluoropolymers which meet the criteria for Polymers of Low Concern (PLCs), under the definition provided by the OECD Expert Group on Polymers. The fluoropolymers used in specialty wires and cables include PTFE (including expanded PTFE), FEP, and ETFE as dielectric/insulation as well as gliding layers and PFA as jacket layer. The materials used are presented in Table 2:

Table 2. PFAS used in Specialty Wire and Cable Products

Gore product	Type of PFAS	CAS number	Is this PFAS a PLC?
Specialty wires and cables	PTFE	9002-84-0	Yes
	PFA	26655-00-5	Yes
	FEP	25067-11-2	Yes
	ETFE	95038-71-5	Yes

III. Reference in Restriction Proposal

The Dossier Submitters (DSs) researched the electronics applications of PFAS (as presented in Annex A Table A.1, page 5) and the use of polymeric PFAS as components for wire and cable is listed for a few applications:

- Fluoroelastomers use in automotive vehicles as heat sealable tubing (Annex A, Table A.13, page 24).
- Fluoropolymers (e.g. PTFE, PCTFE, ETFE, FEP, PVDF) used in construction products (Annex A, Table A.57, page 125)
- PTFE as wire insulation in electronics and semiconductors (Annex A, Table A.45 & A.46, page 104; Table A.76, page 183)

For the use of PTFE as wire insulation, the properties PTFE can bring and are needed for the coaxial (data) cables sub use are well understood, namely reliable and efficient signal/data transmission, moldability, stable insulation (under high temperature), lightweight, resistant to corrosion, low friction, … (Annex A, Table A.48, page 106).

The uses of fluoropolymers in cables that test and ensure the proper functioning of capital assets and infrastructure are currently not assessed in the Restriction proposal.

Gore believes that it would be beneficial to create a sub-use for specialty wires and cables as those uses have been missed in the current sector analysis. This submission as well as input provided earlier in the Restriction process provides information which can be used to define the scope for this new sub-use.

Notwithstanding the understanding that PFAS are needed for wire insulation, the DSs have not been able to perform an analysis of alternatives, nor have they considered the need for fluoropolymers as other components of wires and cables. The summary of evidence[1] from stakeholders presented in Annex E (Table E.127, from page 390), indicates that the evidence on alternatives related to electronics, semiconductors and energy is weak. However, it is not clear to what sub-uses this evidence relates as the discussion covers all the sectors named above. On the other hand, information on wire insulation was deemed "*too specific*" by the Dossier Submitters.

In both cases (lack of evidence or 'too specific' evidence), no derogation for components of wire and cables was proposed (Annex E, Table E.131, page 403). The conclusion in the dossier stipulates that there is "*unclear substitution potential at EiF for fluoroelastomers […] in wire insulation and in combination with the inconclusive evidence pointing to the non-existence of technically and economically feasible alternatives at EiF […], no derogation is proposed"* (Annex E, Table E.131, page 404).

With the sections below, we would like to provide further information on the current state of the art in terms of alternatives and highlight the factors supporting the need for a derogation.

IV. Need and Justification for Derogation

A derogation for **specialty wires and cables** is needed and justified. **Without a derogation, field failures in various industrial applications are significantly more likely to occur and resulting in a threat to transport infrastructure, human safety, and energy. In addition, the testing and development of devices, which both the general population and professionals** (transport operators, critical infrastructure, …) **rely on for their daily life and operations, would not guarantee sufficient reliability.**

In September 2022, Gore developed a Socio-Economic Assessment (SEA) prepared by eftec which was shared with all 5 Dossier Submitters. Since information was provided after the end of the Call for Evidence in September 2021, the SEA is attached as **Annex I** to this derogation request for further consideration.

To make the information from the SEAs more easily available and to take into account the information provided in the Restriction Proposal, we have summarized the key information on alternatives in this document, which also contains updated and supplementary information obtained after the SEA was submitted. The information on alternatives is provided at a 'product-type' level, referencing the products described in the Table 1 above.

1. Performance Requirements

There is not a single performance standard or specification for Industrial Cable applications, nor Microwave/RF test cables. They are often custom designed to unique performance requirements for testing a specific type of system which may differ from a similar system in the same end use. The user of these cables specifies the electrical signal performance and

[1] received during the Call for evidence and 2nd Stakeholders consultation in 2020 and 2021 respectively

the physical conditions it must withstand. These physical demands can include attributes such as torque/crush/kink resistance, abrasion resistance, dust/moisture resistance, performance over a wide temperature range, chemical resistance, high flex, and high connector pull strength. Cables achieve these performance attributes though a combination of the inherent properties of the materials used, plus the design and construction techniques used by the manufacturer.

The ability to customize and continue to advance cable performance is critical to keep up with rapid advances in electrical system capabilities. In order to meet these increasingly challenging performance requirements, manufacturers need access to materials with the best physical and electrical properties. The defining properties of materials used in specialty wire and cables typically include a combination of some or all of the characteristics listed below.

Table 3. Performance Requirements

Performance requirements	Dielectric constant (ε_r) Dielectric constant is an important material characteristic which relates to the ability of the material to store electrical energy in an electrical field. Low dielectric constant values are necessary for high frequency or power applications to minimize electric power loss, enabling precise, consistent, and efficient signal transmission. Wire and Cables used for testing must have a minimal signal distortion under external influencing factors (e.g., high pressure, extreme temperatures, and exposure to harsh chemicals) and along the length of the test cable. The material chosen for the cables must therefore display the desirable dielectric constant and ensure: - Ultra-low attenuation of microwave/RF signal over distance (i.e., improving signal resolution) - Low phase/amplitude change over a wide operating temperature range (-55 to +125°C), to allow the necessary measurement accuracy and precision of small signals on semiconductors. For example, electronics devices/equipment need to be tested at low and high temperature to ensure they function properly; therefore, test cables need to operate in the same temperature environment (e.g., space qualified components) - Short time delay of microwave/RF signal over distance to reduce signal distortion - Low capacitance over distance, which also reduces signal distortion - Additionally, generally a thin wall thickness of insulation at a given characteristic impedance is enabled with a small dielectric constant. It is desirable to provide small sized cables to ensure higher durability under flexure and movement at small bend radii.

	Service temperature range Test cable assemblies typically need to operate from -55 to 150ºC as to test material and device in harsh environment and still maintain their electrical, mechanical, and environmental performance. Cables used for temperature measurement or tooling in deep oil and gas wells must withstand temperatures up to 300 °C and maintain their performance while being exposed to these high temperatures. Low outgassing As the specialty wires and cables are used for testing, no material contamination or loss/distortion of signal/data transmission due to degradation is tolerated. Therefore, the material must show low outgassing in thermal-vacuum conditions, which ensures less contaminants to the surrounding instruments. Chemical resistance The material must perform its function in harsh conditions and provide chemical resistance to oils and other chemical substances. Mechanical strength The wires and cable materials must be highly durable and withstand frequent/rapid flexing, torsion, and pulling without compromising electrical performance under demanding environments (e.g., extreme temperatures). Low coefficient of friction The cable insulation and jacket layers must have a low coefficient of friction in order to decrease abrasion under continuous flexure and movement.

A few examples of performance specifications in various end use areas are shown below in Table 4. **These are not standards for the end uses, but selected examples of custom specifications to illustrate the variety of end user needs.** In order to manufacture cables which meet the varied and demanding performance requirements, component materials with the appropriate combination of physical, electrical and chemical properties are needed.

Table 4. Performance Specification Examples

Primary performance requirements for a few specific applications	5G Test Systems 5G telecommunications equipment testing cables require a minimum loss of signal, expressed as insertion loss[2], as well as the physical properties to allow to function in confined environment. In addition, the systems must be operating at a wide range of temperatures as the infrastructure will be exposed to any type of weather conditions. Typical key performances requirements:

[2] the amount of energy that a signal loses as it travels along a cable link

	- Insertion Loss at 70 GHz : 7.62dB/m - Minimum Bend radius : 0.4 inch - Cable Outer Diameter : 0.073 inch - Operating Temperature : -55 to +125°C - Theoretical Cut-off Frequency : 108 GHz - Capacitance : 25.8 pF/ft Robotics Cables Typically, cables in these applications will require a completely different set of performance requirements. Almost exclusively, the final devices will be in indoor industrial settings and will not require a wide range of operating temperatures. The key properties will reside in the flexibility of the cable and the ability to maintain signal (data) integrity under continuous flexure. Typical key performances requirements: - Insertion Loss at 70 GHz : 7.62dB/m - Minimum Bend radius : 0.4 inch - Cable Outer Diameter : 0.073 inch - Operating Temperature : -55 to +125°C - Theoretical Cut-off Frequency : 108 GHz - Capacitance : 25.8 pF/ft Downhole Sensor Cables The high temperatures reached in these applications will require the cable to operate for a long period at 300°C or above. The harsh environment will also require high resistance to cuts to guarantee the signal integrity. Typical performance requirement: - Temperature Rating[3] : 45,000 hours at 300 °C - Thermoplastic flow[4] : › 300 °C - Cut through resistance[4]: ›20 N at 21 °C and ›4 N at 300 °C - Insulation wall thickness : 0.003 inch

[3] according to ASTM D3032/14
[4] according to ASTM D3032/22

2. Assessment of Alternatives

a) Why Fluoropolymers can deliver the needed performance

Fluoropolymers combine inherent electrical and mechanical properties with unique ability to be processed into forms suitable for cable construction which are not available from other materials.

- Fluoropolymers like PTFE, FEP and PFA have a **low dielectric constant of 2.1,** where lower numbers enable higher precision and more reliable signal transmission.
- PTFE, in particular, can be processed into an expanded form which has **an exceptionally low dielectric constant of 1.3.**

When compared to other materials, the dielectric constant of expanded PTFE enables precise and accurate microwave/RF testing. This is due to the following characteristics:

- ultra-low attenuation of microwave/RF signal over distance (i.e., improving signal resolution),
- low phase/amplitude change depending on temperature, to allow the necessary measurement accuracy and precision of small signals on semiconductors,
- short time delay of microwave/RF signal over distance to reduce signal distortion, and
- low capacitance over distance, which also reduce signal distortion.

Additionally, its maximum continuous service temperature (MCST) also enables:

- wide continuous use service temperature range, between -240 and +260 °C (for some applications even possible for use up to 300 °C),
- low outgassing in thermal-vacuum conditions, which leads to less contaminants to the surrounding instruments, and
- good mechanical strength to withstand demanding mechanical and environmental challenges (i.e., withstanding handling, bending, torsion, and pulling without compromising electrical performance).

This combination of properties is neatly presented in Figure 1 below where we can see that PFA and PTFE have the most desirable values of both dielectric constant (ε_r) and maximum continuous service temperature (MCST).

Figure 1. [redacted]

[redacted]

Fluoropolymers also offers a wide chemical resistance as seen in the box in Figure 2 below.

Figure 2. Chemical resistance of polymers against chemical families[5]

	ETFE	FEP/TFE/PFA	FLPE	FLPP	HDPE	LDPE	PC	PETG	PP	PVC	TPE***
Acids, Dilute or Weak	E	E	E	E	E	E	E	G	E	E	G
Acids, **Strong/Concentrated	E	E	G	G	G	G	G	N	G	G	F
Alcohols, Aliphatic	E	E	E	E	E	E	G	G	E	G	E
Aldehydes	E	E	G	G	G	G	G	G	G	G	G
Bases/Alkali	E	E	F	E	E	E	N	N	E	E	F
Esters	G	E	G	G	G	G	N	G	G	N	N
Hydrocarbons, Aliphatic	E	E	E	G	G	F	G	G	G	G	E
Hydrocarbons, Aromatic	G	E	E	N	N	N	N	N	N	N	N
Hydrocarbons, Halogenated	G	E	G	F	N	N	N	N	N	N	F
Ketones, Aromatic	G	E	G	G	N	N	N	N	N	F	N
Oxidizing Agents, Strong	E	E	F	F	F	F	F	F	F	G	N

*Not for tubing chemical resistance (except PVC) **Except for oxidizing acids (See oxidizing agents, strong) ***TPE gaskets

EXCELLENT	GOOD	FAIR	NOT RECOMMENDED
30 days of constant exposure causes no damage. Plastic may tolerate for 30 years.	Little or no damage after 30 days of constant exposure to the reagent.	Some effect after 7 days of constant exposure to the reagent. The effect may be crazing, cracking, loss of strength or discoloration.	Immediate damage may occur. Depending on the plastic, the effect may be severe crazing, cracking, loss of strength or discoloration, deformation, dissolution or permeation loss.

[5] Source: Chemical Compatibility Chart - LDPE, HDPE, PP, Teflon Resistance (calpaclab.com). Note: PTFE is referenced as "TFE" in this chart

The market reflects the lack of viable alternatives. For example, 95% of high-performance microwave/RF coaxial cables used within Aerospace & Defense (A&D) and Space applications utilise PTFE as dielectric material. Also, over 95% of the same sectors use FEP or PFA as jacket material. The A&D and pace sectors presents some of the most challenging environments for cables and wires, which explains why lower performing products cannot be used in these demanding applications.

b) *Alternative Materials*

The DSs identified several materials as potential alternatives for PFAS applications in electronics and semiconductors (Annex E, table E.128, page 396). The DSs acknowledge that there is no conclusive evidence that alternatives are or will be available by the EiF.

Table 5. Assessment of Alternate Materials

Alternatives suggested in Restriction Proposal:	Polyethylene (PE) PE has been found to be a sufficient dielectric material for some applications. However, in many uses, its low service temperature range and low resistance to abrasion, water, oil, and chemical substances limit its capacity to be substituted for PTFE or other fluoropolymers in more demanding uses (e.g., space test applications). In addition, its low resistance to abrasion, water, oil and chemical substances as well as its low mechanical strength reduce its appeal even further. Since it cannot withstand demanding environments and challenging mechanical conditions, **PE is not a technically feasible alternative** where high performance is needed. Polyvinyl chloride (PVC) PVC is the most popular jacket material for less demanding products. In addition to its low resistance to abrasion and chemical substances, applications will be limited by its Continuous Service Temperature (up to 80 °C) and the outgassing property in thermal vacuum condition[6]. **This material is not a feasible alternative for high performance or custom end uses.** Silicone / Silica Materials Gore notes that SiO_2 (silica sand) can also be used as a dielectric material, but only for less demanding applications with many electrical and mechanical drawbacks. For example, the dielectric constant value of 3.9 leads to high signal attenuation. Moreover, the physical form of silica (powder or semi-powder) can only be used inside of semi-rigid cable, which in turn limits the number potential applications. Separately, Silicone Elastomers are also not desirable in test cable applications due to their high outgassing property. **This material is not a feasible alternative.** Ethylene propylene diene monomer (EPDM) For this material, the limitation comes from its high dielectric constant which makes it undesirable for electrical performance. EPDM has high

[6] Customers in aerospace sector have strict requirements on outgassing (especially under vacuum conditions)

	dielectric constant value of 3.3 which makes it undesirable for electrical performance in addition to a relatively low Continuous Service Temperature (i.e., 150 °C).[7] As described in the performance requirements above, a high dielectric constant will mean loss of signal transmission, **which will make wires and cables made with this material unable to be used for testing**. <u>Polyetheretherketone (PEEK)</u> As for EPDM, PEEK has high dielectric constant of 3.3 and relatively low Continuous Service Temperature. Similar to EPDM, **its high dielectric constant will make this material unable to be used for test cables**, notwithstanding the limitation in terms of temperature of application.
Conclusion	**Alternatives may be able to replace a singular property, but when two or more properties are required simultaneously, especially in harsh conditions and demanding applications, the only viable material is fluoropolymer based.** **Despite the high cost of raw materials[8] and the inherent incentive to find cheaper alternatives to fluoropolymers, no viable alternative materials have been identified and developed to date for use in specialty wires and cables.**

3. Timeline for Substitution

Based on Gore's research and other available information, Section 2 describes that no alternative materials are apparent at the time of writing and the combination of properties needed will be difficult to find in a new material (low dielectric constant, high service temperature, mechanical strength, chemical resistance, etc.). We will now underline the timeframe needed once a material with the suitable combination of properties has been discovered or invented for these applications.

Examples from the past, show that the time span to develop new materials can vary significantly. For example, the development of acrylic polymer took several decades. The process from the first synthesis of acrylic acid to the introduction of the commercial polymer, was an 85-year journey.[9] The development of PTFE from the "accidental" discovery to a commercial product took about 10 years, from 1938 to 1948[10], and then decades more to mature that technology into the materials used today. Development advances over this time have had to occur in polymerization, finishing, lubrication and blending, pelletization, extrusion, etc. In the absence of such an initial unexpected discovery, we can only

[7] A dielectric constant below 2,5 is required for those applications

[8] The Restriction Dossier refers multiple times to higher costs of fluoropolymers (Annex E, page 285, 390, 444, 458, 504, …)

[9]See https://www.ptonline.com/articles/tracing-the-history-of-polymeric-materials-part-20.

[10] https://www.teflon.com/en/news-events/history#:~:text=An%20Accidental%20Discovery&text=Roy%20J.,to%20form%20polytetrafluoroethylene%20(PTFE).

speculate that developing a new polymer to commercial availability will take **more than 20 years**.

After identifying a material, the possible alternative materials will need further development in order to optimise them for specific application requirements. We estimate that this development stage could take 2 to 3 more years. There is also no guarantee that the new material and the associated manufacturing of that material would be preferable from an environmental perspective, as it would replace what is intrinsically a safe polymer.

The final optimised material will then need to be manufactured into cable assemblies that can be evaluated and qualified both at a manufacturing and end-use level.

Table 6. Substitution Steps for Developing an Alternative to Fluoromaterials in Specialty Wire and Cable Applications

Steps for substitution	**What activities does this step entail?**	**Time required for step**
1. Identification and development of new material	Identify and develop suitable alternative materials. Product Development from lab discovery to pilot scale.	**Unknown** Estimate > 20 years
2. Product development an iterative stage of R&D, (re)formulation and lab testing	Optimise material for specific application requirements	2-3 years
3. Qualification and/or Validation - testing and validation with customers and/or external testers	Reliability testing of manufactured components.	2-3 years
4. Production - implementing the manufacturing plan for the alternative, including a possible pilot phase, regulatory approval, and modifications to the production line.	Supply chain development (new production capabilities and capacity for mass production).	1-2 years
5. End Device – Development and testing of product in-use with end device	Development cycle of new end device	1 year
Total		**Unknown** >26 years

V. Additional Information in SEA

Specific information requested in the stakeholder consultation is available in the full SEA which is attached as Annex I to this derogation request. The information provided in the SEA include the following:

- Market and sales for products (Section 2.3 and 2.5.2);
- Types and volumes of PFAS used (Section 2.4, 2.5.3 and 2.5.5);
- Material flow, including emission volumes (Section 2.4.3 and 2.5.3);
- Further information on alternatives (Chapter 3);
- Economic impacts (Section 4.3);
- Impacts on health and the environment (Section 4.4);
- Social and wider economic impact (Section 4.5); and
- Comparison of impacts and proportionality (Chapter 5).

Please note that the SEA covers the much wider sector of Electronics and Telecommunications than just Specialty Wires and Cables discussed in this submission, therefore, it also contains information on other Electronics and Telecommunications categories which fall under different applications/sub-uses.

Based on the high costs involved and the adverse impacts on critical infrastructure of using inferior alternatives, a derogation is justified.

4. Socio-economic impacts

The SEA shows that not granting a derogation for specialty wire and cable products similar to those set out in Table 1 will have large and wide-reaching impacts on the EU. These include significant economic costs throughout the value chain, impacts on employment (lost jobs) as well as adverse critical communications, computing, transportation infrastructure, and energy provision operations.

EU consumers have come to rely on communications and services (e.g., 5G, capital infrastructure) for which testing capabilities must be available with sufficient reliability and performance.

A common property of all these wires and cables is that their dielectric constant and stability (mechanical and chemical strength, low outgassing) which enable accurate and reliable testing, including in harsh environments and capital infrastructure in telecommunications. Considering that the fluoropolymers used are polymers of low concern, it is not apparent that restricting this particular use would lead to a net improvement for the environment.

Gore, as well as the wider industry, have searched for alternatives to fluoropolymers for use in wires and cables applications over many years, but there are currently no alternatives available that can provide the same combinations of functionality. If forced to use inferior alternatives, it will lead to significant adverse impacts, including lower reliability of testing and increased resource use due to system failure (including critical raw materials).

Telecommunication is a large and growing industry that generates significant income and supports a large number of jobs in the EU[11]. Value chain disruptions from restricting a key component in this sector may therefore significantly impact the EU economy.

5. Emissions

It is demonstrated in Section 2.4.3 of the SEA that emissions from product manufacturing, service life, and end of life are negligible. **Additional information on responsible manufacturing, processing and disposal of fluoropolymers and products made from fluoropolymers are provided in Gore's derogation request for fluoropolymers.**

In addition, an estimate of worst case emissions based on the "investigation report summaries" published by the DS in 2021 (National Institute for Public Health and the Environment (RIVM) et al., 2021) is provided (see section 2.5.3). This information has been compiled to create a basis for further consideration within the framework of the SEA. It does not correspond with our knowledge on emissions and in particular our knowledge on emissions from product manufacturing with emission control technologies in place. In our opinion, the emissions from product manufacture estimated in the investigation report summaries are significantly overestimated. **But even when applying highly conservative emission factors, the resulting costs of reducing PFAS through restricting if high at €12,500 – €33,500 per kg PFAS emissions reduced.** As described below, this cost would not even be clearly proportional if the PFAS were SVHC's. **Since only fluoropolymers are used this cost is clearly not proportional, especially when considering the unquantified costs of failure of complex electronic systems across multiple sectors.**

A CE estimate does not in itself, indicate whether benefits (costs) of a restriction outweigh the costs (benefits). For cases where risks and impacts of reducing exposure to a substance are unknown, it is common to compare the cost-effectiveness estimates with some type of benchmark. A study by Oosterhuis et al. published in 2017 found that for PBTs, vPvBs and substances with similar properties (e.g., lead) emission reduction measures with a cost-effectiveness below €1,100[12] per kg emission reduced were generally not rejected due to costs i.e., the costs were found to be proportionate. Measures with costs above €56,400[13] per kg, on the other hand, were more likely to be rejected, i.e., costs at this level were found to be disproportionate. Cost in between could be either proportionate or disproportionate – a so called 'grey zone' (Oosterhuis et al., 2017). The Oosterhuis benchmarks (BMs) have been used for the assessment of a number of regulations of PBTs and vPvBs, which are substances of very high concern (SVHCs). These BMs are, however, not necessarily

[11] See SEA for more information
[12] €1,000 in original study, uplifted to 2022 prices
[13] €50,000 in original study, uplifted to 2022 prices

applicable to substances of low concern such as PTFE and other PLCs. The reasoning behind this is that the implied willingness to pay (acceptability of costs) would be higher, the higher the perceived risk of a specific substance.

If the Oosterhuis BMs are to be used for substances of low concerns, it is reasonable to make some indicative, quantitative or qualitative, adjustments. For example, if the 'grey zone' for a PBT ranges from €1,100 – €56,400 per kg PBT emission reduced, it is reasonable to assume that upper bound (and likely also the lower bound) would be significantly lower for substances of low concern.

There are uncertainties associated with all parts of the analysis and a multitude of impacts could not all be quantified and/or monetised. However, due to the consistent conservative approach taken it is believed that the most significant non-quantified impacts are costs of a possible REACH restriction and would therefore further strengthen the conclusions from the quantitative analysis. **It is therefore concluded that restricting the use of PFAS in specialty wire and cable end uses will result in highly disproportionate societal costs for the EU.**

Annex I – Socio Economic Assessment Electronics and Telecommunication Products

See file submitted in the attachment.