[**The Forever Lobbying Project**](https://foreverpollution.eu/)

**Stress Test Methodology and Sources**

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*The online version of this document can be found on* [*this page*](https://foreverpollution.eu/lobbying/the-stress-test-methodology/)*.*

**Introduction**

In February 2023, Germany, Denmark, Norway, the Netherlands and Sweden proposed a ‘[universal restriction](https://echa.europa.eu/fr/-/echa-publishes-pfas-restriction-proposal)’ (‘uPFAS’) of PFAS under the European REACH regulation (Registration, Evaluation and Authorisation of Chemicals).

Unprecedented in its scope, the restriction on per- and polyfluoroalkylated substances has mobilised more than a dozen industry sectors working to defend their business.

The Forever Lobbying Project wanted to explore methodically whether the lobbying arguments put forward were based on reliable data, a complex task never before carried out by journalists. The team developed a stress-test methodology together with Gary Fooks, a social scientist at the University of Bristol (UK), who specialises in corporate harm and the ‘[commercial determinants of health](https://www.thelancet.com/series/commercial-determinants-health)’.

**Stress Test Methodology note**

**– Sample of lobbying documents**

The [Forever Lobbying Project’s collection](https://foreverpollution.eu/lobbying/the-document-collection/) includes 8,189 lobbying documents, either obtained through Freedom of Information (FOI) requests or extracted from the European Chemicals Agency (ECHA) database of contributions to the 2023 public consultation on the PFAS universal restriction (3,393 documents).

**– Selection of lobbying arguments, phase 1**

As a first step, the journalists collected in a spreadsheet lobbying claims from documents obtained through FOI requests in their respective countries or from contributions to the ECHA consultation sent from their countries. In parallel, complementary research and interviews with various sources led to the identification and mapping of the main lobbying actors. Through this research phase, the fluoropolymer sector was identified as the most active lobbying actor.

**– Focus on the fluoropolymer sector**

After observing an exceptional number of arguments defending fluoropolymers – high-performance plastics manufactured with PFAS and defined as PFAS themselves – we concluded that this sector was the most crucial for the industry to defend. Therefore, we excluded other PFAS uses, such as fluorinated gases, commonly known as F-gases.

**– Selection of lobbying arguments, phase 2**

Journalists compiled into a spreadsheet the lobbying arguments of three “leading” business associations and two “leading” companies at the forefront of defending fluoropolymers in each country. Where neither was available, journalists selected “secondary” actors.

“Leading” entities were defined as:

- Trade associations representing the interest of the plastic industry

- National federations for the chemical industry

- Companiesoperating PFAS manufacturing facilities in Europe and identified by the [Forever Pollution Project in 2023](https://foreverpollution.eu/map/) (3M, AGC, Archroma, Arkema, Chemours, Dyneon/3M, Daikin, F2, Lanxess, Solvay and Synesqo), and Gujarat Fluorochemicals, an Indian company with business interest in Europe.

“Secondary” fluoropolymer defence entities or strategic allies were identified as:

- Medical device/pharmaceutical federations

- Semiconductor trade associations

- Trade associations for electric vehicle batteries

**– Repetition of lobbying arguments**

The research revealed the repeated use of a group of 20-25 similar arguments and lobbying requests at both the European and national levels, suggesting that this was a coordinated campaign orchestrated by the main business associations Plastics Europe (with its Fluoropolymers Product Group, FPG) and the European Chemical Industry Council, CEFIC (for other uses).

This classic lobbying pattern was confirmed by Vicky Cann, a researcher and activist at Corporate Europe Observatory, a Brussels-based organisation that collaborated with the team by sharing FOI documents she obtained from the EU institutions.

At our request, Hugo Subtil, a postdoctoral researcher in the Department of Political Science at the University of Zurich in Switzerland, and Juliette Jahan de Lestang, a student at the École des Mines de Paris in France, attempted to confirm our observation by testing it with Large Language Model (LLM) AI tools. However, the results were not statistically significant and conclusive enough to be utilised.

**– Representativeness of Plastics Europe’s Fluoropolymers Product Group (FPG)**

We identified the FPG as the primary lobbying force for manufacturers and downstream users, who either recycled or customised the lobbying arguments and documents developed by the FPG. We considered these to be the original materials behind the lobbying campaign.

As of January 2025, [the FPG’s member companies](https://web.archive.org/web/20250113212639/https://fluoropolymers.eu/about) were AGC (Japan), Arkema (France), Chemours (US), Daikin (Japan), DuPont (US), Gujarat Fluorochemicals (India), WL Gore (US), Honeywell (US), Syensqo (ex Solvay, Belgium), and Kureha (Japan). The US manufacturer 3M was no longer a member of the group [in 2024](https://web.archive.org/web/20240419170635/https://fluoropolymers.eu/about/).

**– Taxonomy of lobbying arguments**

In the end, the journalists collected 1,178 lobbying arguments. Guided by Gary Fooks, the Stress test team first categorised each of the arguments under one of three themes: scientific arguments, arguments around the lack of alternatives to fluoropolymers (“There is no alternative” arguments), and economic arguments. Then, they coded again the arguments, this time according to the topic.

***Scientific arguments***

* Persistence is not enough
* Not all PFAS
* Polymer of low concern (PLC)
* Definition change
* Non Fluorinated Polymerisation Aids (NFPA)
* Not toxic
* Waste can be managed
* Emissions can be managed

*Lobbying requests linked to scientific arguments*

* Existing regulations are enough
* Self regulation
* No grouping
* Legal threat

***“There is no alternative” arguments***

* There is no alternative
* Green transition
* Digital transition
* Social benefits/consequences
* Strategic autonomy
* Regrettable substitution
* Shortage of medicine

*Lobbying requests linked to “There is no alternative” arguments*

* Derogation for fluoropolymers
* Longer transition periods
* Exemptions

***Economic arguments***

* Economic impact
* Relocation
* Job loss

“Economic impact” was sub-categorised with:

* Investments
* Competitiveness
* Shut down
* Trade balance
* Revenue loss
* Impact on sector
* Circularity
* Shortage
* Cost
* Impact economy and society
* Interactions value chain
* Innovation
* Impact assessment
* International trade

**– Reference Industry documents**

We based our analysis of the scientific and economic arguments on four documents filed by Plastics Europe’s Fluoropolymer Products Group to the ECHA public consultation:

– Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

Plastics Europe Fluoropolymer Products Group (FPG). Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report. September 2023. [https://www.industrydocuments.ucsf.edu/chemical/docs/#id=snjv0346](https://www.industrydocuments.ucsf.edu/chemical/docs/" \l "id=snjv0346)

– Socioeconomic Impact Assessment for fluoropolymers #1

ERM, Plastics Europe Fluoropolymer Products Group (FPG), Socioeconomic Impact Assessment for fluoropolymers. FPG response to the PFAS draft restriction proposal. 31 May 2023. Project No.: 0673581.

[https://www.industrydocuments.ucsf.edu/chemical/docs/#id=tnjv0346](https://www.industrydocuments.ucsf.edu/chemical/docs/" \l "id=tnjv0346)

– Socioeconomic Impact Assessment for fluoropolymers #2

Plastics Europe Fluoropolymer Products Group (FPG), Socioeconomic Impact Assessment for fluoropolymers. FPG response to the PFAS draft restriction proposal. 15 September 2023.

<https://web.archive.org/web/20240821142049/https://fluoropolymers.eu/wp-content/uploads/2023/09/FPG-Socioeconomic-Impact-Assessment-fluoropolymers-EU-PFAS-restriction-proposal-for-publication-Sept-2023.pdf>

– Plastics Europe Fluoropolymer Products Group (FPG). FPG Manufacturing Programme for European Manufacturing sites. September 2023 <https://fluoropolymers.eu/wp-content/uploads/2023/09/FPG-Manufacturing-Programme-for-European-Manufacturing-sites-Final-September-2023.pdf>

**Stress test of the Science arguments**

**Definitions**

FALSE | Statement demonstrably, verifiably, and categorically inconsistent with the available scientific evidence.

MISLEADING | Statement conflicting with established scientific facts.

POTENTIALLY DISHONEST | Statementthat may imply an intention to provide misleading information.

**Science stress test conclusions**

*Health*

#1 ‘Not all PFAS’ [are the same] MISLEADING

#2 [Fluoropolymers are] ‘Not toxic’ MISLEADING

#3 [because Fluoropolymers are] ‘Polymers of Low Concern (PLCs) according to criteria established by the Organisation for Economic Co-operation and Development’ POTENTIALLY DISHONEST

→ [leading to the lobbying request of] ‘No grouping’

#4 ‘Persistence is not enough’ FALSE

→ [REACH does not foresee persistence alone as a motive to regulate]

*Environment*

#5 ‘Emissions are/can be managed’ FALSE

#6 ‘Non-fluorinated polymerisation aids’ [allows clean manufacture of fluoropolymers] FALSE

→ [leading to the lobbying request of] ‘Self-regulation’

#7 ‘Waste can be managed’ FALSE

→ [leading to the lobbying request of] ‘Existing regulation/s are enough’

**Expert**

Martin Scheringer (ETH Zurich, Switzerland), an environmental chemist and world-renowned researcher on PFAS, reviewed and contributed to the bibliography and recommended other experts.

**1) Health**

**– Main lobbying arguments:**

#1 **‘Not all PFAS’** [are the same] MISLEADING

#2 [Fluoropolymers are] **‘Not toxic’** MISLEADING

#3 [because Fluoropolymers are] **‘Polymers of Low Concern (PLCs)’** POTENTIALLY DISHONEST

**– Product-defence evidence presented by industry**

In its lobbying documents, the industry generally cites two scientific articles arguing that fluoropolymers are ‘Polymers of Low Concern (PLCs)” according to criteria established by the Organisation for Economic Co-operation and Development (OECD)” to back up the claims cited above. Both articles are mentioned 997 times in the corpus of lobbying documents we analysed (comments to ECHA’s consultation and FOI documents).

Henry, B. J et al. (2018). A Critical Review of the Application of Polymer of Low Concern and Regulatory Criteria to Fluoropolymers. *Integrated Environmental Assessment and Management.* 14(3), 316-334. <https://doi.org/10.1002/ieam.4035>

Korzeniowski, S.H. et al. (2023). A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers. *Integrated Environmental Assessment and Management,* 19(2), 326-354. <https://doi.org/10.1002/ieam.4646>

**– On 10 October 2024, the Organisation for Economic Co-operation and Development (OECD) provided a statement to the Forever Lobbying Project clarifying that they have never finalised the PLC criteria.**

“From 1993 to 2009, expert groups at the Organisation for Economic Co-operation and Development (OECD) engaged in discussions on criteria for identifying polymers of low concern. However, no agreed-upon set of criteria at the OECD level was finalised.

Several countries have since implemented their own criteria for reduced regulatory requirements for polymers, drawing on the discussions from the OECD, but tailored to fit their specific regulatory frameworks. No further work has been conducted at the OECD on polymers of low concern since 2009.

It is important to note that life-cycle aspects were not considered during the discussions, and the OECD has not conducted an assessment of fluoropolymers against the criteria that were discussed.”

“A summary of past OECD on polymers of low concern can be found” in [this document](https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/risk-management-risk-reduction-and-sustainable-chemistry/polymers-of-low-concern.pdf/_jcr_content/renditions/original.media_file.download_attachment.file/polymers-of-low-concern.pdf).

**– Peer-reviewed publication of the competent scientific community**

Lohmann R. et al. (2020). Are Fluoropolymers Really of Low Concern for Human and Environmental Health and Separate from Other PFAS? *Environmental Science & Technology*, 54(20): 12820-12828. <http://doi.org/10.1021/acs.est.0c03244>

**#4 “Persistence is not enough”** FALSE

**– Except for one instance, this argument is never sustained by a reference.**

**–** As explained in our [article about this stress test](https://foreverpollution.eu/lobbying/the-disinformation-campaign/), leading scientists in the field [wrote](https://doi.org/10.1039/D0EM00355G) that “because the possible effects cannot be predicted with sufficient reliability and remain incompletely known or entirely unknown, high persistence alone should be used as a sufficient indicator that serves as a proxy for adverse effects” (Cousins, 2020). Severalpeer-reviewed publications develop this specific point:

Cousins, I. T. et al (2019). Why is high persistence alone a major cause of concern?. *Environmental Science: Processes & Impacts*, 21(5), 781-792. <https://doi.org/10.1039/C8EM00515J>

Cousins, I. T. et al (2020). The high persistence of PFAS is sufficient for their management as a chemical class. Environmental Science: Processes & Impacts, 22(12), 2307-2312. <https://doi.org/10.1039/D0EM00355G>

Scheringer, M. et al. (2022). Stories of global chemical pollution: will we ever understand environmental persistence? *Environmental Science & Technology*, *56*(24), 17498-17501. <https://doi.org/10.1021/acs.est.2c06611>

**2) Environment**

**#5 Emissions can be managed** FALSE

**– Evidence presented by industry**

FPG Manufacturing Programme for European Manufacturing sites

<https://fluoropolymers.eu/wp-content/uploads/2023/09/FPG-Manufacturing-Programme-for-European-Manufacturing-sites-Final-September-2023.pdf>

**– Peer-reviewed publications of the competent scientific community on PFAS emissions and their history:**

Dalmijn, J., Glüge, J., Scheringer, M., & Cousins, I. T. (2024). Emission inventory of PFASs and other fluorinated organic substances for the fluoropolymer production industry in Europe. *Environmental Science: Processes & Impacts*, *26*(2), 269-287. <https://doi.org/10.1039/D3EM00426K>

Joudan, S. et al. (2024). Aqueous Leaching of Ultrashort-Chain PFAS from (Fluoro) polymers: Targeted and Nontargeted Analysis. *Environmental Science & Technology Letters*, 11(3), 237-242. <https://doi.org/10.1021/acs.estlett.3c00797>

Cousins, I. T., Johansson, J. H., Salter, M. E., Sha, B., & Scheringer, M. (2022). Outside the safe operating space of a new planetary boundary for per-and polyfluoroalkyl substances (PFAS). *Environmental Science & Technology*, *56*(16), 11172-11179. <https://doi.org/10.1021/acs.est.2c02765>

Lohmann R. et al. (2020) Are Fluoropolymers Really of Low Concern for Human and Environmental Health and Separate from Other PFAS? *Environmental Science & Technology*, 54(20):12820. <https://doi.org/10.1021/acs.est.0c03244>

Wang, Z. et al. (2014). Global emission inventories for C4–C14 perfluoroalkyl carboxylic acid (PFCA) homologues from 1951 to 2030, Part I: production and emissions from quantifiable sources. *Environment international*, *70*, 62-75. <https://doi.org/10.1016/j.envint.2014.04.013>

Wang, Z. et al. (2014). Global emission inventories for C4–C14 perfluoroalkyl carboxylic acid (PFCA) homologues from 1951 to 2030, part II: the remaining pieces of the puzzle. *Environment international*, *69*, 166-176. <https://doi.org/10.1016/j.envint.2014.04.006>

**#6 ‘Non-fluorinated polymerisation aids’ [enables clean manufacture of fluoropolymers]** FALSE

Polymerisation is the process by which chemical ingredients are transformed into fluoropolymer. Some companies have developed manufacturing processes where Fluorinated Processing Aids (FPAs) are replaced by Non-Fluorinated Polymerisation Aids (NFPAs), mostly hydrocarbon-based alternatives.

The most [proactive](https://fr.slideshare.net/slideshow/oecd-global-forum-on-the-environment-dedicated-to-per-and-polyfluoroalkyl-substances-addressing-the-concerns-related-to-fluoropolymers-during-their-lifecycle-deepak-kapoor/266309778) company in this field is the Indian company Gujarat Fluorochemicals (GFL). Gujarat claims it can manufacture PTFE without Fluorinated Processing Aids. Other companies, mainly Arkema and Solvay, are making the same claims. However, they do not claim that using Non-Fluorinated Polymerisation Aids generates or emits no PFAS. Indeed, Gujarat [provides](https://fr.slideshare.net/slideshow/oecd-global-forum-on-the-environment-dedicated-to-per-and-polyfluoroalkyl-substances-addressing-the-concerns-related-to-fluoropolymers-during-their-lifecycle-deepak-kapoor/266309778) an estimation of 50 kg of PFAS by-product per 50,000 tonnes of produced polymer, but does not say where those 50 kg end up, and the raw data are not public. Therefore, no independent assessment can be made.

A competitor to Gujarat, and one of the historical companies with commercial and legal interests in PFAS,Chemours, is critical of the approach and published a study showing that the new process generates Fluorinated Processing Aids at several stages. It could even increase the quantity of PFAS by-products. As it happens, the industry has stress tested itself on this one.

Reference: Sworen, J. C. et al (2024). Interrogation of a fluoropolymer dispersion manufactured with a non-fluorinated polymerization aid for targeted and non-targeted fluorinated residuals by liquid chromatography high resolution mass spectrometry. *Journal of Chromatography A*, *1736*, 465369. <https://doi.org/10.1016/j.chroma.2024.465369>

**– Evidence presented by the industry in favor of Non-fluorinated polymerisation aids**

Ameduri, B., Sales, J., & Schlipf, M. (2023). Developments in fluoropolymer manufacturing technology to remove intentional use of PFAS as polymerization aids. *International Chemical Regulatory and Law Review*, *6*, 18. <https://icrl.lexxion.eu/article/icrl/2023/1/5>

Responsible manufacturing of fluoropolymers without the use of fluorinated polymerization aids (FPAs) – Report reviewed by Ramboll, 2023 - This report is not publicly available.

Arkema. (2008). Arkema eliminates fluorosurfactants from Kynar 500PVDF®. <https://www.pcimag.com/articles/88876-arkema-eliminatesfluorosurfactants-from-kynar-500-pvdf>

Arkema. (2021b). Fluorosurfactant free KynarPVDF resin®. <https://kynar500.arkema.com/en/product-information/fluorosurfactant-free/>

Chemours. (2022). Chemours announces process innovation with New Viton™ fluoroelastomers advanced polymer architecture (APA) offering. <https://gfl.co.in/upload/pages/ebce5fed9030753d0ee651bf1f48d0a0.pdf>

Gujarat Fluorochemicals Limited. (2022). Company announcement on the development of a non‐fluorinated polymerization aid. <https://www.gfl.co.in/assets/pdf/Announcement-9th-March-2022.pdf>

Solvay. (2022). Innovating with non‐fluorosurfactant technologies. [www.solvay.com/en/innovation/science-solutions/pfaares](http://www.solvay.com/en/innovation/science-solutions/pfas)

Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

PlasticsEurope Fluoropolymer Products Group (FPG). Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report. September 2023. [https://www.industrydocuments.ucsf.edu/chemical/docs/#id=snjv0346](https://www.industrydocuments.ucsf.edu/chemical/docs/" \l "id=snjv0346)

**– A recent peer-reviewed publication of the competent scientific community addresses the issue of ‘Non-fluorinated polymerisation aids’:**

Dalmijn, J. et al. (2024). Emission inventory of PFASs and other fluorinated organic substances for the fluoropolymer production industry in Europe. *Environmental Science: Processes & Impacts*, *26*(2), 269-287. <https://doi.org/10.1039/D3EM00426K>

**–** The Forever Lobbying Project asked [Joost Dalmijn](https://www.su.se/english/profiles/joda5001-1.516956), a PhD Student with Ian Cousins at the Department of Environmental Science at Stockholm University (Sweden), who took part in the Forever Lobbying Project’s Expert group, to stress test the non-fluorinated polymerisation aids (NFPA) argument. Joost Dalmijn was the lead author in a [major 2024 publication](https://doi.org/10.1039/D3EM00426K) on an emission inventory of PFAS emissions due to fluoropolymer production (referenced above). Here’s his note for the Project:

“Several fluorochemical companies claim that their processes are ‘clean’ because they replaced one PFAS ingredient in polymerization (i.e., the Fluoropolymer Polymerisation Aids in Pol FPA) with a new non-PFAS ingredient (NFPA). However, fluoropolymer manufacturing itself remains carbon-fluorine chemistry and will likely involve PFAS formation at one or more stages. Focusing on a single ingredient is therefore too narrow a perspective when addressing PFAS emissions.

An added drawback of Non-Fluorinated Polymerisation Aids is their likely interaction with the polymerization process in the reactor, which could lead to the increased formation of additional PFAS by-products. In my opinion, this is what Chemours’ data\* and data collected by the US EPA around a plant in the US\*\* suggest. The chemical structure and resulting total concentration of these residuals could be very similar to that of the FPAs the NFPAs aim to replace. This similarity raises the question of whether NFPAs are intentionally added to stimulate the formation of PFAS by-products in the reactor, which subsequently act as the actual polymerization aids.

The reason the use of Non-Fluorinated Polymerisation Aids may lead to increased by-product formation compared to a classical Fluoropolymer Polymerisation Aid is that the latter’s perfluoroalkyl tail is inert and limits interactions during polymerization. The hydrocarbon structure of an NFPA does not provide this ‘protection.’ Consequently, this ‘solution’ essentially trades one problem (Fluoropolymer Polymerisation Aids) for another (increased by-product formation). Additionally, Chemours claims that certain fluoropolymers produced using this process are of lower purity and quality than those made with Fluoropolymer Polymerisation Aids — a claim difficult to verify but plausible.

Furthermore, several key properties of PFAS polymerization by-products, such as toxicity, persistence, and bioaccumulation potential, remain largely unknown. This increases complexity for scientists and regulators and raises costs associated with additional testing, monitoring and studies.

Purposefully or not, industry appears to focus solely on the impacts of reducing use and emissions of Fluoropolymer Polymerisation Aids. In my view, the focus should be on minimizing PFAS emissions throughout all stages of the fluoropolymer production process to limit human and environmental exposure to these substances. A key role herein lies with the European Commission and the governments and regulating authorities of the member states. These should ensure a level playing field so that companies throughout Europe are kept to the same standards when it comes to their emissions of PFAS from fluoropolymer production.”

\* Sworen, J. C. et al (2024). Interrogation of a fluoropolymer dispersion manufactured with a non-fluorinated polymerization aid for targeted and non-targeted fluorinated residuals by liquid chromatography high resolution mass spectrometry. *Journal of Chromatography A*, *1736*, 465369. <https://doi.org/10.1016/j.chroma.2024.465369>

\*\* Delaware Riverkeeper Network. “Re: Comments on Proposed Judicial Consent Order And Modifications To The Direct Oversight Requirements in the Matter of NJDEP V. Solvay Specialty Polymers USA, LLC, DKT. NO. GLO-L001239-20”, 3 October 2023. <https://delawareriverkeeper.org/wp-content/uploads/2024/02/20231003_DRN_Comment_SolvayJudicialConsentOrder.pdf>

\*\* NJDEP Report #11- NTA Solvay Samples\_FINAL\_23FEB2022 – Unpublished document cited in: Craig Welch, Jana Cholakovska, Pooja Sarkar, Alec Gitelman, Clare Fieseler, Emilie Rosso. ‘Forever chemical’ polluters land hefty contracts to meet electric vehicle battery demand. The Examination, 10 July 2024, <https://www.theexamination.org/articles/forever-chemical-polluters-land-hefty-contracts-to-meet-electric-vehicle-battery-demand>

**#7 Waste can be managed**

**– The main evidence presented by the fluoropolymer industry is an incineration study sponsored by the Indian company Gujarat Fluorochemicals Limited (GFL), performed at the Karlsruhe Institute of Technology (KIT), and later published in a peer-reviewed journal.**

Gehrmann, H.-J. et al. (2024). Mineralization of fluoropolymers from combustion in a pilot plant under representative European municipal and hazardous waste combustor conditions. *Chemosphere*. 143403. <https://doi.org/10.1016/j.chemosphere.2024.143403>

**→ What they did**

This “Pilot-Scale Fluoropolymer Incineration Study” was conducted at a pilot incineration plant “under representative European municipal solid waste and hazardous waste combustor conditions”. The researchersplaced a “mixed sample of fluoropolymers representing 80% of commercial fluoropolymers” in the incinerator and combusted it “at conditions representative of municipal (860 °C for 2 s) and industrial (1095 °C for 2 s) waste incinerators operating in EU”.

**→ What they concluded**

“Statistical analysis of the results confirmed non-detect to negligible levels of PFAS evidencing mineralization of fluoropolymers. Inorganic fluorides were detected as hydrogen fluoride (between 70 and 80 wt%). There was no discernible effect of temperature on the mineralization of fluoropolymer and testing at 860 °C versus 1095 °C did not show evidence of an increase in PFAS emissions.”

**Other studies often cited by industry on the incineration of fluoropolymers:**

Aleksandrov et al. (2019). Waste incineration of Polytetrafluoroethylene (PTFE) to evaluate potential formation of per- and Poly-Fluorinated Alkyl Substances (PFAS) in flue gas. *Chemosphere*, 226: 898-906. <https://doi.org/10.1016/j.chemosphere.2019.03.191>

Bakker et al. (2021). Per- and polyfluorinated substances in waste incinerator flue gases. RIVM Report 2021-0143. <https://www.rivm.nl/bibliotheek/rapporten/2021-0143.pdf>

Giraud, R.J., Taylor, P. H., Huang, C-p. (2021). Combustion operating conditions for municipal Waste-to-Energy facilities in the U.S. *Waste Management*, 132:124-132.<https://doi.org/10.1016/j.wasman.2021.07.015>

Giraud, R. J. 2021b. Municipal Waste-to-Energy Combustion of Fluorinated Polymers as a Potential Source of PFOA in the Environment. PhD Thesis. University of Delaware.

<https://udspace.udel.edu/items/352050b2-fd85-43e2-bd9b-a056ecd4ac62>

**– A technical report on fluoropolymers published in 2021 by the European Environment Agency and involving a dozen experts reviewed the evidence currently available on incineration:**

Wahlström, M. et al. (2021). "Fluorinated polymers in a low carbon, circular and toxic-free economy Technical report." European Environment Agency.

<https://www.eionet.europa.eu/etcs/etc-wmge/products/etc-wmge-reports/fluorinated-polymers-in-a-low-carbon-circular-and-toxic-free-economy>

– The Forever Lobbying Project asked Dorte Herzke, who took part in the 2021 European Environment Agency report, to stress test the fluoropolymer industry’s arguments on the incineration of PFAS waste. Dorte Herzke is a senior scientist at the Arctic environment section in NILU’s Department of Environmental Chemistry and Health Effects, Kjeller (Norway).

**Forever Lobbying Project – *Are there existing incineration technologies or conditions which can guarantee the complete destruction of PFAS?***

**Dorte Herzke –** For large-scale applications, not to my knowledge, since we still have not fully understood all the various PFAS intermediates formed under the numerous technologies applied. Even if the decomposition of PTFE (polytetrafluoroethylene) is essentially complete by 650°C, a large number of new fluorinated organic substances are also formed at higher temperatures. These are not limited to the PFAS measured in the 2024 study by Gehrmann *et al*. In our [2021 European Environment Agency] report, we list a selection of them. Here we further write “In Australia, companies licensed to incinerate soil and water contaminated with PFAS, operate at temperatures of 1,050–1,100 °C (Seow, pers comm, 2020).” And that is in my opinion the temperature you have to reach in order to be on the safe side.

**Forever Lobbying Project *– The fluoropolymer sector has been using the recently published*** [***Gehrmann study***](https://www.sciencedirect.com/science/article/pii/S0045653524023014)***, which they funded, to claim they can manage the waste phase. Is this study relevant to address the issue in real-life conditions?***

**Dorte Herzke –**This study gives useful additional information on a little understood process, but I am not sure if all real-life conditions were taken into account. I am also not an expert on the real-life composition of household waste that is representative of European municipal solid waste, and no reference for that is given in the paper. So I do not know if the applied feed rate of fluoropolymer mixture of 0.32 kg/h (320 g/h) is appropriate. This sounds little to me to also cover episodes of higher loads. The fluoropolymer pieces were cut into very small sizes and mixed only with wood and no other household waste as other plastics etc. was added, also not reflecting real-life conditions.

Other plastics present would change the availability of additional small organic molecules that could react with the fluorine and from additional PFAS. But the biggest concern I have is on the PFAS covered, since they do not belong to the most probable PFAS formed and any claim that since they can not be found, the fluoropolymers are fully mineralized\* is on shaky grounds. According to their fluorine inventory, 30-20 % of fluorine is not accounted for, which is still a considerable amount.

\***mineralized**: The goal of incineration is to mineralize PFAS. The high temperature breaks the carbon-fluorine bond. When the carbon is gone from a given material, it is mineralized.

**Forever Lobbying Project *– What are the main unresolved issues with fluoropolymer waste incineration?***

**Dorte Herzke –** First, understanding all the intermediates formed and evaluating their volumes and fate after emission to the environment. Most of the most probable PFAS formed will be very small molecules which are very volatile and airborne after emission, leading to a fast atmospheric distribution also over longer distances. Some of these chemicals are known for their high stability and greenhouse gas potential.

Second – What are the actual volumes of fluoropolymer ending up in municipal waste? Is it a non-stick pan here and there and a Gore-Tex jacket or is it much more? That would also require us to have knowledge about all the various FP applications in customer goods.

Third – There is no closed system. We have to make sure that the emissions that happen are safe and clean; we need innovation and good methods to follow them up for that.

**Stress test of the “There is no alternative” arguments**

We labelled under the category “There is no alternative” all industry arguments claiming there are no available, viable, and safe alternatives to fluoropolymers for certain uses and applications now or in the foreseeable future.

Industry actors have wrapped up the same “There is no alternative” arguments into many different packages.

* Plain “There is no alternative” for specific uses, applications or devices argument
* Fluoropolymers have unique properties that benefit society (durability, heat resistance, etc.), which makes them irreplaceable
* Fluoropolymers are needed to achieve and implement European policies such as the Green and Digital transitions, the Chip Act, etc.
* Because there are no alternatives, the PFAS universal restriction poses a threat to Europe’s strategic autonomy
* Existing alternatives are not viable or perform much worse, which brings about the risk of regrettable substitution.

Almost half (n=525) of the 1,178 corporate statements collected by the team members were “There is no alternative” arguments, making them the cornerstone of the lobbying campaign. This claim and its by-products have framed the entire political discussion on the PFAS restriction proposal.

Stress testing every claim of "there is no alternative" requires investigating all of the potential alternatives for each specific use of fluoropolymers. In real-life conditions, the precise applications of fluoropolymers in industrial and other processes are highly specific and technically complex. In many cases, only the company utilising a specific fluoropolymer has enough information to determine which is a viable alternative for them.

In fact, in its [instructions](https://echa.europa.eu/documents/10162/aea5537d-b698-3b75-4b67-0cadd0fd11d3) on how to respond to its consultation process, ECHA explicitly asked for highly detailed information on the work industry actors have undertaken: “For cases in which alternatives are not yet available, information on the status of R&D processes for finding suitable alternatives, including the extent of R&D initiatives in terms of time and/or financial investments, the likelihood of successful completion, the time expected to be required for substitution (including any relevant certification or regulatory approvals) and the major challenges encountered with alternatives which were considered but subsequently disregarded.”

In the documents we reviewed, however, we found that companies claiming “there is no alternative” provided very little detailed information. To carry out the stress test we had to classify their “there is no alternative” claims according to a particular categorisation of applications. We used the categorisation provided by the [Alternative Assessment Database](https://zeropm.eu/alternative-assessment-database/), developed as part of the EU-funded project [ZeroPM](https://zeropm.eu/).

The ZeroPM database classifies PFAS according to “use category” (for example, food contact materials), “sub-use” (for example, cookware), and “application” (for example, consumer cookware and industrial food and feed production equipment). The ZeroPM database lists all known potential alternatives for each application, those already available and in use in commercial products as well as those still being tested. Romain Figuière, a researcher at Stockholm University, Sweden, and a lead developer of the ZeroPM database, assisted us in our efforts to cross-reference the claims with the database.

Working with Figuière, we found that only 134 of the 525 “there is no alternative” claims contained enough information to assign them a “use category”, a “sub-use”, and an “application”, and submit them to our stress testing. Cross-checking these 134 claims with the ZeroPM database, we found that there were potential alternatives listed for nearly two-thirds of them (85 out of 134).

The ZeroPM database was last updated in April 2023, and most of the potential alternatives listed are drawn from [Annex E](https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18663449b) of the ECHA restriction proposal. Known potential alternatives from other sources were added by the researchers. An updated version of the ZeroPM database was being developed as of January 2025.

***Additional sources:***

**– Swedish NGO ChemSec proposes an online database of PFAS-free products, Marketplace.**

<https://marketplace.chemsec.org/alternatives?groups=10>

**– A recent peer-reviewed article on lithium-ion batteries found that “**it is technically feasible to make PFAS-free batteries for battery applications, but PFAS-free solutions are not currently well-established on the market. Successful substitution of PFAS will require an appropriate balance among battery performance, the environmental effects associated with hazardous materials and chemicals, and economic considerations.”

*Reference:* Savvidou, E. et al. (2024). PFAS-Free Energy Storage: Investigating Alternatives for Lithium-Ion Batteries. *Environmental Science & Technology*, 58, 50, 21908–21917. <https://doi.org/10.1021/acs.est.4c06083>

**Stress test of the Economic arguments**

As we needed to read the methodology and calculations used by Plastics Europe’s Fluoropolymer Product Group (FPG) to develop their claims and figures, we had to reach out to them with technical questions.

Gary Fooks worked with us to select the key economic statements contained in the FPG documents and group them into 6 themes:

* General statements
* Figures about economic losses
* Shutdown of plants
* Relocation
* Job losses
* Investment, innovation & competitiveness

And in October 2024, we sent the following claims and questions to Ronald Bock, chair of the FPG:

**1 / General statements**

**Claim**: Overall, a scope-limited derogation scenario could result in significant impacts not just for the fluoropolymer manufacturers, but for the whole EEA economy and society.

Source: Socioeconomic Impact Assessment for fluoropolymers (15 September 2023)

***→ Questions asked by the Forever Lobbying Project***

– What background research did you perform in preparation of this statement?  
– We're assuming that, because of your claim that the scope-limited derogation might result in "significant impacts … for the whole EEA economy and society", and not only for specific sectors, you modelled these impacts – taking into account the dynamic, economy-wide effects of the proposed derogation – and have produced a range of quantitative measures.  
– Could you confirm that you modelled the above impacts (i.e., that you undertook an analysis of the dynamic effects of the scope-limited derogation)?  
– Assuming that you undertook the above modelling, could you share your baseline/input data and your findings (along with relevant sensitivity analyses, etc.) with us?

**2 / Figures about economic losses**

**Claim #1**: The total value of fluoropolymer products manufactured or sold in the EU by FPG members participating in this study was estimated to be in the range of €1.0 – 3.0 billion in 2022. This value will be lost and is unlikely to be transferred to suppliers / manufacturers of alternatives in the EU, considering the difficulty in identifying and implementing suitable alternatives for most of the demanding applications in which fluoropolymers are used.

Source: Socioeconomic Impact Assessment for fluoropolymers (15 September 2023)

***→ Questions asked by the Forever Lobbying Project***

– Regarding the observation that the "value … is unlikely to be transferred to suppliers / manufacturers of alternatives in the EU", you note that this is because of "the difficulty in identifying and implementing suitable alternatives...etc." We're interested to know the basis of that claim. Specifically, we'd like to know:  
– a) whether you undertook a survey (or similar) of users of manufactured fluoropolymer products about their efforts to identify and implement suitable alternatives;  
– b) whether you sought information from users about their investments (actual and/or projected) in identifying and/or implementing alternatives;  
– c) the results of the data relating to b) (i.e., could you provide the figures you collated along with the number of users surveyed, etc.)  
– d) how you brought this information together in the course of projecting that the value was "unlikely to be transferred to suppliers / manufacturers of alternatives in the EU" (i.e., what modelling did you undertake).  
– In addition to a) to d), would you be able to share with us the input data, methods and results of your analysis?

**Claim #2:** Overall, this report estimates that more than 80% of the fluoropolymer quantities sold in the EEA would not be covered by a currently proposed derogation and would potentially have to stop after the 18-month transitional period envisaged in the restriction proposal. This would mean that fluoropolymer manufacturing operations in the EEA will stop completely, as the volume covered by the proposed derogations would be too small to justify continued production, and the fluoropolymer production lines cannot easily be repurposed for different products. This could result in an overall loss of EU revenue in the range of € 6.2 – 18 billion for the 2025 – 2030 period, discounted to 2025 prices (1), along with the highly specialised and high value assets. (1. This assumes the EiF of the restriction in 2025.)

Source: Socioeconomic Impact Assessment for fluoropolymers (15 September 2023)

***→ Questions asked by the Forever Lobbying Project***

– Regarding your note about the "overall loss of EU revenue", we're assuming that you would have undertaken some sort of dynamic economic modelling to arrive at the the figures indicated, which, for example, takes account of altered incentives for firm capital investment and firm growth beyond the fluoropolymer sector (e.g., suppliers / manufacturers of alternatives). Could you confirm that you undertook such modelling and provide us with the details (e.g., input data, assumptions, methods, findings, nature of sensitivity analysis, etc.)?  
– If you did not undertake a dynamic approach to modelling the effects, could you share with us the details of the approach you did take (e.g., input data, assumptions, methods, findings, nature of sensitivity analysis etc.)? In order for us to properly understand your methods, comprehensive information on your assumptions and the basis on which you made these assumptions would be particularly welcome.  
– Further, you note that "fluoropolymer production lines cannot easily be repurposed for different products." Again, we're interested in the analysis you undertook to support this observation as well as any associated economic modelling. Could you provide details of, a) the nature and scope of the analysis you undertook; b) the associated economic modelling you performed?

**3 / Shutdown of plants**

**Claim:** In general, fluoropolymer manufacturers expect the following impacts to their plants, depending on their individual circumstances:

* Shutting down only of specific product lines, which are used in fluoropolymer manufacturing, but no additional impacts for the rest of the plant.
* Shutting down of whole plants, as they usually rely extensively, or exclusively, on the manufacturing of fluoropolymers.

Source: Socioeconomic Impact Assessment for fluoropolymers (15 September 2023)

***→ Questions asked by the Forever Lobbying Project***

– In relation to this statement, we're assuming that you performed some sort of survey or similar. Could you confirm the nature and scope of the research that underpinned this statement and provide us with that research (or at least its key characteristics, such as scope, method, major findings, etc.)?  
– Further, could you confirm whether you explored with your members the basis of their responses to you? Did you, for instance, explore the basis of their conclusions on closed product lines and plant closure?  
– In addition, could you specify how many specific product lines and plants would be shut down?  
– Finally, we note that manufacturing plants require various types of non-specific infrastructure to support their operations. These include bespoke power supply to run heavy machinery, etc., wastewater treatment, access to road, rail, port facilities and material storage facilities. One consequence of this, is that plants can typically be repurposed (either by existing or new owners), even if some of the machinery, etc. can't. Could you confirm whether you factored in these considerations into the costs of discontinuing fluoropolymer manufacturing?

**4 / Relocation**

**Claim**: This could result in the complete relocation of the fluoropolymer industry outside the EU with significant impacts and unpredictable consequences for critical European sectors that rely heavily on these materials.

Source: Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

***→ Questions asked by the Forever Lobbying Project***

– What is the basis for the conclusion that there will be a complete relocation of the fluoropolymer industry outside the EU? Could you also provide us with details of the firm-level economic impact assessments which presumably have been undertaken to assess the respective costs and benefits of relocation?  
– Could you specify the "significant impacts" and "unpredictable consequences" and the research and analysis upon which these observations are based?

**5 / Job losses**

**Claim**: Fluoropolymers support essential downstream operations worth hundreds of billions of euros in the EU, including some of the largest manufacturing sectors in the region, such as automotive, aerospace, chemical and medical technology industries. It is estimated that these sectors employ tens of millions of people in the EU and a large share of these jobs may be at risk under this scenario.

Source: Socioeconomic Impact Assessment for fluoropolymers (15 September 2023)

***→ Questions asked by the Forever Lobbying Project***

– You note that, "it is estimated....[that] a large share of these [tens of millions of] jobs may be at risk under this scenario". What modelling did you undertake to arrive at these estimates? Would you share your method and assumptions? We would also be interested in your input data, and in the specific results (e.g., how many jobs, in which sectors).

**6 / Investment, innovation & competitiveness**

**Claim #1**: The proposed restriction creates general uncertainty that is already undermining investment decisions and innovation in relation to these and other overarching EU ambitions.

Source: Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

***→ Questions asked by the Forever Lobbying Project***

– Regarding the statement that the proposed restriction “is already undermining investment decisions and innovation”, could you provide us with a little more detail here about the data behind the statement?  
– In addition, we're interested to know the specifics of the scale and type of these investment decisions and the scope and type of innovation that's been already undermined:  
– Have you explored this in a systematic way?  
– How large are the investments that are already being undermined?  
– What kind of investments? What specific types of innovation is being undermined in what sectors?  
– Regarding future scenarios, we are assuming that you also took into consideration the investment and innovation relating to alternatives to fluoropolymers. Could you provide us with the input data, assumptions and modelling that was the basis of your analysis? And what is your estimation regarding these investments and innovation in the field of alternatives to fluoropolymers in the coming years.

**Claim #2**: Lack of access to these high-performance materials directly reduces the competitiveness of industry in Europe.

Source: Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

***→ Questions asked by the Forever Lobbying Project***

– Regarding this statement, could you provide us with the input data, assumptions and modelling your analysis was based on? The statement seems to imply, for instance, an absence of alternatives to fluoropolymers and potentially overlooks how the use of and innovation in alternatives may work to enhance the competitiveness of some sectors of the European economy (in the context of restrictions on the use and sale of fluoropolymers).

**Claim #3:** The restriction proposal in its present form could also lead to applications having lower durability and reliability resulting in higher maintenance and replacement frequency and increased waste, negative impacts for emerging and growing technology markets such as energy storage, electrification, renewable energies, and hydrogen and constraints for products required to meet stringent standards requirements (e.g. safety and environmental standards), in addition to the need to re-design products. Together, all these factors will also have significant implications for the global competitiveness of European industry.

Source: Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

***→ Questions asked by the Forever Lobbying Project***

– Regarding this statement, could you provide us with the input data, assumptions and modelling your analysis was based on? As in the case of the statement above, this one seems to imply a lack of alternatives, a lack of alternatives providing equivalent performance, and apparently fails to recognise that innovation in alternatives may actually boost the competitiveness of European industry.  
– Could you provide us with specifics about the scale of the “significant implications for the global competitiveness of European industry” when compared to your baseline?

**Claim #4:** Economic implications include regression of advanced technologies and the reduced ability of Europe to attract high and medium technology manufacturing investment. This could result in efficiency losses, as well as higher capital and maintenance costs.

Source: Restriction on the manufacture, placing on the market and use of PFAS Fluoropolymers Product Group (FPG) Comments to Annex XV restriction report

***→ Questions asked by the Forever Lobbying Project***

– Regarding this statement and the listed economic implications, could you provide us with the input data, assumptions and modelling your analysis was based on? Does your analysis allow you to grade the probability and impacts / gravity of the risks your statement indicates?  
– Regarding your note that such economic implications “could result in efficiency losses, as well as higher capital and maintenance costs”, could you also provide us with the input data, assumptions and modelling your analysis was based on? And could you provide us with specifics about the scale of the indicated possible losses and higher capital and maintenance costs when compared to your baseline?

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| **Final reply sent by email by Ronald Bock, chair of Plastics Europe’s Fluoropolymer Products Group, to the *Forever Lobbying Project* on 8 November 2024.**  “Thank you for your swift response. It is great to hear that you want to get the full picture, especially around the data on the socio-economic impact of the restriction. We are eager to collaborate and support you with further information. To that end, we would like to refer you to the [consultation on the PFAS restriction proposal](https://echa.europa.eu/nl/comments-submitted-to-date-on-restriction-report-on-pfas) and highlight the contributions of trade associations representing industries of high socioeconomic importance (e.g. MedTechEU, Hydrogen Europe, ASD etc.). To assist you with reviewing the comments, please find attached our response index [LINK] on the PFAS restriction proposal consultation.    Furthermore, we want to encourage you to have a look at the [Draghi Report](https://commission.europa.eu/document/download/ec1409c1-d4b4-4882-8bdd-3519f86bbb92_en?filename=The future of European competitiveness_ In-depth analysis and recommendations_0.pdf) (pages 101 and 129) and its mentioning of the impact a PFAS restriction would have on the European Union. It notes that banning PFAS “would impact the use of substances needed to produce clean technologies (batteries and electrolysers), for which there are currently no alternatives”, ultimately having an adverse socio-economic impact on Europe.    Other useful sources to get a full understanding on the issue would be the joint statement on the use of fluoropolymers of [Hydrogen Europe](https://hydrogeneurope.eu/joint-statement-on-the-importance-of-fluoropolymers-to-the-energy-transition/), the position paper of [MedTechEurope](https://www.medtecheurope.org/wp-content/uploads/2023/10/230907_medtech_europe_pfas_position_paper_final.pdf) on the REACH regulation as well as a study that was recently published by the [US Chamber](https://www.uschamber.com/assets/documents/Essential-Chemistries_-Providing-Benefits-Across-the-U.S.-Economy.pdf) on essential chemistries.    Unfortunately, an interview will not be possible within your set timeframe, however, we believe the information provided should be sufficient to answer your questions.” |