Science. Applied to Life.™

Brussels, xx October 2021

To Whom it May Concern:

3M Corporation ("3M") appreciates the opportunity to participate in the Second ("2nd") Stakeholder Consultation on a Restriction for PFAS.[1] We also appreciate the opportunity to comment on the 'investigation report summaries' for the various PFAS use categories. 3M has been an active participant in the stakeholder consultations, from the First ("1st") Call for Evidence in July 2020 through present day. 3M has submitted twelve responses in the 1st Call for Evidence in July 2020 (see Table 1) as well as thirteen use-specific studies from October 2020 through May 2021 (see Table 2). In October 2021, 3M provided responses to eleven of the categories during the 2nd Call for Evidence (see Table 3). A summary of 3M's submissions is listed below. These submissions are readily available and may be re-submitted at the request of the authorities.

Table 1: 3M submitted 12 individual responses during the 1st Call for Evidence (July 2020), providing information according to individual product lines and with inputs from various 3M reporting units:

1) **3M Fluorinert, 3M Performance Chemicals and 3M-branded fluids** (by 3M Transportation & Electronics)
2) **3M Novec-branded fluids** (by 3M Transportation & Electronics)
3) **3M Fluoropolymers: Fluoroplastics Dispersions** (by 3M Transportation & Electronics)
4) **3M Fluoropolymers: Solid Fluoroplastics** (by 3M Transportation & Electronics)
5) **3M Fluoropolymers: Fluoroelastomers** (by 3M Transportation & Electronics)
6) **3M Fluoropolymers: Polymer Processing Additives** (by 3M Transportation & Electronics)
7) **3M Specialty Chemicals** (by 3M Transportation & Electronics)
8) **3M PFAS-enabled products: PFAS for Product Release Liners** (by 3M Healthcare, 3M Safety & Industrial, and 3M Consumer)
9) **3M PFAS-enabled products: PBSF-Enabled Fluorosurfactants - Acrylic Foam Tapes** (by 3M Safety & Industrial and 3M Transportation & Electronics)
10) **3M PFAS-enabled products: PBSF-Enabled Fluorosurfactants** (by 3M Healthcare, 3M Safety & Industrial, 3M Transportation & Electronics, and 3M Consumer)
11) **3M PFAS-enabled products: PBSF-Enabled Coatings** (by 3M Safety & Industrial, 3M Transportation & Electronics, and 3M Consumer)
12) **3M PFAS-enabled products: Other PFAS and PFAS Mixture Based Coatings** (by 3M Healthcare, 3M Safety & Industrial, and 3M Transportation & Electronics)

Table 2: 3M provided information to 13 use-specific studies conducted by the five countries (and respective consultants) between October 2020 and May 2021:

1. 3M Response to de Milieutafel on PFAS in Medical Devices and Pharmaceuticals
2. 3M Response to RPA on PFAS Manufacturing
3. 3M Response to Exponent on PFAS in Data center Immersion Cooling
4. 3M Response to Exponent on PFAS & F-gases

[1] Survey Powered by Webropol: 2nd Stakeholder Consultation on a Restriction for PFAS (webropolsurveys.com)

5. 3M Response to Exponent on PFAS Fire Suppression Manufacturers and Users
6. 3M Response to Exponent on PFAS in Food and Feed Equipment
7. 3M Response to Exponent on PFAS in Kitchenware
8. 3M Response to Exponent on PFAS in Packaging Food and Non-Food
9. 3M Response to HaskoningDHV on PFAS in Electronics and Energy Industry
10. 3M Response to BAUA on PFAS in Transport and Lubricants & Greases
11. 3M Response to Wood on PFAS in Textiles (for PPE and Medical Device products)
12. 3M Response to Wood on PFAS in Petroleum and Mining Sector
13. 3M Response to Wood on PFAS in Construction products

Table 3: 3M provided response to Section A-E (as applicable) via the online portal for the below 11 category-specific components of the questionnaire on 17 October 2021. 3M also provided additional detail for many questions' response via email on 17 October 2021.

1. 3M Response to TULAC
2. 3M Response to Medical Devices
3. 3M Response to Electronics and Energy
4. 3M Response to Construction
5. 3M Response to PFAS Manufacturing
6. 3M Response to Transportation
7. 3M Response to Lubricants
8. 3M Response to Waste
9. 3M Response to Food Contact
10. 3M Response to Manufacturing
11. 3M Response to F-Gas

Based on 3M's past submissions, we would like to highlight data gaps in the investigation report summaries, including missing uses and applications, missing PFAS substances, or wrongly stated information.

The information below serves as a 3M-only data-gap analysis for the authorities regarding the accuracy and completeness of these reports based on the information provided. When developing the PFAS restriction dossiers, 3M would ask that the authorities consider corrections to the reports. 3M recognizes the significant effort and complexity of consolidating many responders' input and would welcome the opportunity to further discuss 3M's input with the authorities.

3M believes regulatory decisions should be grounded in sound science. 3M remains committed to sharing all available and relevant information to help inform the understanding of the five countries preparing the PFAS restriction proposal.

DATA GAP ANALYSIS

LUBRICANTS:
In the use category "Lubricants":

- The product 3M™ Novec™ 7000 Engineered Fluid (375-03-1) should be added to the list of carrier solvents.
- The products 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and 3M™ Novec™ 7200 Engineered Fluid (CAS# 63702-06-5/163702-05-4) also used as carrier solvents are included in the report.
- The summary report section 4 Emissions, Table 3 estimates that 35 tonnes of PTFE (Micropowder) are emitted to air annually and 31 tonnes to water. As PTFE is not volatile and insoluble in water, it is unclear how the report could reach this conclusion. Similar partitioning is applied to PTFE (granulates) and PFPE which raised comparable questions regarding the conclusion of this section.
- Section 4.1, Table 5 notes that the justification for application of emission factors during filling of lubricants in sealed articles says, "Formulation of lubricants is likely to happen at elevated temperature, (…)". Use of elevated temperatures in formulation is unknown from our experience and appears not be a reasonable assumption. The justification indicates that "it is possible during filling of articles that there may be spillages/leaks which would further contribute to emissions." This statement is not a reasonable assumption due to the lack of volatility of these substances and lack of water solubility. Spills or leaks in filling are manageable and are unlikely to result in uncontrolled emissions to air or water as noted in the table.
- The lack of volatility and water solubility of most of the higher molecular weight backbone fluoropolymers leads to emissions that are overstated and appear to partition too heavily to air and water.

PETROLEUM AND MINING
In the use category "Petroleum and Mining":

- The summary report does not include use of PFAS in the Chemical Processing Industries (CPI) which also extensively use PFAS, and particularly backbone fluoropolymers (such as Fluoroplastics or Fluoroelastomers) in equipment like uses in Petroleum and Mining such as seals, linings and coatings.
- The summary report "PFAS in mining and petroleum industry – use, emissions and alternatives" should list FKM and FFKM as examples of fluoroelastomers used in seals, liners, valves, O-rings, gaskets, and packer elements in the petroleum industry (Table 2.2).

CONSTRUCTION:
In the use category "Construction":

- The use of foam blowing additives in the production of energy efficient building material is missing from the current report. It is important to note the use of 3M™ FA-188 Foam Blowing Additive (CAS #3709-71-5) in this application.

- Structural Glazing is missing from the current report. PBSF-enabled tapes are used to attach glass panels to metal frames in curtain wall systems, commercial windows and doors, skylight and canopy systems replacing commonly used mechanical fasteners, gaskets and structural silicone sealants. They bond with excellent dynamic strength to replace conventional wet glazing and resist to environmental conditions such as UV, moisture, heat, and cold.
- PBSF-enabled Architectural Panel Tapes are missing in the current report. They are used for many applications in the construction industry, including the manufacture of architectural panels for curtain walls, exterior building cladding and interior panel and trim attachment. In many situations, they replace liquid adhesives, sealants, welds and mechanical fasteners. They provide immediate handling strength during the fabrication process and do not shrink after curing, like with some liquid applied sealants. This shrinkage can result in isolated panel stress that may be visible on the exterior face of the architectural panel.
- Window films are missing from the current report. PBSF-enabled coatings are used in window film applications for construction because these films deliver superior performance over standard polyester films in blast and impact events; yet still maintain a high level of optical clarity. The PBSF is used to aid in wetting out during the coating step. Window films are used in both automotive aftermarket as well as in public, commercial and residential buildings. For construction applications window films are used for the following properties: mitigates hazards from shattered glass during natural disasters, helps protect people from flying glass shards, one of the most common causes of blast-related injuries and fatalities, helps increase security and provide added protection against smash and grab burglaries, significantly blocks the amount of harmful UV rays.
- 3M™ Trizact™ Diamond TZ Abrasive Pads & Strips used in stone and concrete floor polishing should be added.
- A fluorosilicone chemistry is used in release liners for silicone-based adhesives in some home improvement applications. Two silicone-based chemistries are used in products, one picture hanging and one for bath and outdoor products. The fluorosilicone release chemistry is used in the manufacture of the release liner which allows the silicone-based adhesives to be coated and converted in the form of an adhesive transfer tape to produce the final product.
- Glass - fibre impregnation by PTFE-Dispersion is missing in the current report. The main use of this product is roofing applications as a fire-resistant, weather resistant, self-cleaning and light-weight construction material. It is frequently used in applications where glass is not technically viable (https://en.wikipedia.org/wiki/Mecca_fire_of_1997; https://www.ifai.com/2008/09/01/fireproof-tents-shelter-visitors-at-mecca/).
- ETFE and THV films are used in different construction applications due to UV-transparency, hail and water resistance.
- In the questionnaire, PTFE should be divided in the following sub-categories: moulding powder, fine-powder, and dispersion.
- Table 2 on page 6 contains a typo: it should say “ETFE” instead of “EFTE”. Chemical Process Industry is the second largest segment according to the Socioeconomic study published by Plastics Europe FPG group. It is not appropriately reflected in the summary report or questionnaires. PTFE, PFA, FEP, PVDF, THV, FKM and FFKM are all

used in the construction of chemical handling facilities – chemicals, pharmaceutical, bio-tech, oil & gas and other plants. The functionality spans UV-transparency, fire-resistance, weather resistance (e.g., hail, general weathering), resistance to harsh cleaning chemicals or sterilization, effective corrosion prevention to creating a metal ion free environment. PFAS-containing Polymer Processing Additives are used to help with the defect-free extrusion of high strength HDPE (https://multimedia.3m.com/mws/media/991385O/dynamar-ppas-in-applications-of-hdpe-pipes.pdf).

MEDICAL DEVICES:
In the use category "Medical devices":

- The use of cooling liquids is included, but the product 3M™ Novec™ 7500 Engineered Fluid (CAS # 297730-93-9) and the product 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS # 1064698-37-8) should be added.

TULAC
In the use category "TULAC":

- It is important to note the use of 3M Polymer Melt Additive in the medical protective clothing & facemasks. 3M Polymer Melt Additive is a fluorochemical flake (PFBS (C4) based fluoro-polymeric material) for incorporation into polyolefin and other synthetic resins (e.g. polypropylene). 3M Polymer Melt Additive is heat and shear stable to a wide variety of extrusion conditions. 3M Polymer Melt Additive is designed to be compatible with synthetic resins at extrusion temperatures. Consequently, the additive can localize at the surface during quenching or within a few hours to provide an effective surface-active treatment, while not significantly influencing fiber properties.
- The report references personal protective equipment (PPE) several times, but a dedicated section or category would be appropriate to include the following products should be added: 3M™ Fall Protection harnesses, 3M™ PELTOR™ ComTac™ VII communications headset and system control unit, Protective Coveralls 4532+, high performance filtration applications, valves, washers, o-rings and electrical components with coated wires, used in multiple 3M Scott Fire & Safety products.

PFAS PRODUCTION (MANUFACTURING)
In the category PFAS production (manufacturing), the following substances should be added:

- Manufactured in EU/sold in EU+UK = 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS #1064698-37-8), 3M™ Fluorinert™ Electronic Liquid FC770 (CAS #1093615-61-2), 3M™ Performance Fluid PF5056 (2187449-42-7), 3M™ Performance Fluid PF5058 (CAS# 2176446-38-9), 3M™ FA-188 Foam Blowing Additive (CAS #3709-71-5);
- Imported into EU/sold in EU+UK = 3M™ Novec™ 7000 Engineered Fluid (375-03-1), 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and 3M™ Novec™ 7200 Engineered Fluid (CAS# 63702-06-5/163702-05-4).

F-GASES
In the use category "F-gases":

- The use of foam blowing additives in the production of energy efficient building material should be added. It is important to note the use of 3M™ FA-188 Foam Blowing Additive (CAS #3709-71-5) in this application.
- The use of fluoroketone is missing as a clean agent fire suppression fluid, specifically 3M™ Novec™ 1230 Fire Protection Fluid (CAS # 756-13-8).
- The application of cover gas is detailed, however, the use of fluoroketone is missing as a cover gas, specifically 3M™ Novec™ 612 Magnesium Protection Fluid (CAS # 756-13-8).
- The following product listed in F-Gas Annex I is missing: 3M™ Fluorinert™ Electronic Liquid FC-72 (CAS# 1064697-81-9). This product is typically used as a heat transfer agent. Other products used as heat transfer agents are: 3M™ Fluorinert™ Electronic Liquid FC-3283 (CAS# 338-83-0), 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS# 1064698-37-8), 3M™ Fluorinert™ Electronic Liquid FC-770 (CAS# 1093615-61-2).
- The electrical equipment application is mentioned but the use of alternatives to sulfur hexafluoride (SF_6) in electrical switchgear, gas insulated lines and other gas-insulated equipment is missing. It is important to note the use of fluorinated ketone 3M™ Novec™ 5110 Insulating Gas (CAS # 756-12-7) and fluorinated nitrile 3M™ Novec™ 4710 Insulating Gas (CAS # 42532-60-5) as low global warming potential alternatives to sulfur hexafluoride in this application.
- The preservation of documents application should be added. The products used in this application include 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and 3M™ Performance Fluid PF-5060 (CAS# 1064697-81-9).
- Specific F-gas (specific composition is confidential) is used as explosion tamer in polymerization processes during the production of fluoropolymers. CAS # can be shared confidentially.

ELECTRONICS & ENERGY
In the use category "Electronics & Energy":

- The use of alternatives to sulfur hexafluoride (SF_6) in Energy in electrical switchgear, gas insulated lines and other gas-insulated equipment is missing. In particular, the summary report and the questionnaire do not mention the use of fluorinated ketone 3M™ Novec™ 5110 Insulating Gas (CAS # 756-12-7) and fluorinated nitrile 3M™ Novec™ 4710 Insulating Gas (CAS # 42532-60-5) as low global warming potential alternatives to sulfur hexafluoride in this application.
- The following substances should be added under fire protection fluid: 3M™ Novec™ 1230 Fire Protection Fluid (CAS # 756-13-8).
- The following substances should be added under Coatings of electronic components: 3M™ Novec™ 1710 Electronics Coating (2-10% trade secret fluoroaliphatic polymer, balance 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6)).
- The following substances should be added under Heat transfer fluids: 3M™ Novec™ 7200 Engineered Fluid (CAS# 63702-06-5/163702-05-4), 3M™ Novec™ 7700 Engineered Fluid (CAS# 957209-18-6), 3M™ Fluorinert™ Electronic Liquid FC-

3283 (CAS # 338-83-0) and 3M™ Novec™ 649 Engineered Fluid (CAS# 756-13-8). Other heat transfer fluids included in the report are: 3M™ Novec™ 7500 Engineered Fluid (CAS# 297730-93-9), 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS# 1064698-37-8) and 3M™ Fluorinert™ Electronic Liquid FC-72 (CAS# 1064697-81-9.

- The following substances should be added under Solvent/Solvent Cleaning of Electronics Components: 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6), 3M™ Novec™ 71IPA Engineered Fluid (azeotropic blend of Isopropanol with 3M™ Novec™ 7100 Engineered Fluid CAS# 163702-08-7/163702-07-6), 3M™ Novec™ 73DE Engineered Fluid (azeotropic blend of trans-1,2-dichloroethylene (t-DCE) with 3M™ Novec™ 7300 Engineered Fluid (CAS # 132182-92-4)).
- The following substances should be added under Lubricant deposition for use as solvents: 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and 3M™ Novec™ 7200 Engineered Fluid (CAS# 63702-06-5/163702-05-4).
- The following substances should be added under Thermal testing: 3M™ Fluorinert™ Electronic Liquid FC-770 (CAS# 1093615-61-2) and 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS# 1064698-37-8).
- The following substances should be added under Data Centers – immersion cooling of semi devices/servers: 3M™ Fluorinert™ Electronic Liquid FC-3284 (CAS# 382-28-5), 3M™ Fluorinert™ Electronic Liquid FC-3283 (CAS# 338-83-0), 3M™ Fluorinert™ Electronic Liquid FC-40/43 (CAS #1064698-37-8), 3M™ Fluorinert™ Electronic Liquid FC-72 (CAS# 382-28-5), 3M™ Novec™ 7000 Engineered Fluid (CAS# 375-03-1), 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and 3M™ Novec™ 649 Engineered Fluid (CAS# 756-13-8).
- The following products for fluoropolymer tube lining, solar films, cable and wire insulation should be added: PFPE (CAS# 69991-67-9) lubricant is used on silicone cable accessories, Silicone rubber compound containing PTFE (CAS# 9002-84-0) is used in molding and extruding cable accessories; Solar Radiative Film uses PVDF (CAS# 24937-79-9); Heat shrink tubing with PVDF (CAS# 24937-79-9).
- The following sub-use category should be added: Ion exchange membrane in vanadium redox batteries. Ion exchange membrane in vanadium redox batteries, made out of fluoropolymers, are used as sealings for aggressive chemicals. Seals in high temperature stationary fuel cells use fluoropolymer seals due to corrosion and temperature resistance.
- The summary report does not mention a small but growing application of the use of Polymer Optical Fibers for data transmission where electromagnetic interference is a concern. The fluoropolymer serves as a low refractive index layer.
- In the use category “photovoltaic cells” it should be noted that not only PFAS-based films and coatings are being used, but also PFAS-based tapes are heavily used in the bonding of solar panels.

TRANSPORTATION

In the category “Transportation”:

- The report says that no information is available on fire prevention and protection. The following substance should be added as a fire protection fluid: 3M™ Novec™ 1230

Fire Protection Fluid (CAS # 756-13-8). Specific application includes fire systems for marine vessels.

- 3M™ Novec engineered fluids and 3M™Fluorinert™ Electronic Liquids can be used as heat transfer fluids in immersion cooling applications in automotive electronics applications (e.g. inverters, Electronic Control Unit (ECUs), on-board chargers, traction motors). The following substances should be added as heat transfer fluids for power electronics cooling: 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6), 3M™ Novec™ 7300 Engineered Fluid (CAS# 132182-92-4), 3M™ Novec™ 7500 Engineered Fluid (CAS# 297730-93-9), 3M™ Novec™ 649 Engineered Fluid (CAS# 756-13-8), 3M™ Fluorinert™ Electronic Liquid FC-770 (CAS# 1093615-61-2), 3M™ Fluorinert™ Electronic Liquid FC-72 (CAS# 1064697-81-9).
- 3M™Novec™Electronic Grade Coatings and coatings with the Novec engineered fluids used as solvent are used in automotive electronics to coat the printed circuit boards and LED lighting for moisture and corrosion protection. Novec fluids can also be used as carrier solvents for anti-fingerprint or anti-smudge coating materials for automotive display surface coatings. The following substance should be added as a coating for corrosion protection: 3M™ Novec™ 1700 Electronic Coating (2-10% trade secret fluoroaliphatic polymer, balance 3M™ Novec™ Engineered Fluid 7100 (CAS # 756-13-8)).
- The following substances should be added as cleaning fluids: 3M™ Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6) and Novec 71DE fluid (azeotropic blend of t-DCE with Novec 7100 fluid (CAS# 163702-08-7/163702-07-6), Novec 71IPA fluid (azeotropic blend of Isopropanol and Novec 7100 fluid (CAS# 163702-08-7/163702-07-6), Novec 72DE fluid (azeotropic blend of t-DCE with Novec 7100 fluid (CAS# 163702-08-7/163702-07-6) and Novec 7200 fluid (CAS# 63702-06-5/163702-05-4), and Novec 73DE fluid (an azeotropic blend of t-DCE and Novec 7300 fluid (CAS # 132182-92-4)).
- The following substances should be added as solvents for lubricants: 3M™ 3M™ Novec™ 7000 Engineered Fluid (375-03-1), Novec™ 7100 Engineered Fluid (CAS# 163702-08-7/163702-07-6), 3M™ Novec™ 7200 Engineered Fluid (CAS# 63702-06-5/163702-05-4).
- The following substances should be added as testing fluids: 3M™ Fluorinert™ Electronic Liquid FC-3284 (CAS# 382-28-5), 3M™ Fluorinert™ Electronic Liquid FC-40 (CAS# 382-28-5), 3M™ Fluorinert™ Electronic Liquid FC-72 (CAS# 382-28-5).
- Summary report mentions the use of PFAS-enabled adhesive tapes as paint replacement. To be added: adhesive tapes are also used for paint protection. Paint protection film products use PFAS as a stabilizing agent for the polymer that goes into making of the finished product. The finished product itself is affixed to key areas of a vehicle exterior to protect the painted surface from chips caused by impinging debris and rocks. Other adhesive film product, e.g. 3M™ SIT2010 Structural Isolation Tape, utilizes a fluoropolymer film layer that provides weatherability and reduces the potential of corrosion between two dissimilar materials that the SIT2010 is positioned between in the vehicle chassis.
- Summary report rightly mentions that Acrylic Foam Tape (AFT) products (PFAS are used as stabilizing agent in production of tape) are used to affix the weight to the wheel surface. To be added: The finished AFT product is also used to affix components such as molding, clips and emblems to the exterior surface of the vehicle,

as well as in the vehicle interior to affix sensors to the windshield for the rearview mirror assembly, as well as for affixing silicone seals in the doors and trunk lids. AFT products use PBSF as a manufacturing process aid, therefore the PBSF should be added as a PFAS substance used in manufacturing of transportation products and articles. Without its use the final product does not consistently meet quality and performance requirements as defined by the automotive sector.

- Summary report rightly mentions the use of adhesive tapes on aircraft exterior to provide a chemical resistant surface for the aircraft as well as to reduce the aircraft's surface energy. To be added, Polyurethane Protective tape is also used on the interior of an aircraft. The fluoropolymer is incorporated in the polyurethane, which helps the product to provide a moisture resistant barrier that helps to reduce the potential for corrosion on the aircraft interior surface where it is applied.
- Summary report mentions a group of fluoroelastomers as well as perfluoropolymeric ionomers as part of PFAS substances used in transportation products and articles, but does not mention other fluoropolymers, such as fluoroplastics and FKM and FFKM. Fluoroplastic wiring is used in high temperature wiring to the catalytic converter as well as used under the hood wiring applications for smaller and hotter engines. High temperature FKM and FFKM seals are used in aerospace, commercial vehicles and cars. Examples of applications that require high temperature performance combined with chemical resistance are the cylinder head gasket, air intake manifold and turbo charger hoses.
- Additionally, PTFE Micropowders are also used as additives in oil-based lubricants and in dry lubricants. The technical function is to reduce friction and to reduce the temperature dependence of the lubricant formulation. Two critical applications of PFAS containing lubricants include dry lubricants or PTFE bearings, which are frequently used in durability and safety-relevant parts, and these applications are nearly maintenance-free in accessibility-challenged environments. Also, 3M™Novec™Engineered Fluids can be used as carrier solvents for dry lubricants (e.g. PTFE powder) that are added to plastics used in automotive interiors.
- It should be noted that fluoropolymers are essential to meet Euro 6 requirements – for standard and ethanol-containing fuel grades.
- One missing subgroup within the Transportation summary report is wirings. Wiring for catalytic converter sensors are commonly made from PTFE, and under-the-hood wiring use Fluorothermoplastics where high temperature resistance is required (near the Internal Combustion Engine). Fluoropolymers are also required in aircraft wiring due to temperature and chemical resistance. Some aircraft wiring is inside of the Kerosene tanks (wings) and therefore constantly exposed to fuel. Fluoropolymer sleeves or jacketing provides the safety required.
- Window films are missing from the current report. PBSF-enabled coatings used in commercial/residential building window films are missing in the current report. The PBSF is used to aid in wetting out during the coating step. Window films are used in both automotive aftermarket as well as in public, commercial and residential buildings.

FOOD CONTACT MATERIALS AND PACKAGING

In the category “Food Contact Materials and Packaging”:

- The summary report characterizes Gen-X as a polymer processing aid (PPA). Gen-X is a fluorinated emulsifier which is different from a polymer processing additive. We believe there is a risk of confusion between this terminology, equating polymer processing aid and the polymer processing additive. Polymer Processing Additives are fluoropolymer-based additives to polyolefins, and engineering polymers to enable or improve film, tubing, fibers or pipe extrusion or blow molding processes.
- A missing sub-category under the consumer cookware applications are P Electrostatic Powder Coating grades. Powders designed for electrostatic powder spray-coating are used to produce non-stick coatings for industrial cook and backware as well as industrial and consumer use rice cookers.
- Under industrial applications, it should be noted that seals, O-rings, gaskets, tubing and pipes use Fluorothermoplastics and PTFE that are processed into pipes and tubing for commercial food and feed products or equipment for the private household. Fluorothermoplastics and PTFE are also processed into valves and fittings for commercial food and feed products. Fluoropolymer dispersions are formulated into coatings for belts for commercial food and feed products.
- Fluorelastomers designed for food contact applications such as seals that require high temperature and chemical stability (frequently aggressive cleaning chemicals) cannot be provided by other materials. Likewise, Fluorothermoplastics, PTFE and PTFE compounds used for seals, valves and tubing that require high temperature, stability against steam and chemicals (frequently aggressive cleaning chemicals) cannot be provided by other materials.
- The Polymer Processing Additives enable some of the recent reduction of packaging film needed. They are not intended to change the surface properties of the packaging material, but help to reduce or eliminate processing defects, improve processing efficiency, improve energy efficiency and reducte manufacturing waste. Typically, fluoroelastomers or fluorothermoplastics are used as Polymer Processing Additives (not low molecular weight additives). Polymer Processing Additives are frequently formulated with inorganics and non-fluorinated aliphatic polyethers or polyesters as synergists.
- Polymer Processing Additives are used in packaging. Fluoropolymers used in Polymer Processing Additives are fluoroelastomers and fluorothermoplastics, so high-molecular weight fluoropolymers. The summary report is incorrectly reporting their use, especially in the food packaging sub-category.
  Polymer Processing Additives promotes down gauging of films, layer stability in multilayer construction, less waste in manufacturing, and less energy needed for operations (enable overall lower cost in manufacturing). In exchange, they enable affordable food packaging, help enable usage of strong, thin, light-weights packaging articles, reduce overall consumption of plastic, enable preservation of food freshness, reduce food waste and help enable increased recycled contact into packaging.

OTHER: USES NOT COVERED BY THE STUDIES/QUESTIONAIRES

- 3M also uses PFAS in some of our Personal Protective Equipment that is not covered by the TULAC study and questionnaire, including: 3M™ Fall Protection harness, 3M™ PELTOR™ ComTac™ VII communications headset and system control unit, Protective Coveralls 4532+, high performance filtration applications, Valves, washers, o-rings and electrical components with coated wires, used in multiple 3M Scott Fire & Safety products.
- 3M supplies products using PFPE and other PFAS for Release Liners to the industrial converters and users in the general industrial and electronics industry. PFAS-enabled silicone adhesives are used in double coated tapes, adhesive transfer tapes and foam tapes. They are also used in bonding applications in mobile handheld devices and other electronic devices. PFPE is used to coat the liner and provide the proper surface to protect the adhesive prior to use. It provides excellent flexibility, high temperature resistance and consistent performance over wide temperature ranges.
- In the use category "Construction", one missing sub-group is home improvements products (i.e., foam mounting tapes and squares, and damage-free hanging solutions). A fluorosilicone chemistry is used in release liners for our silicone-based adhesives in some home improvement applications. Two silicone-based chemistries are used in products, one picture hanging and one for bath and outdoor products. The fluorosilicone release chemistry is used in the manufacture of the release liner which allows the silicone-based adhesives to be coated and converted in the form of an adhesive transfer tape to produce the final product.
- PBSF coating is used in whiteboard films to provide stain resistant properties. This helps prevent "ghosting" and marker staining on the whiteboard film. The whiteboard films can be applied to a variety of substrates and can be directly applied to a wall, table or as a replacement film over an existing whiteboard.

OTHER: WRONG STATEMENTS:

- It should be noted that there is an error in Appendix 1 in "Report summary F-gas uses". Entry 24 "methoxytridecafluoro-heptene isomers", **MPHE Sion TM is NOT a fluoroketone**.
- Inconsistencies in the terminology used in the summary report: "PFAS Processing Aid" and "fluorinated Processing Aid" are used in confusing and inconsistent ways in the FCM questionnaire and "polymer processing aids (PPAs)" in the summary reports. A clear definition of these terms is critically needed.
- There are limitations to apply ERC approaches to calculate the emissions due to the lack of volatility and water solubility of most of the higher molecular weight fluoropolymers. It will be appropriate to develop Specific Environmental Release Categories (SPERCs) for subsets of PFAS used in individual categories that better consider the applications and material characteristics for PFAS materials or subsets of PFAS (i.e. fluoropolymers, etc.). Therefore, the ERC analysis report should be adjusted taking into consideration the physical properties and use conditions of PFAS.
- In the use Category F-gas, the Section C solvent sub-use alternatives table lists several non-PFAS alternatives. These same non-PFAS solvent alternatives are also reported in Appendix 8 of the report "Report summary F gas uses july 2021." This report and the

listed alternatives are directly contradicted by the contents of the report "Application of Fluorinated Gases (F-Gases) in the European Economic Area," also provided by the authorities, questioning the viability of these options. Paragraph 4.3.2 of this report states, "The following solvents are identified as potential alternatives for metal cleaning: isopropyl alcohol (IPA), n-propyl bromide (nPB), dichloromethane (DCM,methylenechloride),trans-1,2-dichloroethylene,trichloroethylene (TCE), perchloroethylene (PER), volatile methyl siloxanes, hydrocarbons (hexane, heptane, benzene) and acetone. Many of these alternatives have health concerns and regulatory restrictions. Other alternatives such as IPA are considered highly flammable and therefore not suitable for some uses." In fact as referenced by (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP Regulation) the listed alternative solvents present significant flammability and human health concerns and may further include regulatory barriers preventing their use: Isopropyl alcohol (67-63-0) is a category 2 highly flammable liquid/vapor, N-propyl bromide (106-94-5) is a category 1B reproductive toxin and is further subject to Authorization in the EU under REACH Annex XIV, dichloromethane (75-09-2) is a category 2 carcinogen, trans-1,2-dichloroethylene (156-60-5) is a category 2 highly flammable liquid/vapor, trichloroethylene (79-01-6) is a category 1B carcinogen and category 2 mutagen and is further identified as an SVHC for its carcinogenic potential, perchloroethylene is a category 2 carcinogen, octamethylcyclotetrasiloxane (CASRN 556-67-2), a volatile methyl siloxane, is a category 2 reproductive toxin and is SVHC-listed on the basis of its PBT and vPvB characteristics, n-hexane (110-54-3) is a category 2 highlight flammable liquid and vapor and is a category 2 reproductive toxin, benzene (71-43-2) is a category 1A carcinogen and a category 1B mutagen and a category 2 highly flammable liquid/vapor, heptane (142-82-5) is a category 2 highly flammable liquid/vapor, and acetone (67-64-1) is a category 2 highly flammable liquid/vapor.

- In the case of immersion cooling of electronics in data centers, in the "Report summary Electronics and Energy", Section 5, "Manufacturing and Market" under the heading Immersion cooling, the text provided states: "Two-phase liquid immersion cooling showed promising results in the, important, energy saving of datacentres. It is more energy-efficient however, the potential for emissions is deemed higher (reference 18). In 2016 the cost of the fluids alone was found to be higher than the cost reduction because of a higher energy efficiency (reference 19)." Reference 18 does not provide a quantitative representation of emissions. There are installations with reported evaporative fluid losses of 1-2% per year as well as documented reports of ~1% fluid loss per year, as reference (https://146a55aca6f00848c565-a7635525d40ac1c70300198708936b4e.ssl.cf1.rackcdn.com/images/9f425f33160adcab98bfaca87c06c1ff0c71d9a3.pdf) 3M is aware of some system integrator tank suppliers providing warranties for 1% or lower loss of fluid per year. We believe that the industry can achieve evaporative losses on the order of 0.1% per year with ongoing improvements to both tank design and operational controls (i.e., methods to perform routine maintenance.) Also, while Reference 19 is a comprehensive report, it should be considered that the work was published in 2016 and describes fluid loss and energy consumed during a 10-month timeframe based on a single, hand-built, experimental tank. As 3M has firsthand knowledge of the installation and operation of the referenced system, we know that circumstances of the project forced the tank to

remain open in an unsealed state for an extended period of time (i.e., days) leading to losses far higher than is expected (and now demonstrated) in current documented installations. The equipment used is not well described, however, it is known that in 2015/2016 when this work was completed, there were no commercially available systems for two phase immersion cooling. In the past 5 years there have been significant learnings and advancements to operating two phase immersion cooling systems for use in datacenters as well as the availability of commercial systems from multiple suppliers. Improved system design combined with operational standards support greatly improved fluid losses resulting in losses of 1% or less over extended periods of time. A more holistic view of the true value and cost of immersion cooling should consider cost on the scale of an entire datacenter, including annual savings for water and energy. Datacenters built for immersion cooling can be built in less time, require a smaller footprint, use less water and less energy to provide equal or greater computing power compared to an air-cooled datacenter. To take from a published example, reference (www.opencompute.org/files/Open-Compute-Engineering-Workshop-3M-Immersion-Cooling-March-2018-FINAL.pdf)

3M appreciates the authorities' consideration of the above missing uses and applications, missing PFAS substances, or wrongly stated information in the reports when developing the PFAS restriction dossiers.

3M welcomes the opportunity to further discuss any previously provided or above input.