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Technical work: process for the evaluation of perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride pursuant to paragraphs 5 and 6 of part III of Annex B to the Stockholm Convention on Persistent Organic Pollutants

Draft report for the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride

Note by the Secretariat

As referred to in document UNEP/POPS/POPRC.10/5, the annex to the present note sets out a draft report for the evaluation of information on perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF), prepared on the basis of information on the progress made to eliminate those chemicals submitted by parties in the process of reporting under Article 15 of the Convention, and taking into consideration the draft report on the assessment of alternatives to those chemicals[1]. The present note, including its annex, has not been formally edited.

* UNEP/POPS/POPRC.10/1.

[1] UNEP/POPS/POPRC.10/INF/7.

Annex

Draft report for the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride

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I. Introduction

1. At its fourth meeting the Conference of the Parties to the Stockholm Convention adopted its decision SC-4/17, through which it determined that the production and use of perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) should be eliminated by all parties except for the use and production allowed as acceptable purposes and specific exemptions in accordance with Part III of Annex B to the Convention.

2. According to paragraph 5 of part III of Annex B to the Convention, the Conference of the Parties shall evaluate the continued need for PFOS, its salts and PFOSF for the various acceptable purposes and specific exemptions listed in Annex B on the basis of available scientific, technical, environmental and economic information, including:

(a) Information provided by parties that use and/or produce PFOS, its salts and PFOSF on progress made to eliminate these chemicals, in accordance with paragraph 3 of part III of Annex B to the Convention;

(b) Information on the production and use of these chemicals;

(c) Information on the availability, suitability and implementation of alternatives to these chemicals;

(d) Information on progress in building the capacity of countries to transfer safely to reliance on such alternatives.

3. Paragraph 6 of part III of Annex B states that the evaluation shall take place no later than 2015 and every four years thereafter in conjunction with regular meetings of the Conference of the Parties.

A. Mandate for and scope of the report

4. By decision SC-6/4, the Conference of the Parties adopted a process for the evaluation of the continued need for PFOS, its salt and PFOSF. As part of that process, the Conference of the Parties requested the Secretariat to analyze information submitted by parties and along with any other pertinent and credible information available, to prepare a preliminary report on the assessment of alternatives to PFOS, its salts and PFOSF to facilitate the Persistent Organic Pollutant Review Committee in undertaking such an assessment, and to prepare a draft report on the evaluation of information on PFOS, its salts and PFOSF for consideration by the Conference of the Parties at its seventh meeting.

5. The present draft report includes an assessment by the Secretariat of information for the process for the evaluation of PFOS, its salts and PFOSF in accordance with the Terms of Reference provided in decision POPRC-9/5, including:

(a) Information on the progress made to eliminate PFOS, its salts and PFOSF, pursuant to Article 15 of the Convention;

(b) Information on the progress made in building the capacity of countries to move safely to reliance on alternatives to PFOS, its salts and PFOSF.

B. Sources of information

6. The main sources of information in the development of the present report have been: information included in Part D of the national reports submitted by parties pursuant to Article 15 of the Convention and additional information submitted pursuant to decision SC-6/4 on the process for the evaluation of the continued need for PFOS, its salts and PFOSF for the various acceptable purposes and specific exemptions[1], the reviewed and updated National Implementation Plans (NIPs)

[1] A total of 43 national reports submitted by parties prior to 16 September 2014 have been considered in the development of the present report as follows: Argentina, Armenia, Australia, Belgium, Brazil, Bulgaria, Canada, Central African Republic, China, Colombia, Cote d'Ivoire, Croatia, Democratic Republic of Congo, Ecuador, Estonia, France, Georgia, Germany, Guatemala, Guinea, Ireland, Japan, Mali, Mexico, Monaco, Morocco, Myanmar, Nepal, New Zealand, Nigeria, Norway, Peru, Romania, Slovenia, Spain, Sweden, Thailand, The Former Yugoslav Republic of Macedonia, Tunisia, Turkey, Ukraine, United Arab Emirates, Uruguay. These will be made available on the Convention's website at http://chm.pops.int/Countries/Reporting/NationalReports/tabid/3668/Default.aspx.

under Article 7[2], the information submitted by parties and others in follow-up to decision POPRC-8/11 on the work programme on brominated diphenyl ethers and perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, and evaluation of the implementation of the Stockholm Convention for those chemicals[3] and POPRC-9/5 on the process for the evaluation of PFOS, its salts and PFOSF for the various acceptable purposes and specific exemptions[4]. This information has been supplemented through other governmental and intergovernmental reports and relevant scientific articles. The list of references is provided in section VIII of this report.

II. Situation analysis of the production and use of PFOS, its salts and PFOSF

A. Background

7. In accordance with paragraph 4 of Article 4 of the Convention, unless an earlier date is indicated in the Register of specific exemptions for PFOS, its salts and PFOSF by a Party, or an extension is granted pursuant to paragraph 7 of Article 4, the registration of specific exemptions shall expire five years after the date of entry into force of the amendment to that Party.

8. For the acceptable purposes, in accordance with paragraph 1 of Part III of Annex B, a Register of Acceptable Purposes is established. The Secretariat maintains the Register of Acceptable Purposes. In the event that a Party not listed in the Register determines that it requires the use of PFOS, its salts and PFOSF for the acceptable purposes listed in part I of Annex B, it shall notify the Secretariat as soon as possible in order to have its name added forthwith to the Register.

9. The list of acceptable purposes and specific exemptions according to annex B in the Stockholm Convention is shown in Table 1 below.

Table 1: Acceptable purposes and specific exemptions for PFOS, its salts, and PFOSF according to Annex B of the Stockholm Convention

Acceptable purposes	Specific exemptions
Photo-imaging	Photo masks in the semiconductor and liquid crystal display (LCD) industries
Photoresist and anti-reflective coatings for semiconductors	Metal plating (hard metal plating)
Etching agent for compound semiconductors and ceramic filters	Metal plating (decorative plating)
Aviation hydraulic fluids	Electric and electronic parts for some colour printers and colour copy machines
Metal plating (hard metal plating) only in closed-loop systems	Insecticides for control of red imported fire ants and termites
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)	Chemically driven oil production
	Carpets
	Leather and apparel
	Textiles and upholstery
	Paper and packaging
Fire fighting foam	Coatings and coating additives
Insect baits for control of leaf-cutting ants from genus Atta spp. and Acromyrmex spp	Rubber and plastics

10. The information contained in the register of PFOS, its salts and PFOSF pursuant to paragraph 1 of part III of annex B of the Stockholm Convention is provided in Table 2, and Table 3 provides information from the register of specific exemptions for PFOS, its salts and PFOSF.

[2] Available at: http://chm.pops.int/Implementation/NIPs/NIPSubmissions/tabid/253/Default.aspx

[3] Available at: http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC7/POPRC7Followup/InformationonBDEsandPFOS/tabid/2542/Default.aspx

[4] Available at: http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC9/POPRC9Followup/PFOSSubmission/tabid/3565/Default.aspx

Table 2: Register of PFOS, its salts and PFOSF pursuant to paragraph 1 of part III of annex B of the Stockholm Convention

Party	**Production notifications (x=received)**		**Use notifications (x=received)**		**Acceptable purpose activities**	**Chemical name of the precursor (if relevant)**	**Remarks**
	Ongoing	Planned	Ongoing	Planned			
Brazil	x		x		Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	Perfluorooctane sulphonyl fluoride (PFOS-F) (*)	(*) Intermediate in the production of sulfluramid, for the production of insect baits for control of leaf-cutting ants from Atta spp and Acromyrmex spp.
Canada			x	10/12/2010	• Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard metal plating) only in closed-loop systems • Fire-fighting foam		
China, People's Republic of	x		x		• Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard metal plating) only in closed-loop systems • Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters) • Fire-fighting foam		Applicable to Hong Kong SAR and Macau SAR of China
Czech Republic			x		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only		

			in closed-loop systems		
European Union	x	x	• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems.		The EU restriction is not limited to PFOS, its salts and PFOS-F but covers all PFOS derivatives defined as C8F17SO2X, X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers. Please note that the fire-fighting foams that were placed on the EU market before 27 December 2006 may be used until 27 June 2011.
Japan	x	x	• Photo-imaging; • Photo-resistant and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Certain medical devices	Perfluotooctane-1-sulfonyl fluoride (PFOS-F, CAS No. 307-.35-7)	
Norway		x	• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems.		
Switzerland		x	• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems; • Fire-fighting foam.		Although PFOS-based aqueous film forming foams (AFFF5) can no longer be manufactured, or purchased in Switzerland, remaining stocks are allowed to be used in cases of an emergency by fire brigades until 2014 and in stationary installations until 2018.

Vietnam	x	x	• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems; • Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters); • Fire-fighting foam; • Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	• Perfluorooctane sulfonic acid (CAS No: 1763-23-1); • Potassium perfluorooctane sulfonate (CAS no. 2795-39-3); • Lithium perfluorooctane sulfonate (CAS no. 29457-72-5); • Ammonium perfluorooctane sulfonate (CAS no. 29081-56-9); • Diethanol-ammonium perfluorooctane sulfonate (CAS no. 70225-14-8); • Tetraethyl-ammonium perfluorooctane sulfonate (CAS no. 56773-42-3); • Didecyldimethyl-ammonium perfluorooctane sulfonate (CAS no. 251099-16-8) • Perfluorooctane sulfonyl fluoride (CAS No: 307-35-7).	Vietnam is in the process of PFOS inventory and will update information when available.

Table 3: Register of specific exemptions for perfluorooctane sulfonic acid (CAS No: 1763-23-1), its salts and perfluorooctane sulfonyl fluoride (CAS No: 307-35-7) listed in the Annex B

Party	Activity	Purpose(s) of use	Reason(s) for exemption	Duration of the exemption(s), if less than five years	Remarks
Brazil	Use	• Metal plating (hard metal plating) • Metal plating (decorative plating)	The product protects the operators of spray chrome (highly toxic) in electroplating process.		There is no equivalent product available with the same performance.
Canada	Use	• Photo masks in the semiconductor and liquid crystal display (LCD) industries • Metal plating (hard metal plating) • Metal plating (decorative plating)		Specific exemptions for use of PFOS in metal plating only required until 2013.	Specific exemptions for use of PFOS in metal plating only required until 2013.
China, People's Republic of	Production and use	• Photo masks in the semiconductor and liquid crystal display (LCD) industries; • Metal plating (hard metal plating); • Metal plating (decorative plating); • Electric and electronic parts for some colour printers and colour copy machines; • Insecticides for control of red imported fire ants and termites; • Chemically driven oil production.	Currently in use without appropriate alternatives and transition will take some time.		Applicable to Hong Kong SAR and Macau SAR of China.
Czech Republic	Use	• Metal plating (hard metal plating); • Metal plating (decorative plating).			
European Union	Production and use	• Metal plating (hard metal plating); • Metal plating (decorative plating)			The EU restriction is not limited to PFOS, its salts and PFOS-F but covers all PFOS derivatives defined as C8F17SO2X X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers.
Iran	Use	• Metal plating (hard metal plating); • Metal plating (decorative plating); • Chemically driven oil production; • Carpets; • Leather and apparel;	Country data not yet established	5 years as of 26 August 2010	

		• Textiles and upholstery; • Paper and packaging; • Coatings and coating additives; • Rubber and plastics			
Nigeria	Use	• Chemically driven oil production; • Carpets; • Leather and apparel; • Textiles and upholstery; • Paper and packaging; • Coatings and coating additives; • Rubber and plastics	No alternatives available for now		
Norway	Use	• Photo-masks in the semiconductor and liquid crystal display (LCD) industries.			
Switzerland	Use	• Metal plating (hard metal plating); • Metal plating (decorative plating).			
Vietnam	Production and use	• Photo masks in the semiconductor and liquid crystal display (LCD) industries; • Metal plating (hard metal plating); • Metal plating (decorative plating); • Electric and electronic parts for some colour printers and colour copy machines. • Insecticides for control of red imported fire ants and termites; • Chemically driven oil production; • Carpets; • Leather and apparel; • Textiles and upholstery; • Paper and packaging; • Coatings and coating additives; • Rubber and plastics.	Still in use	Five years	Vietnam is in the process of PFOS inventory.

B. Production

11. The voluntarily phase out in 2003 of the production of PFOS, its salts and PFOSF by the most important global producer marked a major decrease in global production and use. Available information indicates that 3M was the main producer of PFOS, its salts and PFOSF until 2003, and that the production before 2003 was mostly for surface treatment and for paper protection[5]. Quantitative data on production have only been available from 3M so far, but it is considered that the combined capacity of the other producers was very much less than that of 3M[6].

12. The following parties have registered for production of PFOS, its salts and/or PFOSF for the acceptable purposes under the Convention: Brazil, China, European Union, Japan and Vietnam; and for specific exemptions: China, European Union, Vietnam.

13. As part of the national reports submitted pursuant to Article 15, past or current production for the acceptable purposes and specific exemptions listed in Annex B of the Convention is reported by Belgium, China and Germany. Further sector-specific details and quantitative annual production data are not available. Brazil and Japan report no production on their territory. Finally, Vietnam has notified production of PFOS, its salts and PFOSF as part of its registration for acceptable purposes and specific exemptions, however data on production levels have not been made available.

14. Based on the submissions received from industry associations pursuant to the request of the ninth meeting of the POPs Review Committee for information on alternatives to the use of PFOS, its salts and PFOSF and their related chemicals[7], Table 4 below lists the potential manufacturers of PFOS, its salts and/or PFOSF.

Table 4: Potential manufacturers of PFOS, its salts and/or PFOSF as of 15 January 2014[8].

Company Name	Country	Website	Chemicals produced
Changjiang Fluorochemical Co., Ltd.	P.R. China	http://www.whcjfkj.com/	PFOSF, Fluoro surfactants, Perfluorooctanesulfonyl Quaternary AmnoniumIodides, FC-248
Fujian Shaowu Haixing Chemical Corporation Ltd	P.R. China	http://haixinchem.en.ec21.com/	PFOS, PFOSF
Hubei Kaike Printing Ink Manufacture Co., Ltd.	P.R. China	No Website	PFOSF
Hubei Xiaochang Xiangshun Chemical Co., Ltd.	P.R. China	http://www.xcxshg.com/	PFBS, PFOS, PFOSF, Fluorinated Surfactants and other
Shaowu Huaxin Chemical Corporation Ltd.	P.R. China	http://www.haixinfluoride.com/eindex.html	PFOS, PFOSF, PBSF
Shaowu Jintang Anshengqi Chemical Co., Ltd.	P.R. China	None	PFOSF
Siyang Qingyun Fine Chemical Co. Ltd.	P.R. China	http://www.qychem.com	PFBS, PFOA, PFOS, PFOSF

[5] UNECE 2006. Overview of Existing Information on PFOS Production, Use, Emissions and Pathways to the Environment and Cost/Benefits with alternatives/substitutes.

[6] Carloni D. 2009. Perfluorooctane Sulfonate (PFOS) Production and Use: Past and Current Evidence. Report prepared for UNIDO. December 2009.

[7] Available at : http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC9/POPRC9Followup/PFOSSubmission/tabid/3565/Default.aspx

[8] Based on UNEP-POPS-POPRC9FU-SUBM-PFOS-Fluorocouncil-3-20140131.En available at http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC9/POPRC9Followup/PFOSSubmission/tabid/3565/Default.aspx

Company Name	Country	Website	Chemicals produced
Wuhan Chemical Industry Institute	P.R. China	http://en.whchinst.com/	PFOA, PFOS, PFOSF, PBSF
Wuhan Defu Economic Development Co., Ltd.	P.R. China	http://defu.chemnet.com/cgi/search-en.cgi?f=introduction_en_1_+company_en_1_&t=introduction_en_1_	PFOA, PFOS, PFOSF, PBSF, Portfolio of Surfactants, N-ethyl-perfluorooctylsulfonamide
Wuhan Jinfu Economic Development Co., Ltd.	P.R. China	No Website	PFOSF
Wuhan Jiangrun Fine Chemical Co., Ltd.	P.R. China	www.jiangrun-chem.com	PFOSF
Wuhang Heide Corporation Ltd.	P.R. China	http://www.fluorochem.cn/aboutus-e.htm	Fluorosurfactants, PFOSF
Yingcheng Sanwei Chemical Co., Ltd.	P.R. China	http://defu.chemnet.com/cgi/search-en.cgi?f=introduction_en_1_+company_en_1_&t=introduction_en_1_	PFOSF, Part of Wuhan Defu Economic Development Co., Ltd.

C. Use

15. The information on the use of PFOS, its salts and PFOSF for the various acceptable purposes / specific exemptions under the Convention as provided by parties as part of the national reports under Article 15 is summarized in the tables below.

Table 5: Parties having reported the use of PFOS, its salts and PFOSF for acceptable purposes under the Convention (source: Article 15 reports, 16 September 2014)

	PFOS was / is in use	PFOS was / is not used	Information not available
Photo-imaging	Australia[9], Germany, Japan	Brazil, Ireland, Sweden	Belgium, Canada, China, France, Norway, Romania, Slovenia, Spain
Photo-resist and anti-reflective coatings for semi-conductors.	Germany, Ireland, Japan	Australia, Brazil, Sweden	Belgium, Canada, China, France, Norway, Romania, Slovenia, Spain
Etching agent for compound semiconductors and ceramic filters.	Japan	Australia, Brazil, Germany, Ireland, Sweden	Belgium, Canada, China, France, Norway, Romania, Slovenia, Spain
Aviation hydraulic fluids.	Germany, Japan	Australia, Brazil, Ireland, Sweden	Belgium, Canada, China, France, Norway, Romania, Slovenia, Spain

[9] Australia has not ratified the amendment to the Convention listing PFOS in Annex B, but reported on the use of PFOS in its Article 15 report.

	PFOS was / is in use	PFOS was / is not used	Information not available
Metal plating (hard metal plating) only in closed-loop systems.	Australia, Canada, Germany, Japan, Slovenia, Sweden	Brazil, Ireland	Belgium, China, France, Norway, Romania, Spain
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD olour filters).		Australia, Brazil, Canada, Germany, Ireland, Japan, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Fire-fighting foam.	Australia, Germany, Japan	Brazil, Ireland, Sweden	Belgium, Canada, China, France, Norway, Romania, Slovenia, Spain
Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	Brazil	Australia, Canada, Germany, Ireland, Japan, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain

Table 6: Parties having reported the use of PFOS, its salts and PFOSF for specific exemptions under the Convention (source: Article 15 reports, 16 September 2014)

	PFOS was / is in use	PFOS was / is not used	Information not available
Photo masks in the semiconductor and liquid crystal display (LCD) industries.		Australia[10], Brazil, Germany, Ireland, Sweden	Belgium, Canada, China, France, Japan, Norway, Romania, Slovenia, Spain
Metal plating (hard metal plating).	Australia, Brazil, Canada	Ireland	Belgium, China, France, Germany, Japan, Norway, Romania, Sweden, Slovenia, Spain
Metal plating (decorative plating).	Australia, Brazil, Canada	Ireland Sweden	Belgium, China, France, Germany, Norway, Romania, Slovenia, Spain
Electric and electronic parts for some colour printers and colour copy machines.		Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Insecticides for control of red imported fire ants and termites.		Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain

[10] Australia has not ratified the amendment to the Convention listing PFOS in Annex B, but reported on the use of PFOS in its Article 15 report.

Chemically driven oil production.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Carpets	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Leather and apparel.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Textiles and upholstery.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Paper and packaging.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Coatings and coating additive	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Rubber and plastics.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain
Other uses.	Australia, Brazil, Canada, Germany, Ireland, Sweden	Belgium, China, France, Norway, Romania, Slovenia, Spain

16. Quantitative data on current use levels are limited and have been summarized below:

Party	Use / Stockpiles in products	Import	Export
Brazil	Reported estimated use of PFOS in insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. at a constant level of around 50,000 kg per year from 2009 to 2014; 1,876 kg/year was used in 2011 for hard metal plating.		
Canada	Reported estimated use of PFOS in metal plating (hard metal plating) only in closed-loop systems at levels of 28.78 kg in 2009, 25.82 kg in 2010, 5.64 kg in 2011, 8.75 kg in 2012, 1.64	The import of PFOS and products containing PFOS is prohibited under the PFOS Regulations with certain	

Party	Use / Stockpiles in products	Import	Export
	kg in 2013 and 0 in 2014. According to Canada's NIP[11], there are no stockpiles consisting of pure PFOS. Canada does, however, have stockpiles of aqueous film forming foams (AFFFs) containing PFOS concentrations that were manufactured or imported before May 2008.	exceptions (e.g., laboratory use and incidental presence)	
Germany	Reported estimated annual use in 2010 was of 75 kg in photo-imaging, 1,87 kg in photo-resist and anti-reflective coatings for semi-conductors, 50 kg in aviation hydraulic fluids, 3400 kg in metal plating (hard metal plating) in closed-loop systems, and 25000 kg in fire-fighting foam. Total use of PFOS in Germany in 2010: 28.527 tons.		
European Union	ESWI (2011)[12] estimates current uses as follows: the metal plating industry (6,500 kg/y), hydraulic fluids (730 kg/y), photographic industry (562 kg/year used +~1,280 kg from historical storage), semiconductor industry (9.3 kg/year), fire fighting foams (90 tons in stocks). Total sources 163 t/year and 1,730 tons in product[13] (mainly from carpets)	According to ESWI (2011): No information available, except for the photo industry: finished articles containing PFOS account for 150 kg/year.	According to ESWI (2011): No information available, except for the photo industry: finished articles containing PFOS account for 250 kg/year.
Ireland	Reported estimated use for photo-resist and anti-reflective coatings for semi-conductors was of 2.6 kg in 2010, 0.4 kg in 2011, 0.3 kg in 2012 and 0 kg in 2013.		
Japan	Reported past use of PFOS for insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex		

[11] Environment Canada, Chemicals Management Division. 2013. Update to Canada's National Implementation Plan under the Stockholm Convention on Persistent Organic Pollutants. April 2013.

[12] Consortium ESWI Expert Team to Support Waste Implementation 2011. Study on waste related issues of newly listed POPs and candidate POPs. Service request under the framework contract No ENV.G.4/FRA/2007/0066. Draft final report. 13 April 2011.

[13] Represents the existing stock of the substance in product in use.

Party	Use / Stockpiles in products	Import	Export
	spp. (3.318 kg in 2009) and in etching agent for compound semiconductors and ceramic filters (12.4 kg in 2009). Japan's NIP[14] cites a survey conducted in 2011, according to which approximately 1.5 tons (approximately 30 kg in PFOS equivalent) of PFOS or its salts in stock were identified for use in the etching agent and photosensitive film of semiconductors. According to the survey conducted by the relevant ministry, a total of approximately 12 tons (amount of PFOS or its salts contained) of the foam extinguishing agents containing PFOS were identified.		
Morocco		Morocco reports as part of its national report on the unavailability of information on PFOS imports; imports of sulfonic compounds potentially containing PFOS have been of 36,000 kg between 2010 and 2012.	
Netherlands	According to the RHDHV (2013)[15]: 145-150 kg was the estimated amount of PFOS used in mist suppressants in the metal plating industry, several kg in photo-resist or anti-reflecting coatings in the semi-conductor industry, 0 kg in photolithographic procedures in the photographic industry, and 0 kg in hydraulic fluids in		

[14] Japan. 2012. The National Implementation Plan of Japan under the Stockholm Convention on Persistent Organic Pollutants. August 2012.

[15] Royal HaskoningDHV (RHDHV) 2013. Inventory on the use of PFOS in the Netherlands. Report prepared for the Ministry of Infrastructure and Environment of the Netherlands. 9 July 2013.

Party	Use / Stockpiles in products	Import	Export
	the aviation industry.		
Norway		Total amount of PFOS and PFOS related substances that have been imported in the period 2010 – 2013 are estimated as follows: 2010: Cas no. 2991-51-7: 3.4 kg; Cas no. 2795-39-3: 0.17 kg 2011: Cas no. 2991-51-7: 6.8 kg; Cas no. 2795-39-3: 0.018 kg 2012: Cas no. 2991-51-7: 2.2 kg; Cas no. 2795-39-3: 1.1 kg 2013: Cas no. 2991-51-7: 0.18 kg	
Slovenia	Reported estimated use of 480 kg in metal plating (hard metal plating) only in closed-loop systems before 2009.		
Sweden	Reported estimated use of PFOS in aviation hydraulic fluids was of 10 kg/year prior to 2013. The estimated use in hard metal plating in closed-loop systems was of 200 kg/year prior to 2010 and currently is of 180 kg/year (see information on import).	Sweden has an ongoing use of PFOS in hard metal plating, with an annual import of about 180 kilograms.	
Switzerland	According to the NIP[16], apart from imports, stocks of PFOS may still be present in particular as fire-fighting foams. In 2005, estimates for stocks of PFOS in fire-fighting foams amounted to a total of approximately 15 - 18 tons.	In 2010 and 2011 respectively 100 kg of PFOS related substances were imported into Switzerland for the purpose of	

[16] Federal Office for the Environment (FOEN). 2012. Switzerland's first update of the National Implementation Plan under the Stockholm Convention. 22 August 2012.

Party	Use / Stockpiles in products	Import	Export
	By the end of April 2012, the reports of the amounts of PFOS used for exempted purposes and stocks of PFOS containing fire-fighting foams for 2011 were received by the Federal Office for the Environment (FOEN). Based on a first evaluation of these data, 1000 tons of PFOS-containing firefighting foams and thus roughly 10 tons of PFOS were still stored in Switzerland in 2010. The difference to the estimates from 2005 may be due to notifications that are still missing and stocks that have been disposed of recently	chromium plating. The estimates for 2012 amounted to 600 kg.	
Turkey	There are no data available on PFOS wastes, stockpiles and PFOS contaminated sites.	It is assumed that PFOS and related substances are imported to the country under the 2923.90.00.90.19 HS Code. However, the exact amount of PFOS imported under the 2923.90.00.90.19 HS Code is not known.	

D. Data gaps and limitations

17. The main sources of information on the production and use of PFOS, its salts and PFOSF were the reports and information submitted by parties. The accuracy and comprehensiveness of the information depend on the ability of parties to make such information available. A large majority of parties are in the process of updating their NIPs through which, initial information on the national situation will be obtained in the future through the inventory process for PFOS, its salts and PFOSF. Until the review and update of the NIPs is finalized, these parties are unable to submit information regarding PFOS, its salts and PFOSF through the process of reporting under Article 15. Likewise, the development of action plans to reduce and ultimately eliminate the production and/or use of PFOS, its salts and PFOSF needs to be prior informed through the inventory process in the frame of the NIP.

18. The present situation analysis is thus limited by data availability and coverage. Quantitative data are not available for a majority of countries and years. Data gaps are notable in developing countries and regions and in countries with economies in transition. Furthermore, there is limited comparability among the data(sets) available as provided by parties, those available from other international and governmental reports and other studies etc. Providing a truly global overview of the production and use of PFOS, its salts and PFOSF is currently challenging.

III. Availability, suitability and implementation of alternatives to PFOS, its salts and PFOSF

19. A number of parties have reported on the actions taken to phase out the use of PFOS, its salts and PFOSF as safer alternative substances or methods have become available (Sources: Article 15 reports, 16 September 2014; RHDHV 2013):

Use	Description of the alternative substances or methods
Photo-imaging	Sweden: Photographic film continue to disappear and the present use is practically limited to special products (medical uses and similar (scientific)). The total amount of PFOS in films imported to Sweden is estimated to be a few grams in 2013. Netherlands: Within the industry, new techniques have been developed which do not require PFOS in photolithographic procedures.
Photo-resist and anti-reflective coatings for semi-conductors	Ireland: In 2006 the World Semiconductor Council (WSC) announced a plan to end non-critical uses of perfluorooctyl sulfonate (PFOS) chemicals in semiconductor manufacturing and to work to identify substitutes for PFOS in all critical uses. Very small amounts of PFOS compounds are critical ingredients in leading edge photo-resists and anti-reflective coatings, materials used in the photolithographic process for imprinting circuitry on silicon wafers. PFOS is used in photo-resist either as a photo-acid generator or a surfactant. Photo-acid generators are used in photo-resists for 248nm and shorter wavelengths which rely on chemical amplification. During exposure the photo-acid generator forms an acid catalyst which aids in creating the desired image that is to be patterned onto the silicon wafer. Photo-acid generators used for this purpose are typically sulfonic acids and PFOS has been the most effective chemical that provides the necessary acidity and stability. In terms of surfactants, surface tension can produce unwanted thickness variations that emanate from the center of the silicon wafer during the spin-on application of the resist. PFOS is particularly effective in lowering the surface tension, reducing thickness variation, and also creating more uniform films. Under the Stockholm Convention the 'acceptable purpose' which allowed for the continued use of PFOS was defined as 'photo-resist and anti-reflective coatings for semiconductors'. While availing of this exemption for critical applications where no replacement was available, other uses of PFOS at the semiconductor manufacturing facility located in Ireland had previously been eliminated prior to 2010. Since 2010 this facility has been striving to eliminate the small uses of PFOS in these remaining critical applications. A total of nine photolithography process steps were re-designed at the facility thereby reducing PFOS use from less than 3 kilograms per year in 2010 to less than 300 grams by the end of 2012. The final and most challenging process step to re-design was not completed before the technology reached end of life at the facility in 2013. The re-design of each process step had to be addressed individually as each process step has its own unique set of chemistries and process and design specifications that need to be met and in each case the mostly suitable alternate resist chemistry had to be identified. The facility has now been re-furbished and is running the latest company technology which was designed from the outset to be PFOS free. In general terms replacement of PFOS has been achieved through a variety of means including the use of shorter-chain compounds (C-4 to C-1 carbon chains), the use of non-fluorinated substitutes and the

	elimination of the surfactant function within the photo-resist.[17] Sweden: No production of photoresist exists in Sweden. No PFOS is remaining in today's import of photoresist. The amount of PFOS in resists usually have been of the magnitude of 0,05-0,1 % which means that PFOS may or may not be declared in the MSDS (depending on who made the MSDS - minor constituents are to be reported only if they contain some hazardous property). In the MSDS for liquid resist there are no statements about PFOS as a component. On a special request for an MSDS on film resist, PFOS was not included in the specification either. One cannot exclude that information from the manufacturers is insufficient or even faulty but with reference to the general PFOS debate it might be more likely that the (international) manufacturers of photoresist actually have substituted PFOS. A substitution to polyfluorinated compounds in photoresist seems likely to have occurred. The situation for the use of PFOS as desmear is a bit unclear. From the suppliers of chemicals to the printed circuit manufacturers it is stated that no PFOS is sold. One of the suppliers claim that PFOS may be omitted by a smaller change in technique when the wafers are cleaned and another one states that PFOS-free desmear has been marketed before. This has not been verified by the manufacturers of printed circuits but the information sounded reliable. Actually, the suppliers of chemicals and technique have conveyed a more profound knowledge about the processes than the manufacturers. This is not surprising since the core business for the manufacturers of printed circuits include more than the actual manufacture. Netherlands: Within the semi-conductor industry, every product has its own specific applications. Therefore, for every product, a PFOS-free alternative has to be developed. The industry, together with suppliers, is working on PFOS-free solutions, however industry claims that they need more time to develop a full range of qualitatively comparable alternatives.
Etching agent for compound semiconductors and ceramic filters.	Sweden: From the suppliers of chemicals to the printed circuit manufacturers it is stated that no PFOS is sold. One of the suppliers claims that PFOS may be omitted by a smaller change in technique when the wafers are cleaned and another one states that PFOS-free desmear has been marketed before. This has not been verified by the manufacturers of printed circuits.
Aviation hydraulic fluids.	Netherlands: According to a producer, PFOS is not an ingredient of the hydraulic fluid. The product does contain a PFOS related molecule (a prefluoroalkyl sulphonate) in an amount lower than 0.1% w/w. This ingredient is not indicated on the Material Safety data Sheet and the producer stated that the substitute molecule was not listed in part I of Annex B to the Stockholm Convention. Despite extensive research, no substitutes for prefluoroalkyl sulphonates (PFOS related molecules) have been identified yet. The use of PFOS in hydraulic fluids seems to be outdated. Sweden: With reference to an official document from one of the suppliers, dated 130522, PFOS has been phased out from phosphate esters based hydraulic fluids. It has been replaced by other fluorinated compounds, PFAS. The phasing out of PFOS by this

[17] Further information on the replacement of PFOS containing photo-resist within the semiconductor industry can be found in the following document: The World Semiconductor Council Joint Statement: http://www.semiconductorcouncil.org/wsc/uploads/WSC_2011_Joint_Statement.pdf See pp. 7, 16-20.

	supplier has not been widely advertised, the customers in question have been informed separately. As far as can be tracked, the substitution of PFOS in this case occurred in 2012/beginning of 2013. The hydraulic fluids existed before PFOS was industrially available and the oil based fluids might be an alternative. Spain: Fluorinated phosphate esters
Metal plating (hard metal plating) only in closed-loop systems.	Australia: Some users have switched to PFOS-free chemicals. Canada: Five-year time-limited exemptions were enacted under the Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations to allow industry sufficient time to transition to alternatives. One alternative substance that has been identified for use is “3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate”, (or 1H,1H,2H,2H- Perfluorooctanesulfonic Acid, CAS RN 27619-97-2), which is used at 1-5 wt% in FUMETROL 21. Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Norway: Hard metal plating in closed loop: Alternatives have been tested but have been found to be less efficient. The use of PFOS in this prosess is none the less very low. Sweden: Partially fluorinated alternatives (fluorotelomers), have shown sufficient properties. The requirements of "closed loop systems" with regards to PFOS needs to be clarified - see comment below. Partially fluorinated alternatives (fluorotelomers), have shown sufficient properties. Experiments on both laboratory scale and pilot scale in a hard chrome plating shop were performed in Denmark and reported in 2012. The telomer is now used by i.a. two middle size hard chrome platers in Sweden. Two of the hard chrome platers use covering balls in combination with additional cover of the baths. With increased ventilation they claim that the work environment is acceptable without mist suppressant agent. Two plating shops with several years of good experience of full scale plating with a fluorotelomer state that the costs are actually lower than with PFOS. The electroplaters still using PFOS are bigger on plating than the other ones. About 8 kg of the partially fluorinated alternative (fluorinated telomer) is estimated to have been purchased to substitute former use of PFOS. This chemical was introduced in 2009 by one supplier. Two hard chrome platers started test runs the same year and 2011 and the PFOS was totally replaced by this telomer. One other of the small suppliers plans to introduce the same kind of mist suppressant agent soon - after having positive experiences from Finland. Netherlands: Suppliers do offer PFOS-free products. However, according to users, not all processes are suitable for the use of PFOS-free mist suppressants/wetting agents. Main reason is the reduced quality of chrome plating with PFOS-free products. Another reason is that the reduction of surface tension by alternatives is lower and could therefore lead to higher exposure to chromium (VI) for the worker. Slovenia: no data on alternatives.

Certain medical devices (such as ethylene tetrafl uoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD olour filters).	Spain: PFOS-free filters. Alternatively, PFBS are tested as surfactant in coating products.
Fire-fighting foam.	Australia: Major users have switched to PFOS-free foams. Canada: Five-year time-limited exemptions were enacted under the Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations to allow industry sufficient time to transition to alternatives. An alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Norway: Norway does not use PFOS-containing fire fighting foams. A number of alternatives are available, both fluor-containg foam and foams without fluor. Due to trade secrets we do not have information about the exact chemical composition of the foams. Romania: BIO HYDROPOL 6 containing 5-10% 2-(2-butoxyethoxy)ethanol (CAS 11234-5; EC 203-961-6) Physicochemical properties of 2-(2-butoxyethoxy)ethanol: - Vap.pres. = 0.02 hPa at 26.9ºC - Wat.sol.ct.= miscible at 20 ºC - logPow = 0.15-0.4 Quantities of use per year: 5729 kg BIO HYDROPOL 6 PROFOAM 806G containing 2-6% Hexylene glycol (CAS 107-41-5, EC 203489-0) • hydrolyzed protein [70-80%], • metallic salt: NaCl+MgCl2 [8-15%]; FeSO4*7H2O[0-2%] Physicochemical properties of Hexylene glycol: - Vap.pres. = 0.07 hPa at 26.9ºC - Wat.sol.ct.= Miscible with water in all properties - logPow < 0.14 at 25 ºC Quantities of use per year: 15799 kg PROFOAM 806G Netherlands: Many regulators and authorities require tests or practice with fire-fighting foam installations. On an industrial scale, this requires huge amounts of foam to be spent and spilled into the environment. Not only PFOS-containing foams but also non-PFOS containing foams based on other fluoro compounds damage the environment. Various suppliers of fire-fighting foams advertise ‘practice’ or ‘test’ foams with environmentally less hazardous ingredients. Spain: Short chain fluorosurfactants, C6 fluorotelomer and dodecafluoro-2- metilpentan-3-ona. Fluoride-free fire-fighting foams (silicone based), hydrocarbon based surfactants, synthetic detergent foams and protein foams. Sweden: Import of PFOS-containing fire-fighting foam ended in 2003. A survey of the chemical content of relevant FFFs on the market is ongoing.

Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	Brazil: The Ministry of Agriculture in collaboration with some Universities has developed studies to test chemicals alternative, pursuant to the recommendations of the Review Committee on Persistent Organic Pollutants (POPRC) in its decision POPRC 8/8 and adopted by CoP, which invited Parties that still use PFOS, its salts, PFOSF and its related chemicals for the control of leaf-cutting ants Atta spp. and Acromyrmex spp. to conduct studies, including pilot projects, to develop peer-reviewed information on the feasibility of using alternatives to PFOS, its salts, PFOSF and its related chemicals within an integrated pest management approach . There are basic studies being developed in research centers and universities evaluating biological products, such as entomopathogenic fungi, and natural products such as plant extracts for the control of leaf-cutting ants. The results, however, have been inconsistent, demonstrating technical infeasibility, economic and operational (Boarettto and Forti, 1997; Moreira et al.2004). Fenoxycarb, pyriproxyfen, diflubenzuron, teflubenzuron, silaneafone, thidiazuron, tefluron, prodrone, abamectin, methoprene, Hydramethylnon, boric acid, some insecticides from the group of neonicotinoids, pyrethroids, Spinosyns, etc., had been tested for leaf-cutting ants, but they were not effective.
Photo masks in the semiconductor and liquid crystal display (LCD) industries.	Spain: Telomer-based products of various perfluoroalkyl chain length. C3- and C4-perfluorinated compounds. Hydrocarbon surfactants. Silicone products.
Metal plating (hard metal plating).	Australia: Some users have switched to PFOS-free chemicals. Canada: Five-year time-limited exemptions were enacted under the Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations to allow industry sufficient time to transition to alternatives. One alternative substance that has been identified for use is “3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate”, (or 1H,1H,2H,2H- Perfluorooctanesulfonic Acid, CAS RN 27619-97-2), which is used at 1-5 wt% in FUMETROL 21. Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Germany: The German Federal Environment Agency commissioned a research report on alternatives to PFOS in the metal plating industry (hard metal plating, decorative plating). In the metal plating industry, PFOS can either be substituted by H4PFOS (CAS-Nr.: 276-19-97-2), or with non-fluorinated tensides, the basic elements of which are alkylsulfonates (CH3(CH2)nSO3H). H4PFOS is not considered a suitable substitution chemical for PFOS by Germany, given its persistence and estimated substance characteristics, which are similar to PFOS. Alkylsulfonates are commonly used, degradable surfactants. TIB Chemicals has filed a patent and has declared the exact formulation as confidential business information, thus our information refers to the general group of alkylsulfonates. According to the progress report mentioned above, the substitution of PFOS in the metal plating industry with non-fluorinated surfactants is feasible for both bright chrome plating and hard chrome plating. The Federal Environment Agency initiated, in the context of the "cleaner production germany" project, a number of projects to support the substitution of PFOS in the metal plating industry.[18]

[18] Information is available at: http://www.cleaner-production.de/projekte-publikationen/projekte/galvanotechnik/einsatz-cr6-freier-elektrolyte-zur-verchromung-von-hochwertigen-automobil-komponenten.html; http://www.cleaner-production.de/projekte-

	Romania: VpCl - 414 containing 2-6% 2- Amino-ethanol (CAS 141-43-5; EC 205-483-3) Physicochemical properties for 2- Amino-ethanol - Vap.pres. = 0.58 hPa at 26.9ºC - Wat.sol.ct.= miscible at 20 ºC - logPow = - 1.91 at 25 ºC - air photodegradation :50% after 26.6 hours Quantities of use per year: 56 kg VpCl – 414 Sweden: see information provided on metal plating in closed-loop systems.
Metal plating (decorative plating).	Australia: Some users have switched to PFOS-free chemicals. Canada: Five-year time-limited exemptions were enacted under the Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations to allow industry sufficient time to transition to alternatives. One alternative substance that has been identified for use is "3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate", (or 1H,1H,2H,2H- Perfluorooctanesulfonic Acid, CAS RN 27619-97-2), which is used at 1-5 wt% in FUMETROL 21. Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Spain: Use of trivalent chromium, in which case it is not necessary to use a mist catcher. Sweden: In decorative chrome electroplating the chromium layer is a few µm in contrast to the about 35 µm in hard chrome. This enables a somewhat milder electroplating where Cr3+ is used instead of Cr6+ and consequently the aerosols are not as hazardous. By the use of Cr3+ the demisting foam may be omitted and thereby the need for PFOS. With the thinner chrome layer, the intensity of the process is also less which enables other means of surface cover than foam. Plastic balls are one example that may be used in decorative electroplating.
Electric and electronic parts for some colour printers and colour copy machines.	Spain: Environmentally sound product design.
Insecticides for control of red imported fire ants and termites.	-
Chemically driven oil production.	Spain: perfluorobutane sulfonate (PFBS), telomer based fluorosurfactants and other perfluoro compounds for uses in oil recovery such as perfluoroalkyl-substituted amines, acids, amino acids and thioether acids.
Carpets.	Sweden: In most domestic houses stain repellant carpets are not common.
Leather and apparel.	-
Textiles and upholstery.	Spain: perfluorobutane sulfonate (PFBS) based substances, fluorotelomer-based substances, silicone based or other fluorinated copolymers.

publikationen/projekte/galvanotechnik/umruestung-einer-galvanik-auf-umweltfreundliche-beize.html; http://www.cleaner-production.de/fileadmin/assets/pdfs/Abschlussberichte/20_441_2_4_-_Implementierung_eines_neuen_Kunststoffmetallisierungsverfahrens.pdf; http://www.bubw.de/PDF_Dateien/Downloadbereich/Downloads_2011/Abschlussbericht_PFOS.pdf

Paper and packaging.	Spain: Fluorinated products with 1 - 1,5% of fluorochemical. N-Methyl perfluorooctane sulfonamidoethanol acrylate polymers or short chain telomere based substances.
Coatings and coating additive	-
Rubber and plastics.	-
Other uses.	-

IV. National regulatory actions

A. Australia

20. In its national report submitted pursuant to Article 15, information on the National Industrial Chemicals Notification and Assessment Scheme is provided, according to which a series of alerts were issued in 2002, 2003, 2004, 2007 and 2008. These alerts were reviewed and updated in 2013. The alerts recommend that PFOS be restricted to only essential uses, for which no suitable and less hazardous alternatives are available.

B. Canada

21. According to the information provided pursuant to decision SC-6/4 on the process for the evaluation of the continued need for PFOS, its salts and PFOSF, since the coming-into-force of Canada's Perfluorooctane Sulfonate, its Salts and Certain Other Compounds Regulations (the Regulations) on May 29, 2008, the manufacture, use, sale, offer for sale or import of perfluorooctane sulfonate, its salts, and compounds that contain one of the following groups: C8F17SO2, C8F17SO3 or C8F17SO2N (PFOS) have been prohibited with a number of exemptions.

22. Some exemptions were created with time limits to provide industry with a period to transition to alternatives from PFOS. The following time-limited exemptions expired five years after the coming-into-force date of the Regulations, which occurred on May 29, 2013:

(a) The use, sale, offer for sale and import of PFOS-based fume suppressants for certain electroplating applications;

(b) The use of aqueous film-forming foams (AFFF) containing PFOS that were manufactured or imported before May 29, 2008, except for testing and training purposes;

(c) The use of aqueous film forming foam containing PFOS in a military vessel deployed for a military operation before May 29, 2008, or within five years after that day.

23. Prior to the expiration of these time-limited exemptions, the consultation document Perfluorooctane Sulfonate, its Salts and Certain Other Compounds Regulations – Examination of On-going Exemptions[19] was published and requested input from industry and other interested stakeholders during the period of January 4, 2013 to March 5, 2013. This consultation was conducted to gather information to support further action towards meeting the risk management objective of achieving the lowest level of release to the environment that is technically and economically feasible from all emission sources of PFOS.

24. This consultation was also conducted to inform the evaluation of the continued need for the on-going exemptions listed in the Regulations, as Canada had committed to review the continued need for these exempted uses of PFOS. This commitment from Canada is aligned with the Stockholm Convention and the Convention on Long-range Transboundary Air Pollution, which both have a number of time-limited and on-going exemptions. Parties to these Conventions are encouraged to take action to phase out the exempted uses once suitable alternatives are available.

25. Further removal of exemptions for the use of PFOS through regulatory measures would continue to encourage users of PFOS to transfer to alternatives once they become available. All Specific Exemptions under the Stockholm Convention are already prohibited in Canada; therefore an

[19] Environment Canada. Health Canada. 2013. Consultation Document. Perfluorooctane Sulfonate, its Salts and Certain Other Compounds Regulations – Examination of On-going Exemptions. January 2013.

extension of Specific Exemptions that was previously claimed by Canada was not requested in May 2014.

C. China

26. A survey on the production and use of PFOS/PFOSF is ongoing in China, as reported under Article 15. In its announcement made in March 2014 ratifying the Amendments to Annexes A, B and C to the Stockholm Convention on Persistent Organic Pollutants to list nine new persistent organic pollutants, it specifies that as from 26 March 2014, with regard to PFOS/PFOSF specific exemptions, efforts should be made to develop substitutes as soon as possible in order to eliminate all of them before the exemptions expire; for PFOS/PFOSF for acceptable purposes, management and risk control should be reinforced to gradually eliminate their production and use.

D. European Union

27. PFOS, its salts and PFOSF were initially restricted through the EU Directive 2006/122/EC which amended for the 30th time Council Directive 76/769/EEC. As of 1 June 2009, Annex XVII of the REACH Regulation (EC) No 1907/2006 replaced Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States, relating to restrictions on the marketing and use of certain dangerous substances and preparations. In March 201, PFOS, its salts and PFOSF were deleted from Annex XVII and are now regulated under Regulation (EC) No 850/2004 on persistent organic pollutants as amended by Commission Regulation (EU) No 757/2010 of 24 August 2010.

28. According to the regulation, production, marketing and use of PFOS, alone, as well as contained, in mixtures or articles, may only take place in compliance with the restrictions set forth in the annex.[20]

29. Production, marketing and use of PFOS may thus only take place for:

(a) PFOS occurring as an unintentional trace contaminant in substances, preparations in concentrations of PFOS of 10 mg/kg (0.001% by weight) or less;

(b) PFOS occurring as an unintentional trace contaminant in semi-finished products or products or parts thereof, if the concentration of PFOS is lower than 0.1% by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS, or for textiles or other coated materials, if the amount of PFOS is lower than 1 µg/m2 of the coated material;

(c) Use of products already in use before 25 August 2010 and containing PFOS as a constituent is allowed;

(d) Fire extinguishing foam placed on the market before 27 December 2006 may be used until 27 June 2011;

(e) Until new information and safer alternative substances or technologies become available, if the quantity released into the environment is minimized, production and marketing is allowed for the following specific uses:

(i) Until 26 August 2015: wetting agents for use in controlled electroplating systems;

(ii) Photoresists or anti reflective coatings for photolithography processes;

(iii) Photographic coatings applied to films, papers, or printing plates;

(iv) Mist suppressants for non-decorative hard chromium plating in closed loop systems;

(v) Hydraulic fluids for aviation.

30. Where derogations in points (i) to (v) above concern the production or use in an installation within the scope of Directive 2008/1/EC of the European Parliament and of the Council, the relevant best available techniques for the prevention and minimization of emissions of PFOS described in the information of Directive 2008/1/EC shall apply.

31. As soon as new information on details of uses and safer alternative substances or technologies for the uses in points (ii) to (v) becomes available, the Commission shall review the derogations in the

[20] http://ec.europa.eu/enterprise/sectors/chemicals/reach/restrictions/index_en.htm

second subparagraph so that the uses of PFOS will be phased out as soon as the use of safer alternatives is technically and economically feasible, a derogation can only be continued for essential uses for which safer alternatives do not exist and where the efforts undertaken to find safer alternatives have been reported on, releases of PFOS into the environment have been minimized by applying best available techniques.

32. The export of POPs or articles containing POPs is regulated by Regulation (EU) No 649/2012 concerning the export and import of hazardous chemicals. This Regulation implements the Rotterdam Convention and provides for an export ban of POPs listed in Annex A and B of the Stockholm Convention and in Regulation (EC) No 850/2004. The decisions to list nine new substances in the Stockholm Convention were implemented by Regulation (EU) No 214/2011 and currently the export of all substances listed in Annexes A and B of the Stockholm Convention except PFOS is banned. The export of PFOS is currently still possible, but only on condition that the importing country consents to the import of that chemical.

E. Japan

33. According to the NIP, PFOS or its salts were designated in 2010 as Class I Specified Chemical Substance under the Chemical Substances Control Law. Therefore, currently, the manufacture, import and use of PFOS or its salts are virtually prohibited with the exceptions described as follows. The manufacture of the etching agent for the piezoelectric ceramic filter or composite semiconductor for high frequency band, the manufacture of the photosensitive film of semiconductors, and manufacture of photographic film for industrial use, as no alternatives exist and the uses would not threaten human health.

34. Standards for manufacturing equipment regarding PFOS or its salts, technical standards for PFOS or its salts and these three uses along with labeling matters at the time of transfer were established to ensure stringent control. Furthermore, for fire extinguisher, extinguishing agents for fire extinguisher and foam extinguishing agents that have been produced using PFOS or its salts, alternatives already exist, and they are unlikely to be manufactured/imported in the future. However, since large amounts have already been distributed domestically, and it is quite difficult to replace them with alternatives in the short-term, the standards and labeling matters to enable stringent control were prepared as provisional measures for the time being.

35. The “Technical Documents on Treatment of Wastes containing PFOS” was established (revised in September 2010 and March 2011), and proper disposal of these wastes is promoted by relevant business entities.

F. Switzerland

36. According to the NIP, PFOS has been banned in Switzerland in the Chemical Risk Reduction Ordinance (ORRChem) since 10 December 2010 with some exemptions corresponding to acceptable purposes and specific exemptions as defined in the Stockholm Convention.

37. With the amendment planned for December 2012, the regulation in the ORRChem will further improve the level of protection of health and envi-ronment with regard to PFOS. The following uses are currently exempted (Annex 1.16, 3 ORRChem as of 1 August 2011):

(a) Photo-resistant or anti-reflective coatings for photolithography processes;

(b) Photographic coatings applied to films, papers, or printing plates;

(c) Mist suppressants for non-decorative hard chromium (VI) plating and wetting agents for use in controlled electroplating systems where the amount of PFOS released into the environment is minimised;

(d) Hydraulic fluids for aviation;

(e) Medical devices, and components thereof, where the amount of PFOS released during the manufacturing process and during the disposal of process solutions is minimized.

38. The use in fire-fighting foams that were placed on the market before 1 August 2011 is allowed until 30 November 2014 for fire-fighting by professional fire-fighters in cases of emergency and until 30 November 2018 for stationary fire safety installations in industrial facilities and fuel depots.

39. For all users of exemptions reporting to the Federal Office for the Environment (FOEN) is required. The exemptions as they are currently listed in the ORRChem are based on information from the Swiss industry on existing essential uses of these substances due to lack of alternatives.

40. With the amendment from December 2012, the exemptions have been further limited by adding a requirement for closed loop systems for non-decorative hard chromium (VI) plating and limiting the exemption for wetting agents for use in controlled electroplating systems until 31 August 2015. The exemption for use in medical devices will be removed as the exemption is not needed any more in Switzerland.

V. Capacities for countries to transfer to reliance on alternatives to PFOS, its salts and PFOSF

41. A majority of parties are in the process of updating their NIPs, through which, initial information on the national situation will be obtained in the future through the inventory process for PFOS, its salts and PFOSF. For a number of developing country parties and countries with economies in transition in the process of updating their NIPs, this process is ongoing with financial support through the financial mechanism under the Convention. Activities pertaining to the safe transition to alternatives to PFOS, its salts and PFOSF need to be further considered in the development of the action plans for reducing and ultimately eliminating the production and/or use of PFOS, its salts and PFOSF in accordance with paragraph 4 (b) of Part III of Annex B, further to the completion and adoption of updated NIPs.

42. More than 60 per cent of the parties having reported under Article 15 mention the unavailability of information on alternative substances or methods, the lack of financial resources and insufficient technical capacity as challenges hindering their taking actions to phase out the use of PFOS, its salts and PFOSF and transfer to safer alternative substances or methods. A number of developing country parties report inability to take action on the implementation of alternatives to PFOS, its salts and PFOSF and to transfer safely to reliance on alternatives to PFOS, its salts and PFOSF in lack of above-mentioned means.

43. Regarding capacity building for the introduction of alternatives to PFOS, its salts and PFOSF, limited activities were initiated with German co-funding. The Stockholm Convention Secretariat has initiated a study on the environmental friendliness of PFOS substitutes for key applications in China. The mentioned study was prepared in cooperation with the Stockholm Regional Centre for Capacity-building and the Transfer of Technology in Asia and Pacific (SCRCAP), the School of Environment, Tsinghua University together with national and international experts funded by Norway and BMUB. Also under SCRCAP, an exhaustive publication on “POPs in Articles and Phasing-Out Opportunities” has been prepared with BMUB/GIZ co-funding of technical expertise.

VI. National reviews of the continued need for the specific exemption(s) and/or acceptable purpose(s)

44. As part of the national reporting process under Article 15, the following information was collected:

(a) Belgium reports that the country’s specific exemption (hard metal plating and decorative plating) does not need to be extended after 2015;

(b) Brazil has developed an inventory and action plan to identify the uses of PFOS and PFOSF in the country and verify if these chemicals can be replaced. The documents concluded that PFOS and PFOSF cannot currently be replaced in Brazil, and that studies should be further conducted to identify alternatives. The action plan outlines strategies for reducing or eliminating the use of PFOS. Regarding the production of sulfluramid, and concerned with the need to identify new alternatives to control leaf-cutting ants, the Ministry of Agriculture, Livestock and Food Supply of Brazil changed the protocol for the development of experiments aimed at identifying effective and safe alternatives for the control of this pest, after intense discussions with the Brazilian scientific community;

(c) No use of PFOS in articles is identified, thus no need for specific exemptions and acceptable purposes are needed by Bulgaria;

(d) Canada no longer requires the specific exemptions and did not request an extension on these specific exemptions. This conclusion was based on consultations with stakeholders which have indicated that the activities associated with these exemptions no longer occur in Canada;

(e) France reports the ongoing review at the European level;

(f) Germany reports that the specific exemption for PFOS in the EU (hard metal plating and decorative plating) will expire in May 2015. The EU and its member States including Germany

will not apply for an extension of the exemption. The acceptable purposes for PFOS in the EU will prevail;

(g) Ireland has reviewed the continued need for an 'acceptable purpose' for 'Photo-resist and anti-reflective coatings for semi-conductors' in accordance with EU POPs Regulation 850/2004;

(h) Japan indicates that the review is under consideration;

(i) The Inventory on the use of PFOS in the Netherlands[21] concludes that the specific exemptions for the application of PFOS in aviation hydraulic fluids and in photo-imaging are no longer necessary in the country;

(j) Norway reports that there is no continued need for the specific exemption "Photo-masks in the semiconductor and liquid crystal display (LCD) industries". As for the acceptable purposes:

(i) Aviation hydraulic fluids: there is continued need for this application;

(ii) Metal plating (hard metal plating) only in closed-loop systems: the current use of PFOS in this application is low but there is a continued need.

Information was not available in Norway for the present use for the remaining acceptable purposes:

(i) Photo-imaging;

(ii) Photo-resist and anti-reflective coatings for semi-conductors;

(iii) Etching agent for compound semi-conductors and ceramic filters.

(k) The review for the continued need for the specific exemption(s) and/or acceptable purpose(s) was carried out in Romania during March until August 2014. According to the information provided by the National Environment Protection Agency, over the Romanian territory there are no economic operators that produce or use PFOS, its salts and PFOSF.

(l) The use of PFOS is residual in Spain in the metal plating sector (hard metal plating and decorative plating), therefore there is no need to renew this specific exemptions. Communication has been initiated with the industry regarding the use in aviation hydraulic fluids and photographic and photolithographic processes but there were no sufficient answers to draw conclusions.

(m) Sweden reports on the results of a 2013 study made in the areas exempted from the EU ban, as follows:

(i) Wetting agents for use in controlled electroplating systems;

(ii) Photo-resists or anti reflective coatings for photolithography processes;

(iii) Photographic coatings applied to films, papers or plates;

(iv) Mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems;

(v) Hydraulic fluids for aviation.

Further to this study, PFOS is phased out in (ii). In (iii) the consumption is reduced to a few grams due to the fact that these techniques are replaced by digital technique. In (iv) and (i) the annual consumption has been rather constant but a phase out has been achieved by some smaller companies by polyfluorinated alternatives and other means of mist suppressing. Based on non-existing information about PFOS in the MSDS (v) the content should be less than 1%. The estimated amount of PFOS used annually in Sweden before 2012 was 10 kg. From 2013 the amount is estimated to be <1 kg as other PFAS, that could be of similar concern, have been phased in.

VII. Conclusions

45. The main sources of information were the reports and information submitted by parties pursuant to Article 15. The accuracy and comprehensiveness of the information depend on the ability of parties to make such information available. A large majority of parties are in the process of updating their NIPs through which, initial information on the national situation will be obtained in the future through the inventory process for PFOS, its salts and PFOSF. Until the review and update of the NIPs is finalized, these parties are unable to submit information regarding PFOS, its salts and

[21] RHDHV 2013. Inventory on the use of PFOS in the Netherlands. 9 July 2013.

PFOSF. Likewise, the development of action plans to reduce and ultimately eliminate the production and/or use of PFOS, its salts and PFOSF needs to be prior informed through the inventory process in the frame of the NIP.

46. The present situation analysis is thus limited by data availability and coverage. Quantitative data are not available for a majority of countries and years. Data gaps are notable in developing countries and regions and in countries with economies in transition. Furthermore, there is limited comparability among the data(sets) available as provided by parties, those available from other international and governmental reports and other studies etc. Providing a truly global overview of the production and use of PFOS, its salts and PFOSF is currently challenging.

47. Clearly there has been a significant drop in production and use since the voluntary phase out by 3M in 2003 until today. This is largely due to stricter legislation and control worldwide, although uncertainty remains as to the current levels of use of PFOS, its salts and PFOSF taking into account the limited quantitative data available.

48. More than 60% of the parties having reported through Article 15 mention the unavailability of information on alternative substances or methods, the lack of financial resources and insufficient technical capacity as challenges hindering their taking actions to phase out the use of PFOS, its salts and PFOSF and transfer to safer alternative substances or methods.

49. Among the information made available regarding actions that parties have taken to phase out the use of PFOS, its salts and PFOSF as safer alternative substances or methods have become available, one can note that:

(a) In the photo-imaging sector, photographic films continue to disappear and the present use is practically limited to special products. Further, new techniques have been developed which do not require PFOS in photolithographic procedures;

(b) In photo-resist and anti-reflective coatings for semi-conductors, PFOS free technology has been reported, however, for reasons of confidential business information, the alternate photo-resist chemistry could not be disclosed. Replacement of PFOS has been achieved through a variety of means including the use of shorter-chain compounds (C-4 to C-1 carbon chains), the use of non-fluorinated substitutes and the elimination of the surfactant function within the photo-resist. Information from other parties points to the industry, together with suppliers, working on PFOS-free solutions, however industry asserts that more time is needed to develop a full range of qualitatively comparable alternatives;

(c) The use of PFOS in hydraulic fluids seems to be outdated. It has been replaced by other fluorinated compounds. The hydraulic fluids existed before PFOS was industrially available and the oil based fluids might be an alternative;

(d) In metal plating (hard metal plating) only in closed-loop systems: some parties report users having switched to PFOS-free chemicals, others that alternatives have been tested but have been found to be less efficient. While suppliers do offer PFOS-free products, according to users, not all processes are suitable for the use of PFOS-free mist suppressants/wetting agents. One alternative substance that has been identified for use is “3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate”, (or 1H,1H,2H,2H- Perfluorooctanesulfonic Acid, CAS RN 27619-97-2). Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Partially fluorinated alternatives (fluorotelomers) are considered to have shown sufficient properties;

(e) Users tend to switch to PFOS-free fire-fighting foams according to the information provided by various parties. Caution has been expressed that not only PFOS-containing foams but also non-PFOS containing foams based on other fluoro compounds can damage the environment;

(f) There are basic studies being developed in research centers and universities evaluating biological and natural products such as plant extracts for the control of leaf-cutting ants. The results, however, have been inconsistent, demonstrating technical, economic and operational infeasibility;

(g) For metal plating (hard metal and decorative plating), some parties report users having switched to PFOS-free chemicals. One alternative substance that has been identified for use is “3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate”, (or 1H,1H,2H,2H-Perfluorooctanesulfonic Acid, CAS RN 27619-97-2). Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3, however H4PFOS is not considered a suitable substitution chemical for PFOS by some parties, given its persistence and estimated substance characteristics, which are similar to PFOS. Alkylsulfonates are commonly used, degradable surfactants. The exact formulation is confidential business information, but the substitution

of PFOS in the metal plating industry with non-fluorinated surfactants seems feasible for both bright chrome plating and hard chrome plating. In decorative plating, through the use of Cr3+ instead of Cr6+, the demisting foam may be omitted and thereby the need for PFOS. Plastic balls are one example that may be used in decorative electroplating. Several parties report that an extension of the specific exemption for metal plating (hard metal and decorative plating) will not be required in their case.

50. Further information and data would be needed to cover the gaps in the present report. Through the process for updating the NIPs currently ongoing in a majority of countries, additional information on PFOS, its salts and PFOSF will be obtained. Further capacity building in developing regions to support the introduction of alternatives to PFOS, its salts and PFOSF would be needed, as insufficient technical capacity and unavailability of information on alternative substances or methods have been identified as main challenges in taking actions to phase out the use of PFOS, its salts and PFOSF and transfer to safer alternative substances or methods.

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