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Montreal Protocol issues: information submitted by parties on their implementation of paragraph 9 of decision XIX/6 to promote a transition from ozone-depleting substances that minimizes environmental impact (decision XXV/5, paragraph 3)

Summary of the information submitted by parties on their implementation of paragraph 9 of decision XIX/6 to promote a transition from ozone-depleting substances that minimizes environmental impact (decision XXV/5, paragraph 3)

Report by the Secretariat

I. Introduction

1. In paragraph 9 of its decision XIX/6, the Meeting of the Parties to the Montreal Protocol encouraged parties to promote the selection of alternatives to hydrochlorofluorocarbons (HCFCs) that minimize environmental impacts, in particular impacts on climate, as well as meeting other health, safety and economic considerations. In paragraph 3 of its decision XXV/5, the Meeting of the Parties encouraged parties to provide to the Secretariat, on a voluntary basis, information on their implementation of paragraph 9 of decision XIX/6, including information on available data, policies and initiatives pertaining to the promotion of a transition from ozone-depleting substances that minimize environmental impact wherever the required technologies are available. It also requested the Secretariat to compile such information for consideration by the Open-ended Working Group of the Parties to the Montreal Protocol at its thirty-fourth meeting.

2. By the time of the thirty-fourth meeting of the Open-ended Working Group, held from 14 to 18 July 2014, the Secretariat had received information from 14 parties pursuant to paragraph 3 of decision XXV/5. The Secretariat compiled that information in document UNEP/OzL.Pro.WG.1/34/INF/4 and its addenda for consideration by the Open-ended Working Group at its thirty-fourth meeting. At that meeting the Open-ended Working Group requested the Secretariat to prepare a summary of all information submitted by parties, including information already submitted and any additional information submitted by 30 August 2014.[1] The Secretariat has prepared the present report in response to the request of the Open-ended Working Group at its thirty-fourth meeting.

* UNEP/OzL.Conv.10/1/Rev.1-UNEP/OzL.Pro.26/1/Rev.1.

[1] UNEP/OzL.Pro.WG.1/34/6, para. 76.

3. Following the thirty-fourth meeting, the Secretariat received information from six parties, two of which provided updates to their earlier submissions. One of those six parties was the European Union, which submitted information on regulatory measures applicable to its 28 member States and more specific information on behalf of five member States. The 23 parties that have provided information in response to decision XXV/5 and the request of the Open-ended Working Group are listed in table 1 below. As mentioned above, the original submissions by which those parties submitted the information prior to the Open-ended Working Group meeting are set out in document UNEP/OzL.Pro.WG.1/34/INF/4 and its addenda. The submissions received subsequent to that meeting are reproduced in document UNEP/OzL.Pro.26/INF/4.

Table 1

Parties that have provided information to the Secretariat

1. Australia	9. Ireland[a]	17. Slovenia[a]
2. Bangladesh	10. Japan	18. Spain[a]
3. Belgium	11. Mexico	19. Swaziland
4. Canada	12. Mozambique	20. Switzerland
5. Congo	13. Netherlands	21. Togo
6. Denmark[a]	14. Norway	22. United States of America
7. El Salvador	15. Poland[a]	23. Zimbabwe
8. European Union	16. Republic of Moldova	

[a] Contribution included in the submission by the European Union.

4. As requested in decision XXV/5, the parties listed in table 1 provided information on their own implementation of paragraph 9 of decision XIX/6. In addition, however, the United States of America, through a study conducted by the United States Environmental Protection Agency (USEPA), provided information pertaining to nine of the parties listed above (Australia, Canada, Denmark, Japan, the Netherlands, Norway, Poland, Switzerland and the European Union) and 24 other parties and the state of California in the United States. Those 24 parties are listed in table 2 below. This additional information is reproduced as submitted by USEPA in two information documents that were made available for the thirty-fourth meeting of the Open-ended Working Group (UNEP/OzL.Pro.WG.1/34/INF/4/Add.1 and 2). It is also reflected in the present summary. The amount of information provided varies considerably from party to party in terms of coverage or detail.

Table 2

Additional parties for which information was provided by USEPA

1. Austria	14. Maldives
2. Belize	15. Mauritius
3. Bosnia and Herzegovina	16. Montenegro
4. Brazil	17. New Zealand
5. Burkina Faso	18. Serbia
6. China	19. Sweden
7. Colombia	20. Thailand
8. Croatia	21. The Former Yugoslav Republic of Macedonia
9. Egypt	22. Turkey
10. France	23. United Kingdom of Great Britain and Northern Ireland
11. Germany	
12. India	24. Yemen
13. Italy	

5. The present summary, consistent with the term “minimize environmental impact, including impacts on climate” focuses on measures to avoid high global-warming-potential (GWP) substances, such as hydrofluorocarbons (HFCs), while also taking into consideration energy efficiency. Most parties provided information on mandatory measures for dealing with HFCs such as legislation and regulations. A number of parties cited examples of voluntary initiatives that involve government, the private sector or both. Some parties also provided important information relating to energy efficiency activities and raised issues related to health and safety.

6. The information provided by parties in response to decisions XXV/5 and the request of the Open-ended Working Group is summarized in sections II–VI of the present report. Section II summarizes information submitted by parties on legislation, regulations and other mandatory measures relevant to the transition from ozone-depleting substances to climate-friendly alternatives. An overview of those measures for ten parties is provided first before specific subject areas are presented

in subsequent subsections. Section III summarizes information provided on economic incentives, including negative economic incentives, refunds and other positive incentives and emissions trading systems and compliance credits. Section IV summarizes information provided on the efforts of parties operating under paragraph 1 of Article 5 of the Montreal Protocol (Article 5 parties) to achieve a transition to climate-friendly alternatives through their HCFC phase-out management plans. Section V summarizes other initiatives, including on matters such as energy efficiency, voluntary agreements, industry initiatives, adoption of alternative technologies and awareness raising activities. Finally, Section VI provides a summary of health and safety issues raised by some parties. Following a general conclusion in section VII, a summary matrix of reported policy measures to promote a transition from ozone-depleting substances that minimizes environmental impact is set out in the annex to the present document.

II. Legislation, regulations and other mandatory measures

7. A total of 10 parties provided information on their legislation, regulations and other mandatory measures relevant to the selection of alternatives to ozone-depleting substances. Those parties are Australia, Canada, Denmark, the European Union, Japan, the Netherlands, Norway, the Republic of Moldova, Switzerland and the United States. A brief overview of such measures for each party is provided in subsection A below, followed by subsections B–F summarizing their application in the following specific areas: HFC production and consumption control; HFC emissions control; training and certification; recordkeeping and reporting; and labelling.

A. Overview of legislation, regulations and other mandatory measures for each party

8. **Australia** controls HFCs through its Ozone Protection and Synthetic Greenhouse Gas (SGG) Management Act 1989, which was enacted to protect the ozone layer and to minimize emissions of SGGs. The Act does this by controlling imports, exports and the manufacture of bulk ozone-depleting substances and SGGs and controlling imports of equipment containing ozone-depleting substances and SGGs. The Act and its associated regulations also place controls on the end use of ozone-depleting substances and SGGs used as refrigerants and fire suppressants.

9. In **Canada**, federal and provincial regulations prohibit the release of HFCs and ozone-depleting substances from specified sources and require their recovery from closed systems. A code of practice governs ozone-depleting substances and HFC refrigerants and is being updated to incorporate new technologies and best practices to reduce emissions.

10. **Denmark** introduced its national F-gas regulation (Statutory Order no.552 Regulating Certain Industrial Greenhouse Gases) in July 2002. It regulates consumption and emissions of fluorinated greenhouse gases (“F-gases”), including HFCs, perfluorocarbons (PFCs) and sulfur hexafluoride, and includes bans on certain uses, F-gas taxation and support for research and development of alternative technology. The regulation has led to a substantial decline in the consumption of F-gases, with bulk HFC consumption falling from approximately 700 tonnes per year in 2001 and 2002 to approximately 360 tonnes in 2009.

11. The **European Union** provided information on seven pertinent mandatory measures:

(a) F-gas regulation – Regulation (EU) No 517/2014[2] – provides for HFC phase-down, restrictions on use and obligations of refrigerant management and containment. The regulation, effective 1 January 2015, is expected to reduce F-gas emissions by two thirds by 2030 compared with 2014 levels;

(b) Mobile Air Conditioning Directive – Directive 2006/40/EC[3] – restricts the use of HFCs in mobile air-conditioning equipment to substances with a GWP no higher than 150;

(c) European Union Effort Sharing Decision – Decision No 406/2009/EC[4] – establishes binding annual greenhouse gas emissions targets for European Union member States for the period 2013–2020 and provides the possibility for member States to include HFCs in their greenhouse gas emissions reduction efforts;

[2] http://ec.europa.eu/clima/policies/f-gas/legislation/index en.htm.

[3] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=::CELEX:32006L0040.

[4] http://ec.europa.eu/clima/policies/effort/documentation_en.htm.

(d) Regulation on ecodesign and energy labelling for air conditioners and comfort fans – Regulation (EU) No 206/2012[5] – establishes a framework for setting eco-design requirements for air-conditioners and providing bonuses for low-GWP refrigerants;

(e) Directive on Waste Electrical and Electronic Equipment (WEEE) – Directive 2012/19/EU[6] – provides for separate collection and take-back systems for equipment containing ozone-depleting substances or F-gases and the return of waste by final holders and distributors free of charge;

(f) European Eco-Management and Audit Scheme - Regulation (EC) No 1221/2009[7] promotes continuous improvement in the environmental performance of organizations through the establishment and implementation of environmental management systems, including with regard to HFC emissions and waste;

(g) European Union Green Public Procurement Criteria for Electrical and Electronic Equipment used in the Health Care Sector[8] are used on a voluntary basis by public authorities to procure goods and services that have relatively small environmental impact throughout their life cycles. Points are awarded for medical freezers with refrigerants having GWP lower than 10.

12. In **Japan**, requirements for the recovery and destruction of chlorofluorocarbons (CFCs), HCFCs and HFCs from commercial refrigerators and air-conditioners are in place through its Act Concerning the Recovery and Destruction of Fluorocarbons. The Act has been recently amended and renamed as the Act for Rationalized Use and Proper Management of Fluorocarbons, effective 1 April 2015. New measures are to be introduced regarding the promotion of low-GWP/non-HFC alternatives for designated products, the phase-down of HFCs and the reduction of refrigerant leakage from equipment during use.

13. The **Republic of Moldova** implements the Montreal Protocol through its law no. 852-XV of 14 February 2002. Harmonization with European Union law is under way.

14. The **Netherlands** devised in 1992 the so-called STEK certification system to implement CFC emissions controls. It included requirements on the certification of personnel and businesses, logbooks and refrigerant registers, leakage checks, installation, labelling and other matters and applied to CFCs, HCFCs, HFCs and PFCs (with the latter being added in 1995). As a member of the European Union, the Netherlands has been implementing the European Union F-gas regulations.

15. **Norway**, although not a member of the European Union, applies former European Union regulation (EC) 842/2006 on certain fluorinated greenhouse gases, which includes measures on the containment of gases and the proper recovery of equipment; training and certification of personnel and companies; labelling; reporting on imports, exports and production of F-gases; and restrictions on the marketing and use of certain products and equipment containing F-gases. Norway also plans to implement the newly adopted European Union F-gas regulation (No. 517/2014)[9].

16. **Switzerlan**d's regulation on substances stable in the atmosphere (SSA) is part of its Ordinance on the Reduction of Risks relating to the Use of Certain Particularly Dangerous Substances, Preparations and Articles. It was passed in 2003 and amended in 2012. It applies to substances that are stable in the atmosphere (SSA), solvents, synthetic foams, refrigerants, extinguishing agents and spray cans. Substances that are stable in the atmosphere are defined to include some hydrofluorinated ethers but not HFC-152a. The regulation is designed to limit the use of F-gases to those applications for which an alternative product or technology is not available or is environmentally worse, to allow technically justified, time-limited essential use exemptions, to limit emissions for allowed F-gas applications and to promote voluntary commitments developed by industry.

[5] http://eurlex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0206&from=en.

[6] http://ec.europa.eu/environment/waste/weee/legis_en.htm.

[7] http://ec.europa.eu/environment/emas/documents/guidance_en.htm.

[8] http://ec.europa.eu/environment/gpp/pdf/criteria/health/EN.pdf.

[9] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.150.01.0195.01.ENG.

17. The **United States** controls HFCs through its Clean Air Act:[10]

(a) Section 608 of the Act prohibits the knowing venting of refrigerant during the maintenance, service, repair or disposal of refrigeration and air-conditioning equipment;[11]

(b) Section 609 establishes standards for motor vehicle air-conditioning refrigerant recovery and recycling equipment and for the proper use of that equipment;[12]

(c) The Greenhouse Gas Reporting Programme establishes mandatory annual greenhouse gas monitoring and reporting requirements for certain owners, operators and suppliers of facilities that emit HFCs or other greenhouse gases;[13]

(d) Light-duty vehicle greenhouse gas emissions and corporate average fuel economy (CAFE) standards are imposed on 2012–2016 model year new light-duty vehicles produced for sale in the United States;[14]

(e) Light-duty vehicle greenhouse gas emissions and corporate average fuel economy standards for the 2017 model years build on the 2012–2016 model year standards and establish stricter ones;[15]

(f) Greenhouse-gas emissions standards and fuel efficiency standards for medium-duty and heavy-duty engines and vehicles require heavy-duty pickup trucks and vans and combination tractors to meet an air-conditioning leakage standard aimed at controlling HFC emissions;[16]

(g) The Significant New Alternatives Policy (SNAP) (Section 612 (c) of the Clean Air Act)[17] facilitates a smooth transition away from ozone-depleting substances in industrial and consumer sectors through the identification and approval of climate-friendly chemicals while prohibiting certain uses of the most harmful chemical alternatives. Proposed substitutes must be evaluated to reduce overall risk to human health and the environment. Review of proposed substitutes for ozone-depleting substances is based on atmospheric effects, exposure assessments, toxicity data, flammability and other environmental impacts.

B. Application of legislation, regulations and other mandatory measures in specific areas

1. Measures to control the production and consumption of HFCs

18. The measures described in the present section are prohibitions, restrictions or authorizations pertaining to the production, manufacture, trade, placing on the market and use of HFCs and HFC-based equipment. A summary of such measures reported by seven parties is presented below.

19. **Australia**'s Ozone Protection and Synthetic Greenhouse Gas Management Act of 1989 controls the manufacture, import and export of all ozone-depleting substances and their SGG replacements. A license is required to manufacture, import or export HFCs, PFCs, sulfur hexafloride, HCFCs and methyl bromide. This requirement permits the tracking of all scheduled substances for the purpose of reporting on ozone-depleting substances under Article 7 of the Montreal Protocol and for reporting on emissions of SGGs under the United Nations Framework Convention on Climate Change and its Kyoto Protocol. Although the Act sets in place a quota system for HCFCs, quotas do not apply to SGGs. Importers of equipment containing HFCs or HCFCs are required to hold equipment import licenses. Controls provide data on the size and structure of the bank of HCFC and HFC equipment in Australia as well as future servicing demand.

20. In **Canada**, it is proposed that the 1998 Ozone-depleting Substances Regulations be amended to prohibit, beginning in 2015, the manufacture, import and use of HFCs for purposes for which ozone-depleting substances have never been used in the country.

21. **Denmark,** in its national F-gas regulation of 2002, bans products containing or using HFCs starting 1 January 2006. It also prohibits the import, sale and use of new and recovered HFCs and

[10] http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.

[11] http://epa.gov/ozone/title6/608/608fact.html#noventing.

[12] http://epa.gov/ozone/title6/609/.

[13] http://www.gpo.gov/fdsys/pkg/FR-2010-12-01/pdf/2010-28803.pdf

[14] http://epa.gov/otaq/climate/regs-light-duty.htm#new1.

[15] http://www.epa.gov/oms/climate/documents/420f12051.pdf.

[16] http://epa.gov/otaq/climate/regs-heavy-duty.htm.

[17] http://www.epa.gov/ozone/snap/about.html#q2.

other industrial greenhouse gases for specific applications. The ban does not apply to export or to equipment with charges from 0.15 kg to 10 kg of HFCs. The order lists a number of exempted uses, including servicing, and has different effective dates for different uses. It also authorizes the Danish environmental protection authorities to allow derogations.

22. In the **European Union**, the F-gas regulation (Regulation No. 517/2014) limits the total amount of the most important F-gases that producers and importers are entitled to place on the market in the European Union from 2015 onwards and phases them down in steps to one fifth of 2014 sales by 2030. Quotas for placing HFCs on the market are allocated to eligible producers and importers, while exemptions exist for specific categories, including import for destruction and use in feedstock applications. From 1 January 2020, bans will be placed on the use of newly manufactured F-gases with a GWP of 2,500 or more for servicing or maintaining refrigeration equipment with a charge size of 40 tonnes of CO_2-equivalent or more. Until 1 January 2030, the regulation allows the use of reclaimed F-gases with a GWP of 2,500 or more for the maintenance or servicing of existing refrigeration equipment, provided that they are appropriately labelled. It also allows the use of recycled F-gases with a GWP of 2,500 or more for the maintenance or servicing of existing refrigeration equipment, provided that they have been recovered from such equipment. Such recycled gases may only be used by the actor that carried out their recovery or for which the recovery was carried out. Bans are subject to exemptions, including for HFCs used in military equipment. The regulation also bans the use of F-gases in many new types of equipment where less harmful alternatives are widely available, such as refrigerators in homes or supermarkets, air-conditioners, foams and aerosols.

23. Under the European Union mobile air-conditioning directive (Directive 2006/40/EC), since 2008 manufacturers have not been receiving approval for any new type of vehicle fitted with mobile air-conditioners designed to contain F-gases with a GWP higher than 150 leaking more than 40 grams per year from a one-evaporator system or 60 grams per year from a dual-evaporator system. Since 2009 this rule has applied to all new vehicles that have been type-approved in the past. Since 2011, mobile air-conditioners designed to use the above-mentioned gases have been completely banned for new types of vehicles. Beginning in 2017, the ban will apply to all new vehicles, and new vehicles with these systems will not be allowed to be registered, to be sold or to enter into service.

24. In **Japan**, measures for phasing-down HFCs and promoting low-GWP non-fluorocarbon alternatives for designated products will take effect on 1 April 2015 through the Act for Rationalized Use and Proper Management of Fluorocarbons. Producers and importers will be required to develop phase-down plans through the development and production of low-GWP and non-fluorocarbon alternative gases, taking into consideration safety, energy efficiency, affordability and other considerations, for use in designated products. Target GWP values are set based on the lowest GWP (weighted average by volume) among the designated products in the market in Japan, while also considering other issues such as safety, energy efficiency and affordability. The first GWP target, for room air-conditioning products, is GWP 750 by 2018. For 2019, the target for products for cold storage warehouses (of more than 50,000 m^3) is 100 GWP and for dust blowers 10 GWP. For 2020, the target for commercial air-conditioning products for offices and stores is 740 GWP and for urethane foam for house-building materials 100 GWP. For 2023, the target for mobile air-conditioning is 150 GWP and the 2025 target for condensing refrigerating units for standalone showcases and similar equipment is 1,500 GWP.

25. Since 2003, **Switzerland** has had a general ban, with specific exemptions, on the supply and use of SSA-based solvents, products containing those solvents and foams, aerosol dispensers, fire extinguishing agents and domestic appliances containing SSA. It also has measures in place for reducing SSA refrigerant charges. Since 2013, HFCs are also banned in air-conditioning and refrigeration applications, with some exemptions.

26. In the **United States**, in support of President Obama's Climate Action Plan, USEPA has proposed to change the listing status of certain high-GWP chemicals that were previously listed as acceptable under SNAP on the basis of information showing that substitutes posing less risk to human health and the climate are now available. Specifically, USEPA proposes to deem certain HFCs to be unacceptable for various end uses in the aerosols, refrigeration and air-conditioning and foam blowing sectors. It also proposes to restrict the use of HFCs as aerosol propellants to uses for which alternatives posing less environmental and health risk are not available or potentially available. Furthermore, USEPA proposes to include additional climate-friendly refrigerant alternatives by listing certain climate-friendly hydrocarbons (ethane, isobutane and propane) and a hydrocarbon blend (R-441A) as acceptable in stand-alone commercial and household refrigerators and freezers, very low temperature refrigeration, non-mechanical heat transfer, vending machines and room air conditioning units. It also proposes to list HFC-32 as acceptable in room air conditioning units, as the substance has one third of the GWP of the conventional refrigerants currently used in such equipment. USEPA conducts outreach

to stakeholders, including government and non-governmental organizations, industry, the military, research and testing institutes and national and international standards-setting organizations, in an effort to gain support for a transition to alternatives. The USEPA proposed rules and related fact sheets can be viewed online.[18,19,20 21]

27. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Austria, Belize, Burkina Faso, Colombia, Croatia, Montenegro, the Former Yugoslav Republic of Macedonia, Serbia, Sweden and Turkey, as summarized in the following paragraphs.

28. **Austria** has since 2008 prohibited the import and use of HFCs in new fixed air-conditioners and freezers, including domestic refrigerators, freezers and mobile air-conditioners, allowing the continued use of HFCs in refrigeration and cooling appliances for specific circumstances. HFCs have been banned in non-medical aerosol products and as solvents, except when used in closed systems, since 1 July 2003 and their use as a fire-extinguishing agent prohibited. As of 31 December 2007, the use of HFCs for the production of foams has been prohibited.

29. In **Belize** any individual or company is required to apply for a license to import or export any HFC or other refrigerant gas. In **Burkina Faso** the import of HFCs requires a licence and is subject to tax. In **Colombia**, all importers must obtain environmental licenses and seek approval to import any HFC for registration and trade control purposes. **Croatia** (a European Union member State since 1 July 2013)**, Serbia and Turkey** have implemented measures to regulate the import and use of HFCs. **Montenegro** regulates the import, export and marketing of products containing HFCs and other F-gases. In **the Former Yugoslav Republic of Macedonia**, the import of HFCs and mixtures containing HFCs must be authorized by the relevant authorities. Furthermore, the import of used refrigerators, freezers and other cooling and freezing devices relying on HFCs is banned as of 2007.

30. In **Sweden** prior to adoption of the European Union F-gas regulations the maximum HFC refrigerant charge for any system was restricted to 200 kg. The maximum refrigerant charge allowed in a supermarket refrigeration system was 20 kg for medium-temperature applications and 30 kg for low-temperature applications. The intended effect of refrigerant charge restrictions was to encourage the use of lower-GWP alternatives and minimize HFC refrigerant charges, thereby reducing the risk of HFC emissions.

2. Measures to control emissions of HFCs

31. HFCs are used primarily in the refrigeration, air conditioning, foam, aerosol, fire protection and solvents sectors. Emissions originate from manufacturing processes, unintended by-product releases, intentionally emissive applications, evaporation and leakage from equipment and products during use, testing, maintenance and end-of-life practices.

32. Policies to reduce emissions can take many forms, including direct bans or restrictions on emissions (including leakages), required practices, trading schemes and stewardship programmes. These policies are grouped in two broad categories below: releases during a product's useful life, which includes production, manufacture and operational life, and releases resulting from end-of-life practices.

(a) Releases during a product’s useful life

33. In **Australia**, unregulated discharge of a scheduled substance (including HFCs) in circumstances where it is likely that the substance will enter the atmosphere is an offense. These controls are designed to support the industry-based product stewardship scheme (Refrigerant Reclaim Australia), which provides for the collection, transport and disposal of used ozone-depleting substances and SGGs in the refrigerant sector.

34. In **Canada**, federal and provincial regulations prohibit the release of HFCs and ozone-depleting substances from refrigeration and air-conditioning equipment and from containers and equipment used in the reuse, recycling, reclaiming or storage of ozone-depleting substances and HFCs.

[18] Proposed rule: http://www.gpo.gov/fdsys/pkg/FR-2014-08-06/pdf/2014-18494.pdf.

[19] Fact sheet: http://www.epa.gov/ozone/snap/download/SAN_5750_SNAP_Status_Change_Rule-FactSheet_080114.pdf.

[20] Proposed rule: http://www.gpo.gov/fdsys/pkg/FR-2014-07-09/pdf/2014-15889.pdf.

[21] Fact sheet: http://www.epa.gov/ozone/downloads/Low_GWP_refrigerants_NPRM_RIN_2060-AS04%20-%20Fact_Sheet-5-29-14_final.pdf.

Environment Canada is also considering further reducing HFC emissions by requiring industry to implement a stewardship program for HFCs that are used in stationary refrigeration and air-conditioning equipment.

35. In Canada, the Passenger Automobile and Light Truck Greenhouse Gas Emissions Regulations provide strong incentive for light-duty vehicle manufacturers to replace HFC-134a used in mobile air-conditioning with alternatives and to improve the design of mobile air-conditioning systems to maximize energy efficiency and minimize refrigerant leakage. The objective of the regulations is to reduce greenhouse gas emissions by requiring vehicle manufacturers and importers to meet fleet average emissions standards for their passenger automobiles and light trucks for 2011 and later model years. The regulations also include provisions allowing companies to reduce their deemed CO_2-equivalent emissions by subtracting certain optional allowances (in grams per mile) from their carbon-related exhaust emissions. These allowances promote air-conditioning improvements, including refrigerant leakage reduction and system efficiency improvements, along with other innovative technologies whose-greenhouse-gas-reducing impacts are not captured during conventional city/highway emissions testing.

36. The **European Union** has binding annual greenhouse gas emissions targets for member States for the period 2013–2020 with regard to emissions from most sectors not included in the European Union emissions trading scheme. This includes transport (except aviation and international maritime shipping), buildings, agriculture and waste. European Union member States may include HFCs in their efforts to reduce their greenhouse gas emissions.

37. The previous European Union regulation on certain F-gases (Regulation (EC) No 842/2006) prohibited the intentional and unnecessary release of fluorinated greenhouse gases into the atmosphere. It also required all persons responsible for emissions to take all technically and economically feasible measures to prevent and minimize leakage. Refrigeration, air-conditioning and heat-pump equipment and fire protection systems were further required to undergo at least one leakage inspection a year, with the frequency of inspections varying with the quantity of F-gas in the equipment, and the owners of refrigeration, air-conditioning and heat pump equipment and fire protection systems containing 300 kilograms or more of F-gases to install leak detection systems.

38. The current European Union F-gas regulation (Regulation (EU) No. 517/2014) also bans intentional releases and requires operators of equipment that contains fluorinated greenhouse gases to take precautions to prevent their unintentional release and to take all technically and economically feasible measures to minimize emissions. It also includes requirements for leak checks and leak detection systems. The frequency of leak checking is based on the tonnes of CO_2-equivalent charge and the presence or lack of a leak detection system. For the largest systems without a leak detection system, the requirement is at least every 3 months. For the smallest systems with leak detection systems, the requirement is at least every 24 months. Where leakage is detected, the operator is required to ensure that the equipment is repaired without undue delay.

39. **Norway** regulates intentional and unintentional releases of fluorinated greenhouse gases through its implementation of the European Union's F-gas regulation (EC) No 842/2006 and intends to implement the newly adopted regulation (EU) No. 517/2014.

40. The **Netherlands**, as part of its STEK certification system, required operators of equipment to undertake leakage checks from 1 to 12 times per year, depending on the application. In 1999, an extensive study was undertaken to assess the installed base of the various synthetic refrigerants used in all refrigeration and air-conditioning sectors and subsectors. It was found that the STEK measures had contributed to reducing the average ozone-depleting substance and HFC leakage rate from 25-30 per cent to 5–10 per cent. The STEK certification system is no longer in place, but most of its requirements form a central part of current regulations, including the European Union F-gas regulations, which are applicable in European Union member States.

41. Beginning 1 April 2015, HFC users in **Japan** will be required to conduct periodic checks of refrigerant leakage and to call service engineers to undertake repairs upon discovery of any leakage. Refilling equipment with refrigerant is prohibited until leaks are repaired.

42. **Switzerland** requires that stationary systems with more than 3 kg of SSA refrigerant (including HFCs) be checked yearly for tightness control. It also mandates the use of maintenance logbooks.

43. **Togo** reports that it has established a national strategy for the implementation of the Kyoto Protocol to the Framework Convention on Climate Change (controlling emissions of greenhouse gases), along with the Montreal Protocol, incorporating those instruments into its sectoral development plans and policies.

44. In the **United States**, it is prohibited to knowingly release refrigerant (including HFCs) during the maintenance, service, repair or disposal of refrigeration and air-conditioning equipment. Certain types of releases are permitted under the prohibition, however. Thus, the release of de minimis quantities of refrigerant in the course of making good faith attempts to recapture and recycle or safely dispose of refrigerant and releases of HFCs and PFCs that are not used as refrigerants are permitted. For purposes of the rule heat transfer fluids are considered refrigerants.

45. The United States Corporate Average Fuel Economy (CAFE) Standards require improved leakage rates for HFC-based motor vehicle air-conditioning systems in 2012–2016 model year vehicles. USEPA estimates, through utilization of leakage-reducing technologies, that it will be possible for manufacturers to reduce HFC leakage by 50 per cent relative to the 18 gram per year baseline level. Over the five model years subject to the standards, USEPA projects, 85 per cent of light-duty vehicles will have gone through a redesign cycle. If the technology for controlling greenhouse gas emissions is efficiently folded into this redesign process, then by 2016 almost the entire light-duty fleet could be designed to reduce emissions of HFCs from their air-conditioners.

46. Heavy-duty pickup trucks and vans and combination tractors are required to meet an air-conditioning leakage standard aimed at controlling HFC emissions. Unlike light-duty vehicle standards, there is no credit program and no averaging, banking, or trading of HFC credits. For systems with refrigerant capacities equal to or greater than 734 grams, leakage of refrigerant may not exceed 1.5 per cent per year. For systems with refrigerant capacities less than 734 grams, leakage may not exceed 11.0 grams per year. New tractors must obtain design-based certification, but no system-level testing is required. If a system uses a refrigerant other than HFC–134a, the leakage rate is to be adjusted by multiplying it by the GWP of the alternate refrigerant and dividing the product by 1,430, the GWP of HFC–134a. This adjustment is to be applied before comparing the leakage rate to the standard.

47. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Colombia, Germany, Montenegro, New Zealand and Yemen, as summarized in the following paragraphs.

48. **Colombia** sets maximum permissible limits for air pollution by HFCs and other greenhouse gases, which are measured using hourly, daily and annual values.

49. **Germany** has established leakage limits for stationary applications and requires annual leakage controls for certain types of transport refrigeration equipment. Some stakeholders, including several non-government organizations, recommend strengthening the containment requirements and allowable emission rates.

50. **Montenegro** bans the release of HFCs and other F-gases during the maintenance, repair and decommissioning of products containing those substances such as refrigeration and air-conditioning units. Recovery is required for recycling, reclamation or destruction.

51. **New Zealand** has banned the willful release of HFCs and other SGGs from specified sources and activities under the Climate Change Response Act 2002 and fines offenders up to US $38,700. Slow leakage over the natural course of a product's life or release during servicing where best practices are employed is not penalized.

52. **Yemen**'s ozone regulations require the recovery and recycling of HFCs in maintenance workshops.

(b) Releases from end-of-life practices

53. In **Australia**, equipment and controlled substance license holders who import refrigerant gases are required to participate in a product stewardship scheme for properly disposing of ozone-depleting substances and SGGs at end of life.

54. In **Canada**, the proposed stewardship programme briefly mentioned above would ensure the environmentally sound management and disposal of unwanted refrigerants. Building on the existing framework for CFCs and HCFCs, the programme would require importers and reclaimers of HFC refrigerants to prepare stewardship plans to ensure that recovered halocarbon refrigerants, including HFCs, are either reused after recycling or reclamation or disposed of using technologies approved by the Parties to the Montreal Protocol. The disposal aspects of this management framework would be coordinated by industry, which is already coordinating the disposal of CFCs and HCFCs across the country. Consultations are currently under way with Canadian stakeholders on this initiative, which is expected to be implemented in 2015. Domestic appliances would be excluded, but municipal and

regional programmes are in place across Canada that aim to ensure the recovery and sound management of such appliances at end-of-life, including the refrigerants that they contain.

55. The previous **European Union** regulation ((EC) No. 842/2006) on certain F-gases required that fluorinated gases in specified equipment and unused gases left in containers be recovered for recycling, reclamation or destruction whenever possible. Building on that, the current regulation ((EU) No. 517/2014) requires recovery from the cooling circuits of stationary refrigeration, stationary air-conditioning and stationary heat pump equipment; the cooling circuits of refrigeration units of refrigerated trucks and trailers; stationary equipment that contains F-gas-based solvents; stationary fire protection equipment; and stationary electrical switchgear. It also requires operators of products and equipment that is not listed above but contains F-gases, including mobile equipment, to arrange for the recovery of the gases, to the extent that it is technically feasible and does not entail disproportionate costs, by appropriately qualified persons, so that they are recycled, reclaimed or destroyed, or to arrange for their destruction without prior recovery. Residual gases in containers must also be recovered for recycling, reclamation or destruction.

56. The European Union also provides for separate collection and take-back systems for waste electrical and electronic equipment containing ozone-depleting substances or F-gases. Final holders and distributors may return such waste free of charge.

57. **Japan** requires the recovery and destruction of CFCs, HCFCs and HFCs from commercial refrigerators and air-conditioners by approved destruction facilities at the time of maintenance and disposal.

58. In **Norway** there are requirements for proper recovery of equipment as stipulated in the European Union's F-gas regulation (EC) No. 842/2006.

59. **Switzerland** has specific take-back requirements for solvents.

60. Under the **United States** Clean Air Act, any equipment used to recover or recycle HFC-134a from motor vehicle air-conditioners must meet government standards and be tested by an approved testing laboratory (Underwriters Laboratories or Intertek).

61. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Montenegro and Sweden, as summarized in the following paragraphs.

62. **Montenegro** regulates the handling of HFCs and other F-gases and products and equipment containing them as it pertains to their collection, use and permanent disposal at end of life.

63. **Sweden** requires producers and suppliers of HFCs for refrigeration and heat pump systems to accept recovered bulk HFCs for further recycling, reclamation or destruction.

3. Training and certification

64. Training and certification relate to programmes and activities intended to ensure that HFCs and HFC-based equipment are handled properly throughout their life-cycles so that emissions are minimized. A short description of such undertakings is provided below.

65. In **Australia**, a refrigerant handling license must be held by any person who handles a fluorocarbon refrigerant, including decanting, manufacturing, installing, servicing or decommissioning refrigeration and air-conditioning equipment. A refrigerant trading authorization must be held by any individual or business acquiring, possessing or disposing of fluorocarbon refrigerant. An extinguishing agent handling license must be held by any person who handles a fluorocarbon extinguishing agent, including decanting, manufacturing, installing, servicing or decommissioning fire protection equipment. An extinguishing agent trading authorization must be held by any individual or business acquiring, possessing or disposing of any fluorocarbon extinguishing agent. These licensing systems set minimum skill standards for people operating in these sectors and require licensed technicians and businesses to adhere to Australian standards and codes of practice. These controls ensure a high standard of professionalism in the refrigeration and air-conditioning and fire suppression sectors and contribute significantly to reduced emissions of ozone-depleting substances and SGGs. The integrated approach of this system ensures consistency for industry in the use of both ozone-depleting substances and SGGs.

66. **Canada** has published the Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, which outlines best practices for minimizing emissions of all ozone-depleting substance and HFC refrigerants when operating and

servicing equipment. The Code of Practice is currently being revised to incorporate new technologies and best practices for reducing emissions.

67. The previous **European Union** regulation on certain F-gases ((EC) No. 842/2006) required member States to establish certification and training programmes for personnel involved in leakage inspections and the recovery, recycling, reclamation and destruction of fluorinated gases. The programmes had to comply with the minimum requirements and conditions laid down by the European Commission. The current F-gas regulation ((EU) No. 517/2014) includes requirements for training and certification for persons installing, servicing, maintaining, repairing or decommissioning equipment; equipment leak checks; and recovery of F-gases. The certification programmes and training provided must cover applicable regulations and technical standards, emissions prevention, recovery of F-gases, safe handling of equipment and information on relevant technologies for replacing or reducing the use of F- gases and their safe handling.

68. **Japan** requires that only registered collectors perform the recovery of CFCs, HCFCs and HFCs from commercial refrigerators and air-conditioners at the time of maintenance and disposal. Disposal must be effected by approved destruction facilities.

69. Under the **Netherlands** STEK certification programme from 1992, companies and personnel installing, maintaining and servicing refrigeration and air-conditioning equipment with a charge size of 3 kg or more, both for mobile and stationary equipment, were required to be trained and certified in best practices for minimizing emissions.

70. In Norway the requirements for certification of personnel and companies are in line with those of the European Union's F-gas regulations.

71. The **Republic of Moldova** has developed the first set of documentation for a new certification system for refrigeration technicians and reporting system for the servicing sector that would be in harmony with the current European Union F-gas regulations. Discussion of the draft documentation for the certification system was facilitated through the organization of a national workshop. In addition, a requirement for logbooks for equipment containing 3 kg or more of refrigerants was introduced.

72. Under the **United States** Clean Air Act requirements for motor vehicle air-conditioners, technician training and certification programmes across the country provide training on the servicing and repair of motor vehicle air-conditioners and similar appliances, refrigerant containment, refrigerant handling equipment, refrigerant purity, the environmental consequences of refrigerant release, including the adverse effects on the stratospheric ozone layer, and anticipated future technology developments in the motor vehicle air-conditioning sector. Training and certification requirements apply to all handlers of HFCs and HFC-based equipment, including persons involved in the maintenance, repair and decommissioning of HFC-containing products. Proper training and certification requirements for service technicians are intended to ensure that HFCs and HFC equipment are properly handled in order to minimize emissions during all stages of equipment life.

73. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Italy, Montenegro and the United Kingdom, as summarized in the following paragraphs.

74. In **Italy**, Presidential Decree no. 43/2012 established the National Register of Certified Persons and Companies, requiring all persons and companies working with HFCs to obtain certification and to have their names inscribed in the Register. The Register is publicly available and provides a list of certified persons and companies carrying out leakage checking, recovery of gas and installation, maintenance or servicing of equipment containing HFCs (and other fluorinated GHGs), including stationary refrigeration, air-conditioning and heat pump equipment, stationary fire protection systems and fire extinguishers, as well as persons recovering certain HFCs or other fluorinated GHGs from high-voltage switchgear, solvent-containing equipment and air-conditioning systems in motor vehicles.

75. **Montenegro** requires that the recovery of HFCs and other F-gases be undertaken only by persons licensed to maintain, repair and decommission products containing those substances. These service technicians are required to have a university degree, to have completed a mechanical or technical engineering programme during secondary school and to be trained in the proper handling and servicing of refrigeration and air-conditioning equipment.

76. The **United Kingdom**'s Fluorinated Greenhouse Gas Regulations 2009 set out the legal obligations for companies and the qualification requirements for personnel working in HFC-containing

stationary refrigeration (and other nominated industry sectors) covered by the European Union's F-Gas regulation. The regulations are effectively identical to the European Union's F-Gas regulations, in addition to which they cover certain issues specific to the United Kingdom such as approved training courses.

4. Recordkeeping and reporting

77. Recordkeeping and reporting requirements can take many forms, including requirements for keeping equipment-maintenance logbooks, holding licenses for certain activities and maintaining records of import, export and production data. A summary of the reported information is presented below.

78. In **Australia**, importers of scheduled substances, including HFCs, are required to report quarterly on their imports.

79. The previous **European Union** regulation on certain F-gases ((EC) No. 842/2006) required both reporting and recordkeeping. The owners of refrigeration, air-conditioning and heat-pump equipment and fire protection systems containing 3 kilograms or more of F-gas were required to maintain records indicating the quantity and type of gas. The new F-gas regulation includes requirements to maintain records for each piece of covered equipment on the quantity and type of F-gases installed; the quantity of F-gases added during installation, maintenance or servicing or due to leakage; whether the installed F-gases have been recycled or reclaimed, including the name and address of the recycling or reclamation facility and, where applicable, the certificate number; the quantity of F-gases recovered; the identity of the person or entity that installed, serviced, maintained and where applicable repaired or decommissioned the equipment, including, where applicable, the number of its certificate; the dates and results of required checks; and, if equipment is decommissioned, the measures taken to recover and dispose of the F-gases**.**

80. Regulation (EC) No. 842/2006 also required anyone annually producing, importing or exporting more than one tonne of any of F-gas to report the amount produced, imported or exported, the applications in which they would be used and the expected emissions and amounts recycled, reclaimed or destroyed. It also required the owners of refrigeration, air-conditioning and heat-pump and fire protection equipment containing 3 kilograms or more of F-gas to maintain records indicating the quantity and type of gas used in the equipment. The new F-gas regulation requires the maintenance of records for each piece of covered equipment. It also requires each producer, importer and exporter that produces, imports or exports one metric tonne or 100 tonnes of CO_2 equivalent or more, each person that destroys 1 metric tonne or 1,000 tonnes of CO_2 equivalent or more, and each person that uses 1,000 tonnes of CO_2 equivalent or more of covered gases as feedstock during the preceding calendar year to report specific data on each of those substances for that calendar year. The regulation also requires reporting from each importer of equipment that places on the market pre-charged equipment containing HFCs that have not been placed on the market prior to the charging of the equipment. Finally, the regulation requires each person that reports placing on the market 10,000 tonnes of CO_2 equivalent or more of HFCs during the preceding calendar year to ensure that the accuracy of their reported data is verified by an independent auditor.

81. In **Japan**, beginning 1 April 2015, users will be required to keep records of maintenance of HFC-containing equipment so that maintenance personnel and others can refer to them as necessary.

82. Under the STEK certification programme of the **Netherlands**, operators were required to ensure that a logbook was kept with installed equipment to allow maintenance personnel to identify structural problems with equipment and to know how much ozone-depleting substances or HFCs had been installed in the equipment. Installation, maintenance and servicing companies were required to maintain “refrigerant balances” to raise awareness of the refrigerants used by their companies.

83. In **Norway**, there are requirements for reporting imports, exports and production of F-gases in line with the European Union’s F-gas regulations.

84. The Netherlands generates estimates of HFC emissions based on the Intergovernmental Panel on Climate Change guidelines on national greenhouse gas inventories, which it reports in accordance with the provisions of the Framework Convention on Climate Change and its Kyoto Protocol. The party performs data collection to verify these emissions estimates. For the refrigeration and air-conditioning and foams sectors, emissions are derived from statistical data on installed capacity, leakage rates and amounts of HFCs sold for use in the Netherlands. Industrial process emissions (by-product emissions and emissions from handling and re-packaging) are monitored and reported in the Netherlands’ annual environmental report. Solvent uses of HFCs are very limited. Data on imports, exports and the placing on the market of HCFCs and HFCs to be used as refrigerants, solvents and blowing agents, inter alia, is collected and reported annually. A multi-year step-wise approach is used

to verify emissions estimates for the refrigeration and air-conditioning sector, which involves collecting representative samples of data on installed capacity and leaks registered in logbooks. The outcome of these studies is used to prioritize policy interventions, based on the impact of emissions on a sectoral basis, taking into account installed HCFC capacity that still needs to be converted and trends in the choice of alternatives.

85. In the **Republic of Moldova** logbooks for equipment containing 3 kg or more of refrigerants have been elaborated for introduction (see also para. 67).

86. **Switzerland** requires mandatory reporting on the commissioning and decommissioning of stationary systems containing more than 3 kg of ozone-depleting substances or SSA-based refrigerants. It also requires maintenance of logbooks for those systems and mandatory reporting on quantities of all imported SSA.

87. In the **United States**, both the federal requirements for motor vehicle air-conditioning and the California Regulation for Small Containers of Automotive Refrigerant require reporting and recordkeeping to ensure that entities are implementing all aspects of the regulations.

88. Under the United States Greenhouse Gas Reporting Programme, all suppliers of HFCs that reach a certain emissions threshold are required to report their supply activities using an online tool. The purpose of this programme is to allow USEPA to better understand the sources of HFCs and other greenhouse gases and to help inform future policy, business and regulatory decisions. Aggregated HFC emissions data are also available to the public. In 2011, 54 facilities reported a total of seven million metric tonnes of CO2-equivalent in HFC emissions.

89. The United States requires all servicers of motor vehicle air-conditioners to report information indicating that they have approved HFC recovery and recycling equipment and to maintain on-site records of the name and address of the reclaimers to which they send recovered HFC refrigerant. The USEPA uses the information reported to ensure that properly certified technicians are handling motor vehicle air-conditioning systems and that HFCs used in motor vehicle air-conditioners are being recycled.

90. The State of California requires the recycling of HFCs used in motor vehicle air-conditioners. To facilitate monitoring of the policy, manufacturers, distributors, retailers and recyclers must report sales data and the number of returned containers as part of their deposit programmes, as well as the amount of refrigerant recycled annually. In addition, each manufacturer must submit an application to the California Air Resources Board for the certification of products for sale. The programme began with a target recycle rate across all small automotive refrigerant containers of 90 per cent, which increased to 95 per cent on 1 January 2012.

91. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Belize, Egypt, Montenegro, New Zealand and Yemen, as summarized below.

92. **Belize** requires reporting on HFC imports and exports. Since October 2000, **Egypt** has been monitoring imports of controlled substances and products, including HFCs. The customs authority must obtain a letter from the Egyptian Environmental Affairs Agency before clearing any imported shipment including HFCs and other refrigerants through customs. When the importer applies for this letter from the Environmental Affairs Agency, the imported HFCs are registered in a database. Consequently, imports of HFCs and other refrigerants are monitored and registered. Starting from January 2011, the General Organization for Export and Import Control is authorized to inspect and analyse imports of controlled substances on behalf of the Environmental Affairs Agency.

93. In **Montenegro**, anyone who imports and places on the market HFCs and other F-gases is required to keep records of and report annually on such imports and their end-users, including amounts imported, amounts placed on the domestic market and their eventual purposes, existing stocks and other relevant details, exports, amounts exported and amounts of recovered alternative substances exported for reclamation. In addition, the owners and users of stationary refrigeration and air-conditioning and fire protection equipment containing 3 kg or more of HFCs or other F-gases must notify the environmental protection agency in writing within 15 days of putting such substances to use.

94. In **New Zealand**, persons who manufacture or import HFCs in bulk are required to report to the Government. In addition, all importers and manufacturers of HFCs operating as of 1 January 2013 are required to participate in New Zealand's emissions trading system; exporters and destroyers of HFCs may participate voluntarily.

95. **Yemen**'s ozone regulations require importers to report on annual HFC imports.

5. Labelling

96. Placing labels on products and equipment containing HFCs is important in raising awareness about the exact type and amount of the substance they contain and in ensuring proper handling. Information provided by parties on this issue is summarized below.

97. The previous **European Union** regulation ((EC) No. 842/2006) on certain F-gases required that certain types of product and equipment containing F-gases be clearly and indelibly labelled, with a statement of the type and quantity of gas they contained. The requirement covered refrigeration and air-conditioning products and equipment (other than those fitted to vehicles), heat pumps, fire protection systems, switchgear and containers. The labelling might include environmental information such as global warming potential, as well as pictograms applicable to the equipment and the products. The new regulation ((EU) No. 517/2014) includes extensive similar labelling and product and equipment information requirements. It will also include from 1 January 2017 a requirement that labels include the quantity of F-gas, expressed in weight and in CO_2 equivalents, contained in the product or equipment, or the quantity of F-gases for which the equipment is designed, and the GWP of those gases.

98. **Norway** requires the labelling of HFC products and equipment through its implementation of the European Union's F-gas regulations.

99. The **United States** reports that in California small containers containing HFCs as refrigerants for motor vehicle air-conditioners must be labelled so that end-users know that it is illegal to destroy or discard the contents of the container. This requirement is expected to stimulate a move away from HFC-134a to more sustainable options that are not subject to such stringent requirements.

100. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Belize, Montenegro and Yemen, as summarized below.

101. **Belize** has labelling requirements. **Montenegro** requires the labelling of products, including cylinders containing HFCs and other F-gases. Labels must include the chemical formula of the substance contained in the product, its amount expressed in kilograms and a note indicating that the product contains fluorinated gas governed by the Kyoto Protocol. **Yemen's** ozone regulations include labelling requirements for HFC importers.

III. Economic incentives

102. The term economic incentives refers to negative incentives, such as taxes and fees, positive incentives, such as refunds and subsidies, and other financial mechanisms, such as emissions trading systems and compliance credits. The aim of economic incentives is to discourage the choice of HFCs and other high-GWP substances. Sometimes a negative incentive is matched with a positive incentive, which may further contribute to discouraging HFC use. The various incentives reported by parties are outlined in the following sections.

A. Negative economic incentives

103. Denmark, Norway, Poland, Slovenia and Spain reported employing taxes and fees, as summarized below.

104. In **Denmark** a tax on greenhouse gas was introduced in 2001 and a ban on certain applications was introduced in 2002. The main principle was that a tax of 100 Danish kroner (approximately 13 euros) per tonne of CO_2 equivalent was imposed on imported HFCs, PFCs and sulfur hexafluoride. The tax was increased in January 2011 to 150 Danish kroner (approximately 20 euros). Converting from CO_2 equivalence to weight, the tax amounts to 195 Danish kroner (approximately 26 euros) per kg of the most frequently used F-gas refrigerant, HFC-134a. The system is implemented by taxing all bulk gases and imported products. The tax is administered by the Danish Customs and Tax Administration, a branch of the Danish Ministry of Taxation. Information from the market indicates that it has increased awareness among equipment owners and operators, including with regard to alternatives such as hydrocarbons, CO_2 and ammonia, and has resulted in improved housekeeping of reused gas. Initial troubles were solved through cooperation between the industry and Government. The tax has led to a decline in the consumption of F-gases, and the import of bulk HFCs has almost been halved from around 700 tonnes per year in 2001 and 2002 to around 360 tonnes in 2009. There is a delay in the impact of the system for emissions of F-gases as most of the consumed bulk material is used to fill refrigeration systems with certain annual leakage rates. From 2008 to 2009, however, emissions of F-gases declined from 895,000 tonnes CO_2 equivalent to 848,000 tonnes.

105. **Norway** imposes a tax on the production and import of HFCs and PFCs, calculated on the quantity of gas and its GWP. The tax is 229 Norwegian kroner (approximately 29 euros) per tonne CO_2 equivalent. Emissions of HFCs in Norway were 0.95 metric tonnes CO_2 equivalent in 2011, amounting to about 1.8 per cent of the total emissions of greenhouse gases. Emissions in 1990 were insignificant, but they increased considerably in the mid-1990s, when HFCs were introduced as substitutes for ozone-depleting substances. Refrigeration and air-conditioning contribute by far the largest part of HFC emissions. A trend of exponential growth was slowed after the tax on HFCs and PFCs was introduced in 2003. HFC-134a, HFC-125 and HFC-143a are the most important gases. After the introduction of the tax in 2003, the growth rate of imports of HFCs and PFCs was halved. Taxes based on GWP result in high penalties for the most potent gases, which further encourages the adoption of low-GWP alternatives. The tax was increased to 300 Norwegian kroner beginning 1 January 2014.

106. In **Poland**, fees are collected by the Government and deposited to a fund for managing F-gases, both through the maintenance of reporting databases and other F-gas emission reduction projects. The fees are levied on CFCs, HCFCs and HFCs, amounting to approximately 44 euros per kg., 12 euros per kg. and 7 euros per kg., respectively. **Slovenia** reported that it had introduced a tax on fluorinated gases in 2013 under the 1853rd Decree on environmental tax on air pollution caused by emissions of carbon dioxide.[22]

107. In **Spain,** the Council of Ministries has approved a tax (Law 16/2013 of 29 October 2013, Establishing Certain Measures on Environmental Taxation and Taking other Tax and Financial Measures) to be levied on the consumption of F-gases with a GWP above 150, including HFCs. The tax is calculated based on the GWP of the F-gases or their mixtures by applying a factor of 0.020 to the GWP of each F-gas, up to a maximum of 100 euros per kg. The tax will be phased in over three years, with one third of the calculated amount due imposed in 2014, two thirds in 2015 and the full tax in 2016 and beyond. F-gases in hermetically sealed systems and pre-charged equipment with up to 3kg of HFCs would be exempt from the proposed tax. The tax will not apply to the first refrigerant charge of new equipment.

108. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to Burkina Faso, China, France, Montenegro, New Zealand and the former Yugoslav Republic of Macedonia, as summarized below.

109. In **Burkina Faso** imported HFCs are taxed according to the context in which imports take place. Taxes may be waived if there are multilateral or bilateral agreements in place between Burkina Faso and other countries. The full taxation amount for HFCs is between 27 and 30 per cent of the total value of the imported goods.

110. In 2005 **China** passed a proposal to impose a 65 per cent tax on HFC-23 Clean Development Mechanism projects. Proposed uses for the revenue from such projects identified by the Government include funding Clean Development Mechanism administration and approval activities, climate change related capacity-building activities and other sustainable development activities.

111. **France** has been considering introducing a tax on HFCs with a GWP greater than 150. Four different options are being considered, with taxes ranging from 2.5 euros to 60 euros per metric tonne of CO_2 equivalent, depending on the GWP. The Ministry for the Environment estimates that the French HFC tax could lead to reductions in HFCs of up to 50 per cent by 2020 and 80 per cent by 2030.

112. **Montenegro**'s law on administrative taxes includes an administrative fee of 5 euros for each application for the import or export of HFCs.

113. In **New Zealand**, from 1 July 2013, importers of HFCs and PFCs in goods and motor vehicles will face a carbon price through a levy. The levy on motor vehicles will apply when a motor vehicle is first registered for on-road use in New Zealand (when a car receives its license plates) and will be administered by the New Zealand Transport Agency. The levy on all other goods that contain HFCs and PFCs will apply at import and will be administered by the New Zealand Customs Service. The Climate Change (General Exemptions) Amendment Order 2010 sets out exemptions from the levy, as well as from New Zealand's emissions trading scheme. These regulations are currently being amended to remove exemptions for HFC-245fa and HFC-365mfc.

[22] Official Gazette of the Government of the Republic of Slovenia, no. 47/2013 of 31 May 2013.

114. **The Former Yugoslav Republic of Macedonia** imposes a fee for the import of used refrigerators, freezers and air-conditioners, with the amount of the fee depending on the volume and capacity of the equipment.

B. Refunds and other positive incentives

115. Belgium, Canada, Denmark, the European Union, Japan, Mozambique, Norway, Spain and California offer some type of refund, subsidy or other positive incentive.

116. The Flanders region of **Belgium** created the so-called Ecology Premium, which is a form of subsidy provided to companies that choose relatively environmentally friendly and energy-efficient alternatives. Replacement of HFCs with natural refrigerants, for both existing and new systems, is eligible for the premium. The premium is calculated as a percentage of the extra cost of the non-HFC alternative.

117. In **Canada**, the Passenger Automobile and Light Truck Greenhouse Gas Emissions Regulations, described in section II. B. 2. (a) above, are designed to provide a form of incentive. By allowing them to subtract the allowance for reducing air-conditioning refrigerant leakage from their carbon-related exhaust emissions, the regulations reward companies who use air-conditioning technologies that reduce leakage. This encourages the use of refrigerants with a lower GWP than the current standard refrigerant, HFC-134a. As a result, some Canadian-based manufacturers are already using low-GWP HFO-1234yf in new vehicle models.

118. **Denmark** has a refund scheme to go along with its tax, and it reports that information from the market indicates that the tax/refund scheme has led to more awareness by equipment owners and operators. Denmark also supports alternatives. When its regulation was approved, it decided to support research and development projects to promote the quick development of alternative technologies. The Danish Environmental Protection Agency conducted the scheme, and a number of projects in the refrigeration area were supported financially with approximately 20 million Danish kroner.

119. In the **European Union**, the regulation on the ecodesign of air-conditioners ((EU) No. 206/2012) proposes a bonus of lower required energy efficiency to steer the market towards the use of refrigerants with reduced harmful impact on the environment. The bonus is intended as an incentive for the design of appliances that use low-GWP refrigerants. The European Union waste electrical and electronic equipment directive (Directive 2012/19/EU) permits the final holders of waste electrical and electronic equipment containing ozone-depleting substances and F-gases to return such waste to collection facilities free of charge.

120. The Ministry of the Environment of **Japan** provides a subsidy to private companies to cover part of the cost when they purchase commercial and industrial refrigeration equipment that is highly energy efficient and based on natural refrigerants. The subsidy is one half of the introduction cost for refrigerated warehouses, one third of the introduction cost for retail store showcases and one third of the difference in costs as compared to equipment using a fluorocarbon for all other installations.

121. **Mozambique**'s regulation on ozone-depleting substances provides for tax exemptions to importers of alternatives to HCFCs, thus encouraging the import of alternatives such as hydrocarbons and ammonia for use in the refrigeration and air-conditioning sector.

122. **Norway** supplemented its 2003 HFC tax scheme (see paragraph 98 above) with a refund scheme in 2004 that prescribes a similar refund upon destruction. Together the tax and refund schemes serve as a proxy tax on emissions of HFCs. This combination has resulted in better maintenance and improved procedures during the recovery of refrigerant from old equipment. It also gives a strong incentive for choosing HFCs with the lowest possible GWP and has resulted in increased use of natural cooling agents and alternative processes such as indirect systems in new installations.

123. **Spain**'s new F-gas tax provides for a tax refund or tax deduction from amounts due in subsequent periods for taxpayers that deliver F-gases to certified facilities for destruction, recycling or reclamation.

124. On a smaller scale, the **United States** reports that California employs a deposit system for containers for HFCs used in motor vehicle air-conditioners. In January 2009, the California Air Resources Board approved a regulation to reduce emissions associated with the use of small containers, i.e., those holding less than 2 pounds of HFC-134a. A recycling programme for used containers was established, under which a $10 deposit on each container of HFC-134a is charged at the time of purchase. The deposit is refunded by the Air Resources Board upon return of the container within 90 days of purchase.

125. In addition to the information summarized above, which was reported by the parties directly to the Secretariat, the USEPA study included information on **Colombia,** in particular about the party's efforts to provide technical support in the form of consultation, advice on technology replacements, assessing alternatives with zero ozone-depletion potential and prioritizing low-GWP options. For this purpose, special credit lines and tax benefits are being designed to promote environmentally friendly ozone-depleting substance substitutes and energy-efficient consumption.

C. Emissions trading systems and compliance credits

126. So-called "cap-and-trade" emissions trading schemes are used to reduce greenhouse gas emissions. According to USEPA, approximately 30 countries have launched national emissions trading schemes, while a number of other countries are piloting them with plans to launch them in the coming years. Typically, the schemes include a government-controlled emissions cap on the amount of greenhouse gases or other pollutants that may be emitted during a specified period. Polluting firms receive allocations in the form of emission permits, which can be transferred or traded to other firms. Firms that reduce their emissions below their allocated amounts may sell their surplus permits to other firms. The method for initially distributing allowances and a few other design components (e.g., compliance periods, verification, offsets, banking and borrowing allowances) may vary from system to system. An example is the well-known European Union emission allowance trading scheme,[23] created under Directive 2003/87/EC[24] in 2005, covering all 28 European Union member States and three non-members (Iceland, Lichtenstein and Norway). The system is described in document UNEP/OzL.Pro.WG.1/34/INF/4/Add.1.

127. The **United States** introduced a credit trading system that provides an incentive for the reduction of HFC emissions from vehicle air-conditioning systems. Under the 2012–2016 Model Years Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy (CAFE) Standards, manufacturers are required to meet the first-ever national greenhouse gas emissions standards. The standards apply to new passenger cars, light-duty trucks and medium-duty passenger vehicles, covering model years 2012–2016. The standards require covered vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in model year 2016, equivalent to 35.5 miles per gallon (mpg) if the automotive industry were to meet this CO_2 level solely through fuel economy improvements. The programme includes a flexible component by which manufacturers can meet the emissions standards through a system of averaging, banking and trading credits. One option for earning credits to comply with the new standards is by reducing HFC emissions from vehicle air-conditioning systems. For example, manufacturers may earn credits by applying technologies that reduce HFC refrigerant losses (i.e., through system leakage), improve system efficiency or adopt systems that use HFC-alternatives or HFCs with lower GWP than HFC-134a.

128. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, information pertinent to the present section was provided in the study by USEPA with regard to China and New Zealand, as summarized below.

129. In its pledge to cut its emissions by 17 per cent per unit of economic output by 2015 compared to 2010 levels, **China** has approved seven pilot trading programmes in five cities and two provinces, which were scheduled to commence trading in June 2013. The pilot trading programmes will collectively be the second largest in the world and are expected to cover approximately 700 million metric tonnes CO_2 equivalent by 2014. The rules and design of those pilot schemes differ, to better inform the Chinese national programme that is expected to launch in 2015. While initially only CO_2 will be covered, the scope of the programmes may broaden to include HFCs.

130. The **New Zealand** emissions trading system is designed to reduce emissions and meet commitments under the Framework Convention on Climate Change and the Kyoto Protocol. According to New Zealand's emissions trading system review panel, regardless of what happens in the future with regard to the Kyoto Protocol there will be other compelling drivers that reduce emissions in New Zealand. Regulations on reporting HFC emissions under the country's emissions trading system came into force on 1 January 2011. The regulations require importers of HFCs and other SGGs, in bulk or in products, and manufacturers of HFCs and other SGGs, to give the Government one emissions unit for each metric tonne of CO_2 equivalent that they import each year. The emissions trading system also covers exports and destruction of these gases, awarding credits based on the amount of emissions "removed" through these activities. Eligibility to receive emissions credits began

[23] http://ec.europa.eu/clima/policies/ets/documentation_en.htm.

[24] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003L0087.

on 1 January 2013. Firms that have a surplus of emissions units – achieved by reducing emissions – may sell them through a carbon market broker. In addition, firms may earn emissions units through government-approved emissions removal activities.

IV. HCFC phase-out management plans

131. Six parties reported on their efforts to replace HCFCs in specific sectors with low-GWP HFCs or non-HFCs in the context of their HCFC phase-out management plans (HPMPs) under the Multilateral Fund for the Implementation of the Montreal Protocol.

132. **Bangladesh** reported that subsequent to the approval of its HPMP (stage I) at the by the Multilateral Fund Executive Committee at its sixty-fifth meeting, in 2011, it adopted low-GWP, zero-ozone-depletion-potential and energy efficient technology in the foams sector. Bangladesh is now implementing a conversion project for the manufacture of insulation foam for domestic refrigerators. For the project, Bangladesh chose cyclopentane as a foam blowing agent as an alternative to HCFC-141b. Bangladesh is trying to select, especially in the refrigeration and air-conditioning sector, an alternative that has low GWP and ozone-depletion potential and is energy efficient. It is studying low-GWP technology adopted by developed countries such as Japan and countries in Europe and elsewhere. The country's national ozone unit is in the process of standardizing hydrocarbons and fluorocarbons with low flammability for use in the refrigeration and air-conditioning sector. Bangladesh will address energy efficiency issues in the process of preparing stage II of its HPMP in 2015.

133. **Mexico** selected zero-GWP or low-GWP alternatives for the projects under stages I and II of its HPMP whenever it was viable to do so. They included hydrocarbons, perchloroethylene, methylformate, methylal, nitrogen and water. As a new initiative, an HFO blowing agent will be introduced in large amounts in several domestic refrigerator factories. Better refrigeration service practices and various non-investment projects will lead to the phase-out of 1,367 metric tonnes of HCFC-22 without phasing in any greenhouse gases. HFCs will be used only for certain critical applications (e.g., flammable aerosols). The phase-out of HCFCs in aerosols, however, will include 375 metric tonnes of HFC-152a, which has a relatively low GWP (124, calculated for 100 years) and has a positive impact on air pollution, particularly with regard to tropospheric ozone precursors, which is important for air quality management in Mexico. During stages I and II, 6,531 metric tonnes of HCFC-141b and 2,303 metric tonnes of HCFC-22 will be replaced by the various alternatives, many of which have zero or low GWP.

134. The **Republic of Moldova**, consistent with decision XIX/6 and in order to reduce failure rates and energy consumption, wishes to conform its refrigeration and air-conditioning industry to European Union standards. In the light of this, it sees the phase-out of HCFCs as an opportunity to introduce environmentally friendly, energy-efficient solutions. The use of natural refrigerants such as hydrocarbons, CO_2 and ammonia in the sector is currently limited, but the party feels that the possibilities for their implementation are significant. Despite often somewhat higher initial and maintenance costs, it sees the main obstacles as the limited number of qualified and competent service staff and companies and a lack of awareness among end users. It believes that these constraints should be addressed through training and awareness-raising projects during stage II of its HPMP.

135. The party identifies a number of specific actions that could be incorporated into stage II of its HPMP and would enhance its climate change benefits, including the involvement of authorities responsible for climate change policy as key institutional stakeholders; continued adoption of European Union standards for the certification of technicians; and the introduction of refrigerant management regulations that would in the future extend to HFCs. The party feels that new demonstration projects at the national and regional levels are needed to demonstrate the advantages and disadvantages of alternatives to HCFCs.

136. The Government of **Swaziland** is making efforts to use alternatives that do not have known climate impacts. For example, with the assistance of the Multilateral Fund, Swaziland has succeeded in replacing HCFC-22 in the refrigerator manufacturing sector with HC-290 and HC-600a. It has also obtained funding for replacing HCFC-141b pre-polyol with cyclopentane in the foam production sector, which will drastically reduce HCFC imports.

137. The Government of **Zimbabwe** is implementing its HPMP in the manufacturing and servicing sectors, aiming for the use of alternative refrigerants with zero ODP and zero or very low GWP. In the manufacturing sector, the party is phasing out HCFC-141b in pre-blended polyols in foam insulation by using hydrocarbon blowing agents and water-based insulation systems. In the servicing sector, the party is replacing HCFC-22 refrigerants with propane (R90) and isobutane (R-600a) which are hydrocarbons. Other natural refrigerants such as CO_2 and ammonia are being promoted, taking into

consideration health and safety considerations. Dry nitrogen is being promoted as a flushing agent in place of HCFC-141b.

138. **El Salvador** provided detailed information on its phase-out of HCFCs and noted that its stage I HPMP had been approved by the Executive Committee at its sixty-fifth meeting, which would result in a 35 per cent reduction in consumption over the period 2011–2020, putting into effect compliance measures for the reduction of HCFC imports, the retrofitting of equipment with HCFC-free alternatives and capacity-building in best practices over the period from 2013 to 2015.

139. In addition to the information summarized above, which was reported by the parties directly to the Secretariat, the USEPA indicates that as of January 2014, 294 HPMP and HCFC phase-out project preparation activities had been approved for 144 eligible parties. Through their HPMPs, 41 of 43 Article 5 parties with rigid polyurethane foam producers have opted to convert from HCFCs to non-HFC alternatives. Six countries have also included projects aimed at adapting locally-owned systems houses for manufacturing non-HCFC 141b pre-blended polyol systems and, through them, converting large numbers of downstream foam enterprises. These projects have been aimed largely at avoiding HFCs in the foams and refrigeration and air-conditioning sectors. In addition, the Multilateral Fund has sponsored a number of low-GWP pilot programmes. Several valuable case studies and successful demonstration projects have been undertaken in Article 5 parties, a promising signal that a direct transition to climate-friendly technologies and substances is currently possible in some sectors and may be feasible soon in many more. One example is found in **Bosnia and Herzegovina,** where a national expert group is preparing new ozone legislation, which will enter in force in 2014, to implement the party's HCFC HPMP. The HPMP will probably include a transition to low-GWP alternatives. There are also preparations to establish an import and export licensing system in Bosnia and Herzegovina for HFCs and HFC blends. Another task under way, in cooperation with the Montreal Protocol Branch of the Programme Development and Technical Cooperation Division of the United Nations Industrial Development Organization, is the establishment of a national code of good practice for the refrigeration sector. **Maldives** is also making efforts to promote non-HFC based equipment.

V. Other initiatives

A. Energy efficiency initiatives

140. Several countries provided information on energy efficiency, which is reflected to a considerable extent in the summaries above. Some noteworthy examples of information are summarized in the present section.

141. **Bangladesh** developed in September 2013 an action plan for energy efficiency and conservation, with a vision of improving primary and secondary energy savings for sustainable energy security, which includes low carbon emissions. The action plan features a matrix listing actions, responsible organizations and timelines for completing the actions.

142. In **Canada**, the federal Government's CanmetEnergy, a division of Natural Resources Canada, has collaborated with stakeholders in the refrigeration industry and other levels of government to facilitate the adoption of energy-efficient, low-GWP technologies. In particular, Canmet played a key role in the introduction of CO_2 as a refrigerant and as a heat transfer fluid in secondary loop refrigeration systems. This included contributing to modifying the relevant Canadian standard to allow the use of CO_2 in commercial refrigeration and providing technical support for the first demonstration project validating the use of CO_2 in a supermarket refrigeration system.

143. In addition, CanmetEnergy has developed and promoted the CoolSolution® approach to optimizing energy management and reducing greenhouse gas emissions from buildings requiring significant refrigeration. The approach combines advanced practices and technologies in the design and operation of refrigeration systems and has been used in demonstration projects, which show that it is possible to reduce energy consumption by almost 50 per cent in arenas and curling rinks and by 25 per cent in supermarkets, as well as to reduce synthetic refrigerant leaks by 75 per cent.

144. CanmetEnergy provided technical and scientific expertise for the development, implementation and evaluation of the Quebec Refrigeration Optimization Programme (OPTER). Between 2008 and 2013, this programme supported the adoption of measures to improve energy efficiency, together with the conversion and replacement of refrigeration equipment to low-GWP technologies, in over 130 installations (mainly in supermarkets, warehouses, arenas and the food industry). It is estimated that the programme led to the annual elimination of over 64,000 tonnes CO_2 equivalent in total emissions from refrigeration equipment. Direct reductions of refrigerant emissions

result mainly from the adoption of CO_2 and ammonia refrigerants, as well as the use of secondary loop and cascade technologies.

145. These Canadian efforts have led to the development and adoption of CO_2–based refrigeration technology in a number of supermarkets and increased the use of ammonia in ice rinks, two sub-sectors that are responsible for a significant proportion of HCFC and HFC consumption in Canada. Among supermarkets that have converted to low-GWP refrigerants in recent years, one chain in particular has made a commitment to alternative CO_2 refrigeration technology and is reportedly very pleased with the results. The installation of trans-critical CO_2 refrigerant systems with heat reclamation in this chain's stores improves environmental performance and yields economic benefits. Compared to a traditional HCFC refrigerant system, it is estimated, trans-critical CO_2 systems reduce overall CO_2 emissions by 62 per cent, or 862 tonnes of CO_2-equivalent per year per store, and reduce energy consumption by 15–18 per cent.

146. As mentioned in section III. B. above, in the context of the **European Union** regulation on the ecodesign of air-conditioners and comfort fans ((EU) No. 206/2012), bonuses are offered for lower required energy efficiency to steer the market towards the use of refrigerants with reduced harmful impact on the environment.

147. **Japan** reported a number of subsidies for introducing energy-saving equipment with natural refrigerants. Energy efficiency is also an important component in the new policy measures to be introduced by the party related to the promotion of low-GWP or non-HFC alternatives and the phase-down of HFCs (see para. 23).

148. The **Netherlands** has provided limited funding for feasibility studies and demonstration projects for HFC-free and energy effective alternatives in all relevant sectors and special studies on barriers to the use of HFC-free and low-GWP alternatives. To date, the focus has been on supermarkets, data centres, the food processing industry, hospitals, schools and refrigerated transport, including shipping.

149. The **United States** reports that establishing a new goal for energy efficiency standards and advancing vehicle fuel efficiency and greenhouse gas emission standards are two of the key actions under the President's Climate Action Plan. In particular, the plan sets a new goal to establish efficiency standards for appliances and federal buildings. In its biennial Climate Action Report 2014,[25] the United States reports on several energy-efficiency-related initiatives such as the State Energy Programme, providing funding to enable state energy offices to reduce market barriers to the cost-effective adoption of energy efficient technology.

150. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, the USEPA study indicates that some countries such as Mexico and Thailand have introduced efforts to promote energy efficiency and low-GWP or no-GWP refrigerants through their nationally appropriate mitigation action (NAMA) strategies under the Bali Action Plan adopted by the Conference of the Parties to the Framework Convention on Climate Change at its thirteenth session.

151. **Mexico** is in the preliminary stages of coordinating and implementing a domestic refrigerator NAMA strategy aimed at controlling HFC emissions by recovering and destroying refrigerants during the decommissioning of old refrigerators. Within five years the strategy aims to phase-out HFC-based technology and replace 100 per cent of Mexico's domestic market with HFC-alternative-based, energy-efficient technology. The strategy has the potential to mitigate approximately two million tonnes of CO_2 equivalent, 63 per cent of which could be attributed to replacing HFC-134a.

152. The **Thailand** Greenhouse Gas Management Organization, with support from GIZ PROKLIMA, has successfully completed a baseline inventory of HFCs in Thailand. Thailand and Germany are currently working to develop a NAMA strategy focusing on the refrigeration and air-conditioning and foam blowing sectors.

B. Voluntary agreements

153. In addition to mandatory measures aimed at addressing HFCs, a growing number of voluntary initiatives targeting the reduction of HFC consumption and emissions are under way involving Governments, the private sector or both.

154. In **Canada,** the federal Government efforts with regard to energy efficiency described above are voluntary efforts by government bodies and commercial stakeholders. The **European Union**

[25] http://www.state.gov/documents/organization/219038.pdf.

voluntary European Eco-Management and Audit System includes HFC emissions and its Green Public Procurement programme provides extra points for medical freezers with refrigerants of GWP less than 10.

155. The **Netherlands** has used voluntary agreements with industry to reduce HFC process emissions since the early 1990s and is working to promote voluntary agreements (Green Deals) with end users.

156. The **United States** reports that partnership programmes are important in uniting stakeholders within an industry and providing a forum for collaboration on HFC emissions reductions. Examples include:

(a) The GreenChill Advanced Refrigeration Partnership, established in 2007 with the objective of reducing refrigerant emissions from supermarkets. In 2011 the Partnership resulted in the avoidance of 4.12 million metric tonnes of CO_2 equivalent;

(b) The Responsible Appliance Disposal (RAD) programme, established in 2006 and aimed at reducing emissions of refrigerant and foam-blowing agents from end-of-life appliances. In 2011, RAD Partners collected and processed 890,473 appliances, from which they reclaimed or destroyed 146,722 metric tonnes CO_2 equivalent of HFC-134a and 2,850 metric tonnes CO_2 equivalent of HFC-245fa.

157. USEPA reports that several existing multilateral environmental agreements and international organizations are being used to publicize the concerns associated with growing HFC emissions. At the international level, groups such as the Climate and Clean Air Coalition to Reduce Short-lived Climate Pollutants are forming to raise awareness, support emissions reduction activities, promote best practices and improve scientific understanding of the impact of short-lived climate pollutants.

C. Industry initiatives

158. The **United States** reports that several corporations are integrating HFC initiatives into their sustainability strategies. Companies are not only recognizing the potential climate impact of HFCs but are responding proactively to anticipated future HFC regulation and increasing customer concern. Many corporate initiatives on low-GWP alternative substances and technologies, voluntary reduction targets and research projects have emerged. The beverage industry in particular is an example of private enterprise driving the transition to non-HFC refrigerant alternatives.

159. In addition to initiatives by individual companies, there are industry programmes that bring together corporations from around the world. The primary purpose of these initiatives is the mobilization of businesses through knowledge sharing and support. Two examples of these industry initiatives are Refrigerants, Naturally! and the Consumer Goods Forum.

D. Adoption of alternative technologies

160. Two parties, **Canada** and **Denmark**, provided information on the development and implementation of new technologies based on climate-friendly alternatives.

161. **Canada** reported on the development of new technologies as part of their efforts to promote low-GWP, energy efficient alternatives in the refrigeration and air-conditioning sector, as discussed in section V. A. above.

162. In **Denmark**, the Environmental Protection Agency has established the "Knowledge Centre for HFC-free Refrigeration". The Centre offers free consultancy services for the refrigeration industry and installers to help them implement alternative technology. Denmark also provided some examples of the extent of alternative refrigeration technology in the country:

(a) Supermarkets: A number of centralized refrigeration systems using CO_2 refrigerant have been built and tested in supermarkets in Denmark. Trans-critical systems have proved to be effective, economical and energy-efficient, and hundreds have been installed. There is also considerable export of CO_2-based equipment to installers in other countries;

(b) Commercial plug-in cabinets: Commercial refrigerated cabinets using hydrocarbon refrigerants have been developed and tested over the past decade. Components, including compressors, are more energy-efficient than similar HFC-based equipment. Today, hydrocarbon technology is standard in bottle coolers, food service cabinets, ice cream freezers and other equipment. Several international food and beverage companies use commercial refrigerators with hydrocarbon technology;

(c) Industrial refrigeration systems: In Denmark, ammonia has been used for industrial refrigeration for more than 100 years. Today, only very small industrial refrigeration systems are built with F-gases, using less than 10 kilograms of HFCs;

(d) Chillers for air-conditioning and the process industry: Ammonia-based chillers have been produced in Denmark for at least 30 years. In addition, two manufacturers have developed and marketed hydrocarbon-based chillers during the past decade. The ammonia chillers are very efficient and competitive for high-cooling capacity, and the hydrocarbon chillers are very efficient and competitive in the medium to small range. Only very small F-gas-based chillers, using less than 10 kilograms of HFCs, are in use in Denmark. Very recently, the Danish Technical Institute, together with Japanese companies, developed a commercially competitive chiller with water as the refrigerant, which is expected to be introduced to the market in about three years. The chiller is at least as energy efficient as the very best HFC chillers and 10 to 20 per cent better than typical existing installations. The technology will be demonstrated shortly;

(e) Domestic refrigerators and freezers: Introduction of the Danish regulation on F-gases very quickly resulted in almost 100 per cent penetration of hydrocarbon technology for both imported and domestically produced home refrigerators and freezers.

163. In addition to the information summarized above, which was reported directly to the Secretariat by the parties to whom it relates, the USEPA study contains numerous examples of zero-GWP and low-GWP alternatives that are being developed, tested and implemented worldwide, as summarized in the following paragraphs.

164. **India** is a host country for three projects that have qualified for certified emission reduction credits under the Kyoto Protocol's Clean Development Mechanism with the aim of avoiding HFC emissions in polyurethane foam manufacturing.

165. In **Mauritius**, chillers in two government buildings were converted from CFCs to ammonia as part of a pilot project to demonstrate the feasibility of ammonia-based chillers in tropical climates and promote non-HFC technology in the region. The ammonia chillers are more energy-efficient than the existing CFC units and have significantly lower leakage rates. As a result of the success of the pilot project, ammonia chillers are now being considered for air-conditioning systems in Mauritius and other tropical countries.

166. The United Nations Development Programme undertook pilot projects on the use of methyl formate and methylal for polyurethane foam production in **Brazil** in 2009 and 2010, respectively. The projects assessed the feasibility of replacing HCFC-141b based on health, safety and environmental considerations, processability, system composition, physical properties and indicative conversion costs. The methyl formate project found that the mechanical properties of methyl-formate-based spray foams were superior to those of HFC-134a-based foams and were equal to or better than those of HCFC-141b-based foams, while their thermal efficiency needed further optimization. The results of the methylal pilot project indicated that methylal was a feasible substitute for HCFC-141b for a wide variety of polyurethane foam products. In 2008, the company involved in the pilot project reported using 180 tons of HCFC-141b and 60 tons of methylene chloride. The company intends to pursue the use of methylal as a sole or auxiliary blowing agent in the future. Based on rough calculations, this could result in annual reductions of up to 131,000 million metric tonnes CO_2-eq

E. Awareness-raising activities

167. As indicated in sections III. A and III. B. above, market data indicate that in **Denmark** the Government's tax and refund scheme has increased awareness among owners and operators of equipment. The scheme has also increased attention to alternative substances (hydrocarbons, CO_2, ammonia and other substances) and techniques and has resulted in improved handling of reused gas. As mentioned in section V. D. above, the party's "Knowledge Centre for HFC-free Refrigeration" offers free consultancy services for the refrigeration industry and installers on the use of alternative technology.

168. In **Ireland** the environmental protection agency has prepared a number of guidance documents[26] to explain the regulations on ozone-depleting substances and F-gases to contractors and end users of refrigeration and air-conditioning equipment.

[26] http://www.epa.ie/pubs/advice/air/ods/summaryguidanceforcompliancewithodsandfgasregulations.html#.VCLiU3DD_IV.

169. The **Netherlands** requires the inclusion of emissions limits in environmental permits. This raises the awareness of competent authorities, who gradually lower the emissions thresholds in environmental permits based on the outcomes of the measures adopted under voluntary agreements, which further encourages additional measures and prevents backsliding.

170. **Norway** reports a series of initiatives under the auspices of the Nordic Council of Ministers. Beginning in January 2015 it will not be permissible to recharge HCFC-based refrigeration systems in the Nordic countries and the European Union. This could cause problems for owners and users of HCFC refrigeration systems caught unaware. The Danish Technological Institute has therefore developed a report to guide the refrigeration industry and owners and end users. The report provides examples of how to change to more environmental friendly refrigeration systems with natural refrigerants and is available online.[27]

171. The **Nordic Ozone Group** under the Nordic Council of Ministers has also financed the production of 31 information sheets providing a broad range of technical information. The aim is to promote greater use of natural refrigerants by providing practical technical information about the possibilities and limitations of natural refrigerants to system designers and installers. The information sheets (in English) are available online.[28]

172. The **United States** reports that California regulations include a requirement for an education programme that is designed to emphasize best practices in vehicle recharging. Manufacturers and producers of HFCs and HCFC-based motor vehicle air-conditioners must distribute brochures to consumers through retailers and must maintain educational websites. The aim of the brochures and websites is to inform consumers about the importance of reducing HFC emissions and use through enhanced leak repair and recovery. The content must include information on how to identify and repair system leaks, best practices, environmental hazards, potential risks and the state's recycling programme for used HFC containers.

VI. Health and safety issues raised by parties

173. A number of parties express concern about health and safety issues related to low-GWP and zero-GWP alternatives to HCFCs.

174. **Congo**, for example, expressed concern about the flammability and toxicity of alternative refrigerants, including R290, R600a, R717 (ammonia) and R744 (carbon dioxide). The party recommends that UNEP and UNIDO conduct subregional and national training workshops in the safe use of R717, R290, CARE 30 and carbon dioxide as alternatives to HCFCs and HFCs. The **Republic of Moldova** said that moving to low-GWP refrigerants would require extensive education of industry and adaptation of national legislation. The main obstacles for the party are a limited number of qualified and competent service personnel and companies and a lack of awareness among end users. It recommends that the issue be address through education, training and awareness-raising schemes in the context of stage II of HPMPs.

175. **Mozambique** expressed concern with regard to the safety and health risks posed by counterfeit chemicals in the refrigeration and air-conditioning sector and as a step towards addressing the problem proposed that all parties be required to report annually on the quantities of refrigerants they produced and exported, including information on destination countries.

176. Some parties report that there are ongoing efforts to develop the information, standards and capabilities needed to address health and safety concerns.

177. The **Netherlands** reports, for example, that it has developed a training curriculum for handling natural refrigerants in installation, maintenance and servicing. Safety issues are also addressed in the natural refrigeration information sheets developed by the **Nordic Council of Ministers** (as discussed in section V. E. above). Under the **United States**' SNAP programme, substitutes used in industrial, commercial and military applications, including but not limited to refrigeration and air-conditioning, foam blowing, cleaning solvents, fire suppression and aerosols, will continue to be evaluated with regard to risks to human health and the environment. **Zimbabwe** reports that training programmes on the safe use of hydrocarbon refrigerants and conversion from HCFC-based technology to hydrocarbon-based technology are currently under way.

[27] http://norden.diva-portal.org/smash/get/diva2:715186/FULLTEXT01.pdf.

[28] http://www.norden.org/en/publications/publikationer/2014-908.

178. The **United States** also reports that under the global voluntary industry initiative Refrigerants, Naturally! member companies commit to sharing progress, technology and technical information about alternative refrigeration with other members and to working with non-governmental organizations and others to promote safe alternatives and provide a platform for communication among actors in the refrigeration technology supply chain, users, Governments and civil society. Refrigerants, Naturally! member companies are working towards replacing fluorinated gases such as HFCs in commercial and industrial point-of-sale cooling applications with non-fluorinated alternatives such as CO_2 and hydrocarbons.

VII. Conclusion

179. The information reported by parties and summarized in the present document reveals that there currently exists a wide range of regulatory schemes, incentives and initiatives promoting a transition from ozone-depleting substances to more climate-friendly alternatives. For ease of reference, a matrix showing the various existing and planned measures discussed above is set out in the annex to the present document.

Annex

Summary matrix on reported policy measures to promote a transition from ozone-depleting substances to climate-friendly alternatives

Party	*Legislation, regulations and other mandatory measures*						*Economic incentives*			*HCFC phase-out management plans*	*Other initiatives*				
	Control of HFC production and consumption	*Control of HFC emissions*		*Training and certification*	*Record keeping and reporting*	*Labelling*	*Negative economic incentives*	*Refunds and positive incentives*	*Emission trading compliance credits*		*Energy efficiency*	*Voluntary agreements*	*Industry initiatives*	*Alternative technologies*	*Awareness raising*
		During life cycle	*End of life cycle*												
	Information reported directly to the Secretariat														
Australia	√	√	√	√	√										
Bangladesh										√	√				
Belgium[a]								√							
Canada	√	√	√	√				√			√	√		√	
Denmark[a]	√						√	√						√	√
El Salvador										√					
European Union	√	√	√	√	√	√		√	√		√	√			
Ireland[a]															√
Japan	√	√	√	√	√			√			√				
Mexico										√	√[b]				
Mozambique								√							
Netherlands[a]		√		√	√						√	√			√
Norway		√	√	√	√	√	√	√			√				√
Poland[a]							√								
Republic of Moldova				√						√					
Slovenia[a]							√								
Spain[a]							√	√							
Swaziland										√					
Switzerland	√	√	√		√										
Togo		√													

Party	Legislation, regulations and other mandatory measures						Economic incentives			HCFC phase-out management plans	Other initiatives				
	Control of HFC production and consumption	Control of HFC emissions		Training and certification	Record keeping and reporting	Labelling	Negative economic incentives	Refunds and positive incentives	Emission trading compliance credits		Energy efficiency	Voluntary agreements	Industry initiatives	Alternative technologies	Awareness raising
		During life cycle	End of life cycle												
United States	√	√	√	√	√	√		√	√		√	√	√		√
Zimbabwe										√					
	Information contained in the study by the USEPA														
Austria	√														
Belize	√				√	√									
Bosnia and Herzegovina										√					
Brazil														√	
Burkina Faso							√								
China							√		√						
Colombia	√	√						√							
Croatia[a]	√														
Egypt					√										
France[a]							√								
Germany[a]		√													
India														√	
Italy[a]				√											
Maldives										√					
Mauritius														√	
Montenegro	√	√	√	√	√	√	√								
New Zealand		√			√		√	√	√						
Serbia	√														
Sweden[a]	√		√								√				
Thailand										√					
The former Yugoslav Republic of Macedonia	√						√								
Turkey	√														

Party	Legislation, regulations and other mandatory measures						Economic incentives			HCFC phase-out management plans	Other initiatives				
	Control of HFC production and consumption	Control of HFC emissions		Training and certification	Record keeping and reporting	Labelling	Negative economic incentives	Refunds and positive incentives	Emission trading compliance credits		Energy efficiency	Voluntary agreements	Industry initiatives	Alternative technologies	Awareness raising
		During life cycle	End of life cycle												
United Kingdom[a]				√											
Yemen		√				√									

[a] European Union member State implementing European Union legislation.
[b] According to the USEPA study.