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**Report of the individual review of the annual submission of  
Switzerland submitted in 2013\***

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\* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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## I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Switzerland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 2 to 7 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Anna Romanovskaya (Russian Federation) and Ms. Daniela Romano (Italy); energy – Mr. Ole-Kenneth Nielsen (Denmark), Mr. Aidan Kennedy (Ireland) and Mr. Kaleem Mir (Pakistan); industrial processes and solvent and other product use – Ms. Sina Wartmann (Germany) and Mr. Dusan Vacha (Czech Republic); agriculture – Mr. Etienne Mathias (France) and Mr. James Douglas MacDonald (Canada); land use, land-use change and forestry (LULUCF) – Ms. Inês Mourão (Portugal) and Mr. Raehyun Kim (Republic of Korea); and waste – Ms. Medea Inashvili (Georgia) and Mr. Takefumi Oda (Japan). Ms. Inashvili and Mr. Nielsen were the lead reviewers. The review was coordinated by Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Switzerland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Switzerland was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Switzerland was carbon dioxide (CO<sub>2</sub>), accounting for 83.7 per cent of total GHG emissions<sup>1</sup> expressed in CO<sub>2</sub> equivalent (CO<sub>2</sub> eq), followed by methane (CH<sub>4</sub>) (7.4 per cent) and nitrous oxide (N<sub>2</sub>O) (6.1 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 2.7 per cent of the total GHG emissions in the country. The energy sector accounted for 79.7 per cent of total GHG emissions, followed by the agriculture sector (11.2 per cent), the industrial processes sector (7.5 per cent), the waste sector (1.2 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 50,149.22 Gg CO<sub>2</sub> eq and decreased by 5.4 per cent between the base year<sup>2</sup> and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

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<sup>1</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> equivalent excluding LULUCF and emissions from sector other (sector 7 in the CRF tables), unless otherwise specified.

<sup>2</sup> “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

5. Additional background data on recalculations by Switzerland in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

Table 1

**Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year<sup>a</sup> to 2011**

		<i>Gg CO<sub>2</sub>eq</i>								<i>Change (%)</i>	
		<i>Greenhouse gas</i>	<i>Base year<sup>a</sup></i>	<i>1990</i>	<i>1995</i>	<i>2000</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>Base year–2011</i>
Annex A sources		CO <sub>2</sub>	44 661.01	44 661.01	43 673.22	44 020.16	45 563.74	44 349.29	46 028.17	41 965.61	-6.0
		CH <sub>4</sub>	4 675.30	4 675.30	4 268.61	3 915.72	3 844.48	3 788.02	3 767.11	3 733.80	-20.1
		N <sub>2</sub> O	3 457.19	3 457.19	3 322.61	3 182.94	3 109.12	3 065.86	3 134.39	3 074.62	-11.1
		HFCs	0.02	0.02	180.75	498.54	1 025.58	1 065.13	1 119.04	1 171.45	5 199 794.6
		PFCs	100.21	100.21	14.69	69.09	39.06	35.17	36.71	39.36	-60.7
		SF <sub>6</sub>	143.62	143.62	97.73	157.79	244.72	187.12	154.77	164.37	14.4
KP-LULUCF	Article 3.3 <sup>b</sup>	CO <sub>2</sub>					77.42	207.07	202.07	200.66	
		CH <sub>4</sub>					NO	NO	NO	NO	
		N <sub>2</sub> O					0.01	0.01	0.01	0.01	
	Article 3.4 <sup>c</sup>	CO <sub>2</sub>	NA				-1 375.44	-2 179.05	-2 884.32	-2 938.16	NA
		CH <sub>4</sub>	NA				0.39	0.31	0.19	1.24	NA
		N <sub>2</sub> O	NA				0.23	0.18	0.11	0.72	NA

*Abbreviations:* KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

<sup>c</sup> Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2  
Greenhouse gas emissions by sector and activity, base year<sup>a</sup> to 2011

	Sector	Base year <sup>a</sup>	Gg CO <sub>2</sub> eq							Change (%)	
			1990	1995	2000	2008	2009	2010	2011	Base year–2011	
Annex A	Energy	42 083.22	42 083.22	41 876.84	42 403.64	43 683.76	42 557.80	44 050.12	39 989.66	-5.0	
	Industrial processes	3 380.95	3 380.95	2 654.90	2 938.03	3 667.03	3 531.45	3 748.40	3 769.60	11.5	
	Solvent and other product use	470.11	470.11	353.76	258.55	201.04	200.10	197.56	199.43	-57.6	
	Agriculture	6 092.10	6 092.10	5 819.29	5 495.70	5 648.46	5 593.50	5 647.19	5 603.54	-8.0	
	Waste	1 010.98	1 010.98	852.45	748.31	626.41	607.74	596.92	586.99	-41.9	
	LULUCF	NA	-3 155.63	-3 891.36	-1 227.06	-1 615.91	-2 093.14	-2 404.73	-3 410.94	NA	
	<b>Total (with LULUCF)</b>	<b>NA</b>	<b>49 881.73</b>	<b>47 665.88</b>	<b>50 617.17</b>	<b>52 210.78</b>	<b>50 397.45</b>	<b>51 835.46</b>	<b>46 738.27</b>	<b>NA</b>	
	<b>Total (without LULUCF)</b>	<b>53 037.36</b>	<b>53 037.36</b>	<b>51 557.24</b>	<b>51 844.23</b>	<b>53 826.70</b>	<b>52 490.59</b>	<b>54 240.18</b>	<b>50 149.22</b>	<b>-5.4</b>	
	Other <sup>b</sup>	12.13	12.13	13.08	14.05	14.18	14.20	14.21	14.22	17.2	
KP-LULUCF	Article 3.3 <sup>c</sup>	Afforestation and reforestation					-23.02	-25.15	-30.35	-32.56	
		Deforestation					100.45	232.23	232.43	233.22	
		<b>Total (3.3)</b>					<b>77.43</b>	<b>207.07</b>	<b>202.07</b>	<b>200.66</b>	
	Article 3.4 <sup>d</sup>	Forest management					-1 374.82	-2 178.56	-2 884.02	-2 936.20	
		Cropland management	NA				NA	NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		<b>Total (3.4)</b>	<b>NA</b>				<b>-1 374.82</b>	<b>-2 178.56</b>	<b>-2 884.02</b>	<b>-2 936.20</b>	<b>NA</b>

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

<sup>a</sup> "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

<sup>c</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

<sup>d</sup> Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

## II. Technical assessment of the annual submission

### A. Overview

#### 1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Switzerland also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013.

7. Switzerland officially submitted revised emission estimates on 20 September 2013 in response to the list of potential problems and further questions raised by the ERT (see paras. 32, 34, 36, 39, 41 and 49 below).

8. The full list of materials used during the review is provided in annex II to this report.

#### 2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Switzerland. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3

#### The expert review team's overall assessment of the annual submission

<i>General findings and recommendations</i>		
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources <sup>a</sup>	Complete	Mandatory: None Non-mandatory: None
Land use, land-use change and forestry <sup>a</sup>	Complete	Mandatory: None Non-mandatory: "NE" is reported for: CH <sub>4</sub> and N <sub>2</sub> O emissions from drainage of forest soils and wetlands; CH <sub>4</sub> , N <sub>2</sub> O, NO <sub>x</sub> , CO and NMVOC emissions from wetlands, settlements and other lands; and GHG emissions from harvested wood products. See para. 67 below
KP-LULUCF	Complete	
The ERT's findings on recalculations	Generally consistent	See paras. 23 and 24 below

and time-series consistency in the 2013 annual submission

The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission Sufficient

The ERT's findings on the transparency of the 2013 annual submission Generally sufficient The transparency can be enhanced further in the LULUCF and waste sectors (see paras. 68 and 77 and 81 below, respectively)

*Abbreviations:* Annex A sources = sources included in Annex A to the Kyoto Protocol, CO = carbon monoxide, ERT = expert review team, GHG = greenhouse gas, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NE = not estimated, NMVOC = non-methane volatile organic compound, NO<sub>x</sub> = nitrogen oxides, QA/QC = quality assurance/quality control.

<sup>a</sup> The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

### 3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

#### Inventory planning

10. The NIR and additional information provided by Switzerland during the review described the national system for the preparation of the inventory. The Federal Office for the Environment (FOEN), Climate Division, has overall responsibility for the national inventory. The National Inventory System Supervisory Board was established by decision of FOEN, which oversees the GHG inventory and the registry. The GHG inventory working group encompasses technical experts (employed in FOEN or mandated on a regular basis) involved in the inventory preparation process and personnel representing institutions that are significant suppliers of data (e.g. the Swiss Federal Office of Energy (SFOE), the Federal Office of Civil Aviation, the Federal Office for Agriculture (FOAG), the Swiss Federal Statistical Office (SFSO), the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), the Swiss Petroleum Association and industry associations). The Environmental Protection Act<sup>3</sup> encompasses a clause containing the obligation to disclose information required to implement the Environmental Protection Act. In addition to the national registry staff and GHG inventory core group, the GHG working group includes a quality assurance/quality control (QA/QC) officer, who is responsible for the enforcement of the defined quality standards of the national inventory. The LULUCF and KP-LULUCF inventory is prepared by the Forest Division of FOEN with the participation of external experts from Meteotest and Sigmaphan. Activity data (AD) for the LULUCF and KP-LULUCF inventory is provided by SFSO, WSL and the Agroscope Reckenholz-Tänikon Research Station. The ERT concluded that each participant in the national system has a defined responsibility, which is in accordance with the requirements of decision 19/CMP.1.

<sup>3</sup> Federal Act of 7 October 1983 on the Protection of the Environment (Umweltschutzgesetz, USG), SR 814.01.



11. The inventory planning (and management) process is an annual cycle managed by FOEN. The process includes: meetings of the supervisory board, the GHG inventory core group and the GHG working group to coordinate the preparation of the annual submission and to decide on improvements in modelling of emissions and removals; QA/QC activities, including checklists and reviews; key category and uncertainty analyses; official consideration, approval and submission; and publication and archiving. Separate meetings of the LULUCF group and agriculture group are also conducted during the annual cycle.

12. In its 2013 annual submission, Switzerland has reported changes in the legal arrangements in the national system (see para. 97 below).

#### Inventory preparation

13. Table 4 contains the ERT's assessment of Switzerland's inventory preparation process.

Table 4

#### **Assessment of inventory preparation by Switzerland**

<i>General findings and recommendations</i>		
<i>Key category analysis</i>		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> (hereinafter referred to as the IPCC good practice guidance) and the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i> (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	Switzerland reported key category analyses, both level and trend, including and excluding LULUCF
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	The ERT encourages Switzerland to highlight in the NIR the planned improvements that relate to key categories
Are there any major changes to the key category analysis in the latest submission?	No	

*Assessment of uncertainty analysis*

Approach followed?	Both tier 1 and tier 2	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The 2011 and 2012 review reports encouraged Switzerland to perform a quantitative uncertainty assessment for all categories. In response to a question raised by the ERT during the review, Switzerland indicated that efforts to provide reliable quantitative estimates for all non-key categories are disproportionately high if at all possible. The ERT appreciates the analysis made by Switzerland on that issue
Quantitative uncertainty (including LULUCF)	Tier 1: Level = 4.8% Trend = 2.0%	
Quantitative uncertainty (excluding LULUCF)	Tier 1: Level = 3.6% Trend = 1.9%	

*Abbreviations:* ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

14. The ERT did not find that changes in uncertainty estimates between submissions were fully explained in the NIR. The ERT encourages Switzerland to describe the reasons for differences in uncertainty estimates between NIR submissions.

Inventory management

15. Switzerland has a centralized archiving system, which includes the archiving of disaggregated AD and emission factors (EFs), and corresponding documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification, uncertainty analyses and planned inventory improvements. The archive is kept under the supervision of the Climate Division of FOEN. The QA/QC officer ensures archiving of all relevant data and documentation in the FOEN Internal Document Management System. Additionally, inventory data as well as background information on AD and EFs are archived by the national inventory compiler in EMIS (Swiss national air pollution database), which is also located in FOEN. During the review, the ERT was provided with the requested additional archived information as described in the sectoral part of this report.

#### 4. Follow-up to previous reviews

16. The previous review report was published after the due date for the 2013 annual submission. Hence recommendations made in the previous review reports could not be fully considered by the 2013 annual submission.

17. The ERT has identified major improvements in the 2013 annual submission that have been implemented largely in response to recommendations made in previous review reports. Improvements include:

(a) Enhanced documentation of recalculations (e.g. in the energy sector for manufacturing industries and construction);

(b) Updated uncertainties for changed AD and EFs (e.g. in the LULUCF sector for land areas); improved transparency in the description of country-specific methods (e.g. in the waste sector for waste incineration plants, solid waste disposal sites and wastewater handling);

(c) Improved transparency (description and justification) of country-specific EFs (e.g. in the energy sector for refining and storage of oil and flaring of oil; in the industrial processes sector for blasting operations in cement production; and in the agriculture sector for  $\text{Frac}_{\text{GASM}}$  and  $\text{Frac}_{\text{GASF}}$ );

(d) Revised AD (e.g. in the industrial processes sector for  $\text{N}_2\text{O}$  use in anaesthesia, in the agriculture sector for the area under cultivation of histosols and in the waste sector for wastewater handling);

(e) Change in methodology (e.g. in the agriculture sector for gross energy intake of mules and asses, and in the LULUCF sector for calculation of gains and losses on a single tree basis and for carbon stock changes in mineral soils);

(f) Improved completeness of the inventory (e.g. in the energy sector for  $\text{N}_2\text{O}$  emissions from road transportation (gaseous fuels));

(g) Reallocation of emissions in the waste sector for recovered  $\text{CH}_4$  from solid waste disposal sites, which is now reported in the energy sector under public electricity and heat production;

(h) In relation to KP-LULUCF, improvements in the 2013 annual submission include improved completeness (emissions from organic soils due to drainage, and carbon stocks of litter under forest management), improved transparency in relation to methodologies used, descriptions of land classification, explanations of the permanence issue with respect to deforestation, and verifiable information showing that missing carbon pools of litter and dead wood under afforestation and reforestation are not a source.

18. The ERT noted that a recommendation made in the previous review report (see para. 64 of document FCCC/ARR/2012/CHE) on the improvement in the method used to estimate  $\text{CO}_2$  emissions from brick and tile production is planned for the 2014 annual submission. Additionally, Switzerland will also include in the 2014 annual submission the results of an investigation on animal manure processed in digesters. The ERT recommends that Switzerland carries out these improvements.

19. The ERT found that the following recommendations made in the 2011 and 2012 review reports were not addressed by Switzerland in the 2013 annual submission:

(a) Disaggregate the reporting of fuels included under the category other (for feedstocks and non-energy use of fuels) in CRF table 1.A(d) (see para. 28 below);

- (b) Include emissions from natural gas production for 1990 to 1994 (see para. 42 below);
- (c) Provide the detailed documentation for using a methane conversion factor (MCF) of 10.0 per cent for slurry (see para. 60 below);
- (d) Separate the reporting of CH<sub>4</sub> emissions into subcategories under the category other (waste) in the NIR (see para. 81 below);
- (e) Improve the description of the link between the reporting of land converted to forest land under the Convention and the reporting of afforestation/reforestation activities under the Kyoto Protocol (see para. 83 below).

## 5. Areas for further improvement identified by the expert review team

20. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 9.

## B. Energy

### 1. Sector overview

21. The energy sector is the main sector in the GHG inventory of Switzerland. In 2011, emissions from the energy sector amounted to 39,989.66 CO<sub>2</sub> eq, or 79.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 5.0 per cent. The key drivers for the fall in emissions since 1990 are the decreased emissions from other sectors (in particular from residential) and manufacturing industries and construction. These decreases in emissions were partially offset by the increased emissions from road transportation, in particular from diesel road vehicles, and the increase in emissions from energy industries, which is mainly due to the increased combustion of waste for electricity generation. Within the sector, 40.5 per cent of emissions were from transport, followed by 35.1 per cent from other sectors, 13.5 per cent from manufacturing industries and construction and 10.0 per cent from energy industries. Fugitive emissions from fuels accounted for 0.6 per cent and other (energy) accounted for 0.3 per cent.

22. The ERT identified several errors in the NIR submission. For example, the N<sub>2</sub>O EF reported for military aviation was incorrectly listed as 23 kg per TJ, based on the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines); the actual N<sub>2</sub>O EF is far lower (2.33 kg per TJ). Another example was an error in CH<sub>4</sub> EFs listed in table 3-40 of the NIR, where some EFs had been incorrectly listed as 0 (zero). A further example was in table 3-42 of the NIR, where the consumption of liquid and gaseous fuels did not match the values in the CRF tables. Based on the experience of the review, the ERT recommends that Switzerland better adhere to the QC procedures as part of the implemented QC system in place in order to avoid these types of errors.

23. The ERT found that the connection between the energy balance data and the CRF data is not clear. As an example, the ERT analysed natural gas as reported in the energy balance and in the CRF tables. While the total amount matched, there was a different allocation of fuel consumption to the different subcategories. In response to a question raised by the ERT during the review, Switzerland explained that in the Swiss energy statistics the allocation of energy use to the different industrial and commercial end users was changed in 1999. In order to provide a consistent time series in the GHG inventory for the period since 1990, a model is used to allocate energy consumption to the different industrial sectors. Since the EFs for non-CO<sub>2</sub> gases can differ between sectors, it is

important to understand the background for the reallocation of fuel consumption data. The ERT recommends that Switzerland include more information on the reallocation of fuel consumption data in its annual submissions.

24. Switzerland references CO<sub>2</sub> EFs for gasoline, diesel, jet kerosene, gas oil and residual fuel oil to national studies where fuel samples have been analysed. Data from four studies undertaken in 1994, 1998, 2007 and 2011 are available. The EFs used in the inventory seem to be identical to the values from the 1998 study. The sample size of the different fuels is approximately the same (approximately 10) in all studies. In response to a question raised by the ERT during the review, Switzerland indicated that the CO<sub>2</sub> EFs and net calorific values (NCVs) used for the whole time series are taken from the 1998 study, and that the differences in measured values were insufficient to establish a time series. The ERT agrees with Switzerland that there is no statistically significant trend in the measurement data. The ERT notes that while the data in the two latest measurement reports show similar values to the 1998 study used in the inventory, there are, however, differences, most notably for gas oil and fuel oil. Switzerland informed the ERT that there is an ongoing study where the results are expected in mid-2014. The ERT considers that the accuracy of the EFs would be improved and hence the uncertainty decreased, if an average of all measurement data was used in the inventory, thereby increasing the sample size, for example, from 10 to 40. The ERT recommends that Switzerland use the results and outcomes of the aforementioned study to reassess the CO<sub>2</sub> EFs and NCVs from liquid fuels, and to report thereon in the 2015 annual submission.

## **2. Reference and sectoral approaches**

25. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraph 28 below.

Table 5  
**Review of reference and sectoral approaches**

		<i>Paragraph cross-references</i>
Difference between the reference approach and the sectoral approach	Energy consumption: 3.70 PJ, 0.7%  CO <sub>2</sub> emissions: 183.70 Gg CO <sub>2</sub> eq, 0.5%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	
Are differences with international statistics adequately explained?	Yes	
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	See para. 28 below

*Abbreviations:* CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”.

*Comparison of the reference approach with the sectoral approach and international statistics*

26. No problems were identified.

*International bunker fuels*

27. No problems were identified.

*Feedstocks and non-energy use of fuels*

28. The previous review report reiterated the recommendation that Switzerland disaggregate the reporting of fuels used for non-energy purposes. The ERT concluded that this recommendation had not been addressed by Switzerland in its 2013 annual submission. In response to a question raised by the ERT during the review, Switzerland informed the ERT that there are plans to reconsider the treatment of feedstocks and non-energy use of fuels for the 2015 annual submission. Furthermore, Switzerland informed the ERT that for the 2014 annual submission, naphtha and liquefied petroleum gas will be reported separately. The ERT welcomes the planned improvements, reiterates the recommendation made in previous review reports to disaggregate the reporting of fuels used for non-energy purposes in its annual submission and recommends that Switzerland implement the planned improvements in the 2014 and 2015 annual submissions.

**3. Key categories**

Stationary combustion: liquid fuels – CO<sub>2</sub>

29. The ERT found that the 2013 annual submission did not include a reference for the CO<sub>2</sub> EF for refinery gas that is used in petroleum refining. In response to a question raised

by the ERT during the review, Switzerland informed the ERT that the EF used (59.3 t/TJ) is derived by expert judgment, and that no regular measurements are made. In 2010, one refinery provided detailed information regarding the refinery gas composition over two successive years that confirmed the current EF. Considering that CO<sub>2</sub> emissions from petroleum refining is a key category, the ERT considers that the CO<sub>2</sub> EF should be better documented. The ERT recommends that Switzerland review, and if necessary update, the CO<sub>2</sub> EF for refinery gas and report thereon in the NIR of its next annual submission.

#### Stationary combustion: solid fuels – CO<sub>2</sub>

30. The previous review report recommends that Switzerland provide justification for the update of the CO<sub>2</sub> EF for coal, brown coal and petroleum coke. In response to a question raised by the ERT during the review, Switzerland provided this documentation. The cement industry covers a very large share of the consumption of these fuels, 83–92 per cent, and the revised EFs are based on measurements carried out by the Swiss cement industry. The ERT concluded that the EFs are in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). However, the ERT noted that in table 3-40 of the NIR, the old CO<sub>2</sub> EF for coal was still listed. In response to a question from the ERT on this, Switzerland acknowledged that the EF had erroneously been reverted to the old value. The ERT recommends that Switzerland correct this error in its next annual submission.

#### Stationary combustion: gaseous fuels – CO<sub>2</sub>

31. The ERT identified that the CO<sub>2</sub> EF for natural gas (55.0 t/TJ) is low when compared with those of neighbouring countries, and lower than the IPCC default contained in the Revised 1996 IPCC Guidelines (56.1 t/TJ). The CO<sub>2</sub> EF used for natural gas is referenced in the NIR to SFOE (2001). However, this merely contains the numerical value without any documentation on the data basis for the EFs. In response to a question raised by the ERT during the review, Switzerland indicated that the reference for the EF was the 1992 version of the *EMEP/CORINAIR Guidebook*. The ERT analysed the reference and did not find that the underlying documentation could support the use of the EF, considering its low value compared with the IPCC default and corresponding EFs used by neighbouring countries. The ERT concluded that the use of the current CO<sub>2</sub> EF results in an underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

32. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the ERT. Switzerland provided revised emission estimates using the default CO<sub>2</sub> EF for natural gas contained in the Revised 1996 IPCC Guidelines. The recalculation increased the CO<sub>2</sub> emissions from fuel combustion by 2.0 per cent in 2011 (122.60 Gg). The ERT concluded that Switzerland's estimate of CO<sub>2</sub> emissions from natural gas combustion has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

#### **4. Non-key categories**

##### Stationary combustion: biomass – CH<sub>4</sub>, N<sub>2</sub>O

33. The ERT noted that the N<sub>2</sub>O EF for waste incineration is reported as 5.5 kg/TJ for the fossil component and 5.8 kg/TJ for the biogenic component. In response to a question raised by the ERT during the review, Switzerland indicated that the EFs provided in the

NIR are based on two processes, municipal waste incineration and special waste incineration, with each having a different EF. However, Switzerland also informed the ERT that an error was found in the 2013 annual submission in that the N<sub>2</sub>O EF for the fossil and biogenic components for municipal waste incineration were reported as identical for 2009 onwards, and that this would be corrected in the next annual submission. Switzerland also confirmed that the error caused an underestimation of N<sub>2</sub>O emissions from the biogenic part of municipal waste. The ERT concluded that the error in N<sub>2</sub>O emissions from biogenic municipal waste incineration results in an underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

34. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the ERT. Switzerland provided revised emission estimates correcting the N<sub>2</sub>O EF for biogenic waste incineration. The recalculation increased the N<sub>2</sub>O emissions from public electricity and heat production by 3.0 per cent (1.26 Gg CO<sub>2</sub> eq) in 2011. The ERT concluded that Switzerland's estimate of N<sub>2</sub>O emissions from biogenic waste incineration has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

35. Table 3-8 of the NIR states that biogenic CO<sub>2</sub> emissions from charcoal production are not reported in the CRF tables. However, it was not clear to the ERT whether CH<sub>4</sub> emissions are reported for charcoal production. In response to a question raised by the ERT during the review, Switzerland informed the ERT that CH<sub>4</sub> emissions from charcoal production were not included in the inventory. The ERT also noted that charcoal production, as reported by Switzerland (0.11 Gg in 2011), is much lower compared with corresponding data from FAOSTAT, the database of the Food and Agriculture Organization of the United Nations (FAO) (5 Gg in 2011). The ERT concluded that the omission of CH<sub>4</sub> emissions from charcoal production results in an underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

36. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the ERT. Switzerland provided revised emission estimates using the charcoal production data as reported in the NIR combined with the default CH<sub>4</sub> EF from the Revised 1996 IPCC Guidelines. The recalculation increased the CH<sub>4</sub> emissions from other energy industries by 0.07 Gg CO<sub>2</sub> eq in 2011. The ERT concluded that Switzerland's estimate of CH<sub>4</sub> emissions from charcoal production has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

37. In response to the list of potential problems and further questions raised by the ERT, Switzerland also presented information showing that the data contained in FAOSTAT were not accurate. The ERT recommends that Switzerland communicate correct data for charcoal production to FAO.

38. The ERT did not find information in the NIR related to charcoal use. The ERT also noted that information on charcoal use is available from FAOSTAT. In response to a question raised by the ERT during the review, Switzerland informed the ERT that emissions from charcoal use are not estimated in the inventory. The ERT concluded that the omission of CH<sub>4</sub> and N<sub>2</sub>O emissions from charcoal use results in an underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

39. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the



ERT. Switzerland provided revised emission estimates using the charcoal use data (production + import – export) combined with the default CH<sub>4</sub> and N<sub>2</sub>O EFs (200 kg/TJ and 1kg/TJ, respectively) from the Revised 1996 IPCC Guidelines. The recalculation increased the CH<sub>4</sub> emissions from the category residential by 4.8 per cent (1.44 Gg CO<sub>2</sub> eq) and the N<sub>2</sub>O emissions by 1.3 per cent (0.11 Gg CO<sub>2</sub> eq) in 2011. The ERT concluded that Switzerland's estimate of CH<sub>4</sub> and N<sub>2</sub>O emissions from charcoal use has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

#### Oil and natural gas – CO<sub>2</sub> and CH<sub>4</sub>

40. The previous review report contained a strong recommendation urging Switzerland to include in its 2013 annual submission verifiable information that emissions from oil transport are not applicable under the conditions in Switzerland. Switzerland has not addressed this recommendation in the 2013 annual submission. In response to a question raised by the ERT during the review, Switzerland indicated that the emissions would be estimated in the 2014 annual submission. The ERT concluded that the omission of CO<sub>2</sub> and CH<sub>4</sub> emissions from oil transport results in a potential underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

41. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the ERT. Switzerland provided revised emission estimates using the amount of crude oil transported combined with CO<sub>2</sub> and CH<sub>4</sub> EFs from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The recalculation increased the CO<sub>2</sub> emissions from oil by 0.003 Gg and increased the CH<sub>4</sub> emissions from oil by 0.6 Gg CO<sub>2</sub> eq in 2011. The ERT concluded that Switzerland's estimate of CO<sub>2</sub> and CH<sub>4</sub> emissions from oil transport has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

42. The previous review report contained a recommendation urging Switzerland to estimate and report emissions from natural gas production from 1990 to 1994. This recommendation was not addressed by Switzerland in its 2013 annual submission. In response to a question raised by the ERT during the review, Switzerland provided preliminary estimates based on the gas production and default EFs from the 2006 IPCC Guidelines. The ERT reiterates the recommendation made in the previous review report that Switzerland estimate and report emissions of CO<sub>2</sub> and CH<sub>4</sub> from natural gas production for the period 1990–1994 in its next annual submission.

43. Based on the methodological description in the NIR, it was not clear to the ERT how emissions were calculated for natural gas transmission and distribution. Also, it was unclear how emissions from maintenance, accidents, regulating stations and end user losses are considered in the emissions calculation. In response to a question raised by the ERT during the review, Switzerland provided the ERT with documentation and information relating to the methodology used for estimating emissions from natural gas transmission and distribution. Switzerland also informed the ERT that a study is currently under way to assess gas losses of the Swiss gas industry. The study will address the evolution of the gas network and the network components, and the EFs will be reassessed. Results from this study are expected by the end of October 2013. The ERT recommends that Switzerland review, and if necessary update, the emissions from natural gas transmission and distribution and report thereon in the NIR in its next annual submission. The ERT further recommends that Switzerland provide in the NIR of its next annual submission improved

documentation and information on the methodology and information on the above-mentioned study and, if applicable, recalculate the time series.

44. The ERT found that the CO<sub>2</sub> and CH<sub>4</sub> EFs used in estimating emissions from oil systems and flaring are not presented in the NIR. The NIR states that the CH<sub>4</sub> and CO<sub>2</sub> EFs are based on data from the industry along with expert estimates. In response to a question raised by the ERT during the review, Switzerland provided the EFs used and corresponding references. The ERT notes that the references are from 1992 and 1994 and that the EFs may no longer be representative of current conditions in Switzerland. The ERT recommends that Switzerland expand the methodological description in the NIR in its next annual submission. Furthermore, the ERT encourages Switzerland, for example in cooperation with industry, to assess the EFs used and evaluate whether they are still representative of Swiss conditions, and report its findings in its next annual submission.

## C. Industrial processes and solvent and other product use

### 1. Sector overview

45. In 2011, emissions from the industrial processes sector amounted to 3,769.60 Gg CO<sub>2</sub> eq, or 7.5 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 199.43 Gg CO<sub>2</sub> eq, or 0.4 per cent of total GHG emissions. Since 1990, emissions have increased by 11.5 per cent in the industrial processes sector, and decreased by 57.6 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are related to economic development, leading to a decrease of emissions in the early 1990s as well as an upwards trend between 2008 and 2011 (except for 2009). The increase in emissions from fluorinated gases has slowed since the Ordinance on Chemical Risk Reduction<sup>4</sup> came into force in 2005. In the solvents and other product use sector there is a decreasing trend. The reduction of non-methane volatile organic compound (NMVOC) emissions is mainly attributed to the Ordinance on Air Pollution Control (of 16 December 1985) and the VOC tax<sup>5</sup> (2000). Direct CO<sub>2</sub> emissions resulting from post-combustion of NMVOCs to reduce NMVOC emissions in exhaust gases have increased. Within the industrial processes sector, 53.9 per cent of the emissions were from mineral products (with 50.5 per cent of this attributed to cement production), followed by 35.7 per cent from the consumption of halocarbons and SF<sub>6</sub>, 5.8 per cent from metal production and 4.6 per cent from chemical industry.

### 2. Key categories

#### Cement production – CO<sub>2</sub>

46. Switzerland includes emissions from clinker production as well as from the use of blasting agents under this category. A tier 2 approach from the IPCC good practice guidance is used to estimate emissions from calcination in clinker production, with use of a country-specific EF and clinker production data, which are both provided by industry. Emissions from the use of blasting agents are calculated based on a country-specific EF and cement production data, with both also provided by industry.

47. Factors of 600 kg CO<sub>2</sub> per tonne of blasting agent and 0.13 kg blasting agent/t cement are provided in the NIR. When combined, this equates to an EF of 78 g CO<sub>2</sub>/t cement. However, the NIR provides an EF of 96 g CO<sub>2</sub>/t cement, which indicates the factor

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<sup>4</sup> Ordinance no. 814.81 of 18 May 2005 on the Reduction of Risks relating to the Use of Certain Particularly Dangerous Substances, Preparations and Articles.

<sup>5</sup> Ordinance of 12 November 1997 on the Incentive Tax on Volatile Organic Compounds (OVOC).

of 0.16 kg blasting agent/t cement used in the calculation. In response to a question raised by the ERT during the review, Switzerland agreed that the factor of 0.16 kg blasting agent/t cement has been erroneously used in the calculation of the EF, and has subsequently led to an overestimation of emissions from blasting (0.44 Gg of CO<sub>2</sub> is reported instead of 0.36 Gg). Switzerland informed the ERT that the time series would be recalculated with use of the correct EF. The ERT recommends that Switzerland undertake this recalculation and report thereon in the NIR of its next annual submission.

#### Consumption of halocarbons and SE<sub>6</sub> – HFCs

48. Switzerland used a tier 2 approach from the IPCC good practice guidance to model and estimate emissions from the category refrigeration and air-conditioning equipment. AD for this model come from national statistics and industry, and country-specific EFs are provided by industry or through expert estimates. The NIR includes a statement that there was an error in the calculation file used to estimate emissions from air-conditioning equipment in buses that has resulted in an underestimation of emissions in this category. Switzerland has estimated emissions from buses in the period 2008–2011 to be 25–28 Gg CO<sub>2</sub> eq annually. The ERT found that this has led to a potential underestimation in the order of approximately 2 per cent for each year. Switzerland did not rectify this error as it was identified very late in the compilation process, but the NIR states that it will be amended for the 2014 annual submission. The ERT concluded that the error in emissions of tetrafluoroethane (HFC-134-a) from refrigeration and air-conditioning equipment results in a potential underestimation of emissions, and subsequently listed this issue in the list of potential problems and further questions raised by the ERT that was submitted to Switzerland on 7 September 2013.

49. In response to the list of potential problems and further questions raised by the ERT, Switzerland submitted revised emission estimates. This information was reviewed by the ERT. Switzerland provided revised emission estimates correcting the identified error. The recalculation increased the HFC emissions by 2.4 per cent (27.67 Gg CO<sub>2</sub> eq) in 2011. The ERT concluded that Switzerland's estimates of (HFC-134-a) emissions from refrigeration and air-conditioning equipment has been prepared in line with the IPCC good practice guidance. The ERT considered the potential problem to have been resolved.

### **3. Non-key categories**

#### Limestone and dolomite use – CO<sub>2</sub>

50. Switzerland reports CO<sub>2</sub> emissions from brick and tile production under this category. This estimate is based on the amount produced (i.e. tonnes of bricks and tiles), which is multiplied by a constant EF (0.08 t CO<sub>2</sub>/t bricks and tiles). This approach is based on information provided by the industry, which states that the quantity of CO<sub>2</sub> emitted during the calcination process is approximately 4–12 per cent of the mass of the produced bricks and tiles. The ERT found that, while the comparison of this EF with other Parties' EFs does not indicate an underestimation of emissions, Switzerland has not provided a transparent justification for this assumption in the NIR. The ERT noted that previous review reports contained recommendations to provide this detailed justification or to estimate emissions from brick and tile production in accordance with the Revised 1996 IPCC Guidelines.

51. In response to questions raised by the ERT during the review, neither Switzerland nor the overarching brick and tile industry association were able to provide the ERT with further information to justify the CO<sub>2</sub> EF used. Switzerland did, however, indicate that a monitoring system for the brick and tile industry is currently under development, and that this would provide information from 2013 onwards on emissions arising from calcination

of carbonates. The ERT recommends that Switzerland use the outcomes of this monitoring to recalculate the emissions time series, and provide detailed documentation justifying the use of the CO<sub>2</sub> EF, in its annual submission.

#### Nitric acid production – N<sub>2</sub>O

52. Switzerland estimated N<sub>2</sub>O emissions from nitric acid production using a tier 2 method and with use of a plant-specific EF. This EF is based on measurements undertaken in 2009. In response to a question raised by the ERT during the review, Switzerland provided the ERT with detailed technical information to justify the plant-specific EF. The ERT recommends that this information be included in the NIR of its next annual submission.

## **D. Agriculture**

### **1. Sector overview**

53. In 2011, emissions from the agriculture sector amounted to 5,603.54 Gg CO<sub>2</sub> eq, or 11.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.0 per cent. These emissions showed a decreasing trend between 1990 and 2004, when emissions decreased by 10.6 per cent due to the reduction in the number of cattle and the reduced input of mineral fertilizers, while the emissions trend was reversed between 2004 and 2008, when there was a 3.7 per cent increase due to the increase in livestock numbers. Then, since 2007, sectoral GHG emissions have remained relatively stable. In general, the key driver for the fall in emissions is the reduction in the number of cattle and the reduced input of mineral fertilizers due to the introduction of the Required Standards of Ecological Performance.<sup>6</sup> The increase of pasture for cattle which generates less emissions than confined animals has also contributed significantly to the decrease in emissions for the whole period. Within the sector, 44.8 per cent of the emissions were from enteric fermentation, followed by 37.6 per cent from agricultural soils and 17.6 per cent from manure management.

54. The methodologies and EFs used for the inventory for the agriculture sector are, in general, transparently described in the NIR. In order to enhance transparency, the NIR was improved by reporting a new characterization of young cattle as encouraged in the previous review report. The ERT commends Switzerland for this improvement and considers that, generally, the quality of the calculations is good and that the transparency of the NIR is high.

55. For the uncertainty analysis for the agriculture sector, both tier 1 and tier 2 analyses from the IPCC good practice guidance were used. Yet for the inventory year 2011 (i.e. the current submission) the Monte Carlo simulation has not been updated as it requires a lot of resources; this will be done for the next submission in 2014. Switzerland has planned to implement this simulation every two years. The ERT considers that this frequency is sufficient if there are no major recalculations in the submission, as is the case for the present submission.

56. The only improvement planned for agriculture is to take into account biogas digesters, which will affect emissions from manure management. This improvement aims at avoiding double counting of emissions between manure management, public electricity and

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<sup>6</sup> Leifeld, J. and Fuhrer, J. 2005. Greenhouse gas emissions from Swiss agriculture since 1990: Implications for environmental policies to mitigate global warming. *Environmental Science & Policy* 8: 410-417. <<http://dx.doi.org/10.1016/j.envsci.2005.04.001>>.

heat production and other (waste). The ERT encourages Switzerland to implement this plan for its next annual submission. The ERT noted that there are no recommendations made in previous review reports that have not yet been addressed by Switzerland.

## 2. Key categories

### Enteric fermentation – CH<sub>4</sub>

57. Switzerland used a tier 2 methodology from the IPCC good practice guidance to calculate the CH<sub>4</sub> emission estimates for all animal categories, with a country-specific EF developed in line with the IPCC good practice guidance, and with use of country-specific data on nutrient requirements, feed intake and CH<sub>4</sub> conversion rates for specific feed types. The ERT considers that the use of Swiss parameters leads to significantly lower emissions than the IPCC tier 2 methodology with default parameters. The ERT considers that the parameters used are obtained from reliable sources; however, it encourages Switzerland to implement a comparison between the Swiss estimation and the IPCC tier 2 default in order to better explain the differences between these two methods in its annual submission.

58. In response to questions raised by the ERT during the review regarding the calculation of emissions from enteric fermentation, Switzerland provided an example of the calculation and the scientific reference used for dairy cattle. The ERT considers that most of the essential parameters are provided in the NIR. However, in the NIR of the 2013 submission, the information related to dairy cattle was removed from the table of conversion factors used for the calculation of energy requirements (table 6-3). The ERT recommends that Switzerland include the information on conversion factors used for the calculation of energy requirements in its annual submission.

59. For the CH<sub>4</sub> conversion rates (Y<sub>m</sub>), Switzerland uses an IPCC good practice guidance default value for mature sheep (0.07 from table 4.9) for the entire sheep population. This is a conservative choice but does not exactly correspond to the IPCC good practice guidance. During the review, Switzerland indicated that this issue might be addressed during future submissions but argued that the gain in accuracy might not justify the workload. Nevertheless, the ERT considers that the sheep population is already characterized in Switzerland and encourages Switzerland to make full use of the IPCC good practice guidance values in its annual submission.

### Manure management – CH<sub>4</sub>, N<sub>2</sub>O

60. Switzerland used a tier 2 methodology from the IPCC good practice guidance for estimating CH<sub>4</sub> emissions from manure management for all animal species, in line with the IPCC good practice guidance. For the MCF for deep litter and liquid systems, table 4.10 in the IPCC good practice guidance suggests a value of 39.0 per cent. However, it was stated in the NIR that the use of such a value would lead to a large overestimation of CH<sub>4</sub> emissions from manure management systems in Switzerland. Instead, the MCF from the Revised 1996 IPCC Guidelines (10.0 per cent) was used and it was explained in the NIR that the choice of this MCF is supported by a number of studies and is representative of country-specific manure management conditions. A note with explanations and references was provided to the previous ERT, which had recommended that the Party add this to the NIR. It was stated in the NIR that this documentation was contained in annex E but it was not found by the current ERT. Hence, the ERT reiterates the recommendation made in the previous review report that Switzerland include the detailed references for the choice of the MCF of 10.0 per cent in the NIR of its next annual submission. The ERT noted that the use of an MCF that is lower than the one suggested by the IPCC good practice guidance had been agreed upon by the previous ERT in the previous review reports for both deep litter and liquid systems.

61. For the calculation of N<sub>2</sub>O emissions from manure management, Switzerland used a country-specific method which is consistent with the IPCC good practice guidance, with IPCC default EFs (from table 4.12), and AD adjusted to the particular situation of the country. The ERT noted from the NIR that ammonium losses to the atmosphere were calculated using the Swiss ammonium emission model AGRAMMON (see page 225 in the NIR). The input data for the AGRAMMON model for the period 1990–1995 are based mainly on expert judgement and literature studies, whereas the data for the period 2002–2010 are based on the results of extensive farm surveys. As recommended by the previous review report, the results of the 2010 survey were considered in the calculation in the 2013 annual submission. The ERT commends Switzerland for the efforts to maintain its system up to date.

62. In response to a question raised by the ERT during the review regarding the trend of the percentage of dairy cattle on pasture, Switzerland provided information on government policies encouraging the use of pasture since the early 1990s, which are responsible for the large increase in cattle on pasture in Switzerland since 1990. The ERT encourages Switzerland to provide this information in the NIR of its next annual submission.

#### Agricultural soils – N<sub>2</sub>O

63. For the calculation of N<sub>2</sub>O emissions from agricultural soils, Switzerland used a country-specific method (the IULIA model), which is a method derived from the default tier 1b method in the IPCC good practice guidance and uses the IPCC default EFs from table 4.17 of the IPCC good practice guidance. The ERT considers Switzerland's approach to be consistent with the IPCC good practice guidance.

64. The ERT noted that the country-specific method using the IULIA model (see page 236 in the NIR), which was updated using new parameters derived from the Swiss ammonium model AGRAMMON, resulted in considerable differences of emissions (lower) compared with the emissions calculated using the IPCC default method (see page 236 in the NIR). It is explained in the NIR that a comparison was made in 2000 and the main results are available in the NIR. However, the ERT reiterates the encouragement made in the previous review report to update the explanations of the differences in its annual submission.

### **3. Non-key categories**

#### Field burning of agricultural residues – CH<sub>4</sub> and N<sub>2</sub>O

65. All emissions relating to burning of fruit trees previously reported under this category have been reallocated to the waste sector despite a recommendation made in the previous review report to keep reporting them in the agriculture sector (except if the choice was sufficiently explained). Switzerland notes that fruit trees are felled, cut up and burned on piles. This usually occurs on the field, not as standing trees but after chopping and stacking – hence, it can be considered as waste. Switzerland has argued its choice by explaining that it is a process consistent with the most recent guidance from the European Monitoring and Evaluation Programme. The ERT considers that it is also in accordance with the IPCC good practice guidance.

## **E. Land use, land-use change and forestry**

### **1. Sector overview**

66. In 2011, net removals from the LULUCF sector amounted to 3,410.94 Gg CO<sub>2</sub> eq. Since 1990, net removals have increased by 8.1 per cent. The key drivers for the increasing

removals are: gains in carbon stock in living biomass; losses in carbon stock in living biomass (the highest losses are observed in the years following a heavy storm with windfall in December 1999); and net carbon stock changes in dead organic matter on forest land remaining forest land. Within the sector, net removals of 2,955.68 Gg CO<sub>2</sub> eq were from forest land remaining forest land, followed by 1,025.34 Gg CO<sub>2</sub> eq from land converted to forest land, and there were net removals of 232.92 Gg CO<sub>2</sub> eq from cropland remaining cropland and of 3.10 Gg CO<sub>2</sub> eq from land converted to cropland. Land converted to settlements accounted for net emissions of 305.69 Gg CO<sub>2</sub> eq and land converted to grassland accounted for net emissions of 190.66 Gg CO<sub>2</sub> eq. The remaining 309.85 Gg CO<sub>2</sub> eq of emissions were from all other categories within the sector.

67. The inventory for the LULUCF sector is generally complete, as all mandatory gases and land use and land-use change categories are reported. CH<sub>4</sub> and N<sub>2</sub>O emissions from drainage of forest soils and wetlands, CH<sub>4</sub>, N<sub>2</sub>O emissions from wetlands, settlements and other lands, and GHG emissions from harvested wood products are not reported. The ERT encourages Switzerland to report these emissions. Data on areas are inferred from two major sources: the national forest inventory and the national AREA database (see pages 245 and 263–274 in the NIR). However, the ERT noted that the AREA database does not cover the total area of the country (i.e. it covers only 83.0 per cent). Switzerland reports emissions and removals for the complete territory by extrapolating for the rest of the territory using an older database. The ERT considers this approach to be in line with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Previous review reports have recommended that Switzerland increase the coverage of the AREA database. In response to a question raised by the ERT during the review, Switzerland indicated that the area covered by the AREA database has been increasing (e.g. 72.0 per cent in the 2012 submission increasing to 83.0 per cent in the 2013 submission) and that full coverage is expected in 2013. The ERT recommends that Switzerland continue its efforts to increase the coverage of the AREA database and report on the progress in the NIR of its next annual submission.

68. The inventory for the LULUCF sector is generally transparent. Methods, AD and other parameters are described, justified and presented in an exhaustive and comprehensive way. However, the ERT found that the transparency could be significantly enhanced for the two methods (i.e. gains and losses, and stock changes) that Switzerland used and the assumptions therein, and by providing verifiable information to justify why certain carbon pools are not a net source (see para. 71 below) and explanations as to why certain pools are combined (see para. 72 below).

69. Switzerland estimates all pools in accordance with the IPCC good practice guidance for LULUCF. The ERT found that in the application of these methods Switzerland has introduced weighting factors into the IPCC good practice guidance for LULUCF equations (see equations 7.1, 7.2 and 7.3 in the NIR), which in turn raised some questions regarding the transparency, comparability and coherence of the method from the IPCC good practice guidance for LULUCF. These questions related specifically to potential double counting when considering land-use changes, namely land converted to forest land if annual gains and losses are already considered in stock changes. Also, dimensional analysis of the equations showed that the proposed method had dimensional errors (for example, the equations sum t C/ha/year with t C/ha).

70. In response to questions raised by the ERT during the review, Switzerland demonstrated that the two methods (gains and losses, and stock changes) are used alternatively for afforestation and productive and unproductive forest, and stated that it will improve the presentation of the equations referred to in paragraph 69 above in the next annual submission and that it will correct the units in the equation. The ERT recommends that Switzerland significantly improve the presentation of the methods in the NIR of its

next annual submission, which should include presenting information on each method independently and providing the criteria for the use of each method (or indicating the cases in which a method would be applied), and the reasoning behind this. Further, the ERT recommends that Switzerland include, in the NIR of its next annual submission, all references to the sources of information used, including for AD, EFs and parameters used.

71. The ERT identified that changes in soil organic carbon, dead wood and litter pools under afforestation are not reported. The justification for not reporting these pools is that the pools are not a net source of emissions, based on expert judgement. The ERT concluded that the basis for the current justification needs further enhancement by providing in the NIR the references to the published literature that is used to underpin the justification. In response to a question raised by the ERT during the review, Switzerland provided the ERT with the available documentation, and indicated that a scientific literature review will be undertaken and incorporated into the next annual submission. The ERT recommends that Switzerland include in the NIR of its next annual submission all the necessary verifiable information to support its justification for not reporting the carbon pools referred to above.

72. With regard to the combined carbon pools, Switzerland informed the ERT that it plans to provide data on carbon stocks separately for above-ground and below-ground biomass in its next annual submission. The ERT recommends that Switzerland report separated carbon pools in its annual submission as it enables a comparison of the order of magnitude in gains and losses of above-ground and below-ground biomass.

73. Recalculations reported by Switzerland in the LULUCF sector relate mostly to an increase in the area covered by the AREA database that led to different areas of land use and land-use change when comparing to the previous submission (see table 10 below).

## **2. Key categories**

### Forest land remaining forest land – CO<sub>2</sub>

74. The ERT noted that net carbon stock changes in mineral soils are reported as “NO” (not occurring) for unproductive forests in CRF table 5.A. Switzerland clarified that the carbon stock changes in mineral soils were modelled with Yasso07 only for productive forests (see NIR chapter 7.3.4.9). For unproductive forests (mainly brush forest and inaccessible forest) there are not sufficient data available to allow the use of the model. Therefore, a carbon stock change of zero was assumed for unproductive forest (tier 1 approach). For the cases in unproductive forest for which there are insufficient data available on the soil, the ERT recommends that Switzerland provide transparent and verifiable information, which demonstrates that soil organic carbon is not a net source of emissions in accordance with chapter 4.2.3.1 of the good practice guidance for LULUCF in its annual submission. The ERT also encourages a coherent approach between the LULUCF reporting under the Convention and under the Kyoto Protocol (see para. 83 below).

## **F. Waste**

### **1. Sector overview**

75. In 2011, emissions from the waste sector amounted to 586.99 Gg CO<sub>2</sub> eq, or 1.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 41.9 per cent. The key driver for the fall in emissions is the implementation of waste legislation which prohibits the landfilling of municipal solid waste (MSW) and enforces recycling and/or thermal treatment of waste with energy recovery as mandatory. The sectoral emission trends are transparently explained in the NIR. Within the sector, 37.7 per cent of the



emissions were from wastewater handling, followed by 30.8 per cent from solid waste disposal on land, 22.1 per cent from other (waste) (i.e. composting and digesting) and 9.4 per cent from waste incineration.

76. Switzerland has made recalculations for the waste sector between its 2012 and 2013 annual submissions, mainly following changes in EFs (see table 10).

77. The inventory for the waste sector is generally transparent and complete in terms of gases, categories, geographical coverage and years. Switzerland has used largely country-specific methodologies with a view to improving the quality of emission estimates. However, Switzerland has not addressed recommendations made in the previous review reports in relation to transparency, specifically in relation to methodological information and the EMIS database for wastewater handling (CH<sub>4</sub> emissions). The ERT reiterates the recommendations made in the previous review report that the Party include improved documentation and explanatory information in the NIR in its annual submission.

78. The NIR provides useful information on waste management practices and waste streams. The ERT commends Switzerland for providing more information in the NIR on waste streams according to the types of waste treatment under other sectors, such as the energy or agriculture sectors, in response to previous recommendations. However, the ERT found that this information did not fully include the data on the amount of waste reported in the energy sector. Additionally, the ERT noted that information on imports and exports of different types of waste is not provided. In response to questions raised by the ERT during the review, Switzerland provided relevant information. Hence, the ERT reiterates a recommendation made in the previous review report that Switzerland, in its next annual submission, provide more disaggregated information in the NIR on waste streams, such as the amounts of thermal disposal (e.g. waste fuels used in industry, incineration with and without energy recovery) and import/export of waste.

## 2. Key categories

### Solid waste disposal on land – CH<sub>4</sub>

79. Switzerland used a first-order decay method with a combination of default and country-specific parameters to estimate CH<sub>4</sub> emissions from solid waste disposal sites. All waste disposal sites in the country are categorized as managed according to the IPCC classification and are further divided into three different categories according to the type of waste that it manages (i.e. MSW, construction waste and sewage sludge). However, the NIR does not provide information on the composition of MSW and construction waste, although the information was used to derive the degradable organic carbon for each waste type. Switzerland provided this information to the ERT during the review. The ERT recommends that this information be included in the NIR in its annual submission.

### Wastewater handling – N<sub>2</sub>O

80. Switzerland used the IPCC default method from the Revised 1996 IPCC Guidelines to estimate N<sub>2</sub>O emissions from domestic and commercial wastewater handling, with use of data on annual protein consumption per capita. The NIR states that although emission measurements for certain processes in specific wastewater treatment plants have been carried out, the result of these measurements is not transferable to other plants. In order to develop an appropriate country-specific methodology, the ERT encourages Switzerland to enhance its investigations in support of estimating N<sub>2</sub>O emissions from wastewater treatment plants and report its findings in its annual submission.

Other (waste) – CH<sub>4</sub>

81. Switzerland has estimated emissions from composting and digesting of organic waste in this category. Emissions are based on a country-specific emission estimation method. Moreover, Switzerland estimates emissions separately for each fermentation process (see NIR chapter 8.5) in the subcategory digestion of organic waste. However, in spite of the previous annual review’s recommendation, Switzerland reported only aggregated emissions for the category other (waste) in the CRF tables. In response to a question raised by the ERT during the review, Switzerland provided it with disaggregated emission estimates. The ERT recommends that Switzerland enhance the transparency of emission estimates for this category by disaggregating emissions for each subcategory in the CRF tables in its annual submission. In its 2013 annual submission, Switzerland also corrected the EF used to estimate emissions from the fermentation process in digestion, and submitted a recalculated time series.

**G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol**

**1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol**

Overview

82. Table 6 provides an overview of the information reported and parameters selected by Switzerland under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6

**Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol**

<i>Findings and recommendations</i>		
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient	
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management	
	Years reported: 2008, 2009, 2010, 2011	
Identify the period of accounting	Annual accounting	
Assessment of the Party’s ability to identify areas of land and areas of land-use change	Sufficient	Despite the fact that the AREA database covers only 83.0 per cent of the country, the time series is consistent and a full coverage is obtained by also using the national forest inventory and extrapolations (see para. 67 above)

Activities under Article 3, paragraph 3, of the Kyoto Protocol

*Afforestation and reforestation – CO<sub>2</sub>*

83. The ERT reiterates the recommendations made in the previous review report that the Party improve the explanation in the NIR on the linkage between the reporting of land

converted to forest land under the Convention and afforestation and reforestation activities under Article 3, paragraph 3, of the Kyoto Protocol, in terms of the AD and methodology used for the emission/removal calculations. Switzerland has already made some improvements and, for instance, the area budget comparison among the two approaches is included, showing the linkages between the areas reported under the Convention and those reported under the Kyoto Protocol (table 11-5 in the NIR). However, the methodology used to calculate biomass gains for afforestation and reforestation is different from the methodology used for the land converted to forest land category under the Convention, with biomass gains much larger in land converted to forest land. Switzerland informed the ERT that the inventory development plan includes consideration to implement the same methods for reporting under the Convention and under the Kyoto Protocol in the next annual submission. The ERT strongly recommends that Switzerland pursue this and report thereon in the NIR in its annual submission.

84. The ERT also commends the intention of Switzerland to improve the presentation of equations 7.1, 7.2 and 7.3 in its next submission (see para. 69 above).

85. The ERT noted that losses in living biomass in units of land not harvested are reported as “NO” in CRF KP-LULUCF table 5(KP-I)A.1.1. Switzerland referred to the methodology described in its NIR (page 375). For areas of afforestation not harvested (less than 20 years), the gains are calculated following a logistical growth function. Losses are not reported since first management interactions start after 20 years (see page 376 of the NIR: “After 20 years, afforestations are under normal Forest Management and the first thinnings and treatments are conducted”). From this, the ERT sought clarification from Switzerland as to whether there was a reclassification of afforested areas to forest management areas. Switzerland replied that all areas under Article 3, paragraph 3, of the Kyoto Protocol remain as initially classified for the entire commitment period. The ERT encourages Switzerland to consider the revision, in its annual submission, of the above-mentioned statement on page 376 of the NIR to clearly show that forest management practices are being referred to and not a potential reclassification of afforested and reforested areas to forest management areas.

86. The ERT noted that losses in living biomass in units of land harvested are reported as “NO” in CRF KP-LULUCF table 5(KP-I)A.1.2. In response to a question raised by the ERT during the review, Switzerland explained that the notation key should be “IE” (included elsewhere), and that this will be corrected in its next annual submission. The ERT recommends that the Party correct this error.

87. The ERT noted that emissions or removals from mineral soils in afforested units harvested and of dead wood and litter in units harvested are reported as “NO” in CRF KP-LULUCF table 5(KP-I)A.1.2. In response to a question raised by the ERT during the review, Switzerland explained that the reporting of notation key “NO” for carbon pools in mineral soils is due to a bug in the CRF Reporter which does not allow the inclusion of a value zero. In the case of dead wood and litter carbon pools in units harvested, the NIR provides expert judgement to justify the reporting of notation key “NO”, in addition to referring to publications from neighbouring countries (Germany and Austria) that support the assumption. Further, Switzerland indicated that it would improve the documentation in its next NIR submission to justify this reporting and to confirm expert judgement. The ERT recommends that the Party include this information in its annual submission.

#### Activities under Article 3, paragraph 4, of the Kyoto Protocol

##### *Forest management – CO<sub>2</sub>*

88. The ERT concluded that there is a need for Switzerland to further document its method to calculate carbon stock changes for certain practices under forest management in

its annual submission. For example, for the harvesting, the decomposition rate of litter and dead wood can accelerate CO<sub>2</sub> emissions. In response to a question raised by the ERT during the review, Switzerland indicated that by using the model Yasso07 it is able to cover the impacts of all management practices (including harvesting) with respect to changes in soil carbon, litter and dead wood carbon pools. Further, Switzerland indicated that it would (through its inventory development plan) extend the respective NIR chapter with a literature review. The ERT commends Switzerland for this improvement and recommends that the Party report thereon in the NIR of its next annual submission.

**2. Information on Kyoto Protocol units**

Standard electronic format and reports from the national registry

89. Switzerland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.<sup>7</sup> The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

90. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

91. Switzerland has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

92. Table 7 shows the accounting quantities for KP-LULUCF as reported by Switzerland and the final values after the review.

Table 7

**Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO<sub>2</sub> eq**

	2013 submission <sup>a</sup>		2010, 2011 and 2012 submissions <sup>b</sup>	Net accounting quantity <sup>c</sup>
	As reported	Revised estimates	Final	
Afforestation and reforestation	-111 083		-56 699	-54 384

<sup>7</sup> The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party’s SEF tables with corresponding records contained in the ITL.

	2013 submission <sup>a</sup>			2010, 2011 and 2012 submissions <sup>b</sup>	Net accounting quantity <sup>c</sup>
	As reported	Revised estimates	Final	Final	
Non-harvested land	-91 196		-91 196	-49 971	-41 225
Harvested land	-19 887		-19 887	-6 728	-13 159
Deforestation	798 324		798 324	659 046	139 278
Forest management	-9 166 667		-9 166 667	-2 644 366	-6 522 301
Article 3.3 offset <sup>d</sup>	0		0	0	0
Forest management cap <sup>e</sup>	-9 166 667		-9 166 667	-9 166 667	0
Cropland management	NA		NA	NA	NA
Grazing land management	NA		NA	NA	NA
Revegetation	NA		NA	NA	NA

*Abbreviation:* CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

<sup>a</sup> The values included under the 2013 submission are the cumulative accounting values for 2008, 2009, 2010 and 2011, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2011.

<sup>b</sup> The values included under the 2010, 2011 and 2012 submissions are the final accounting values as a result of the 2012 review and are included in table 6 of the 2012 annual review report (FCCC/ARR/2012/CHE, page 37) in the column “2012 submission”, “Final”.

<sup>c</sup> The “net accounting quantity” is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2013 submission and where the quantities issued or cancelled based on the 2012 annual review report have been subtracted (“net accounting quantity” = final 2013 – final 2012 annual review report).

<sup>d</sup> “Article 3.3 offset”: For the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

<sup>e</sup> In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

93. Based on the information provided in table 7 for the activity afforestation/reforestation, Switzerland shall issue 54,384 removal units (RMUs) in its national registry.

94. Based on the information provided in table 7 for the activity deforestation, Switzerland shall cancel 139,278 assigned amount units, emission reduction units, certified emission reduction units and/or RMUs in its national registry.

95. Based on the information provided in table 7 for the activity forest management, Switzerland shall issue 6,522,301 RMUs in its national registry.

#### Calculation of the commitment period reserve

96. Switzerland has reported its commitment period reserve in its 2013 annual submission. Switzerland reported that its commitment period reserve has not changed since

the initial report review (218,554,562 t CO<sub>2</sub> eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

### **3. Changes to the national system**

97. Switzerland reported that there are changes in its national system since the previous annual submission. The Party described the changes in its NIR. Switzerland also provided additional information relating to these changes in response to a question raised by the ERT during the review. Reported changes relate to a change of name and contact information of a national inventory compiler and a change in legal arrangements among participants of the national system (the annual contract base between FOEN and FOAG changed to institutionalized relationships due to the establishment of a standing working group regarding agricultural GHG emissions). The ERT concluded that, taking into account these changes, the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

### **4. Changes to the national registry**

98. Switzerland reported that there are changes in its national registry since the previous annual submission. The Party described the changes in its NIR. These include: change in cooperation arrangement – the cooperation arrangement with Liechtenstein has been terminated as Liechtenstein joined the European Union (EU) registry; technical changes, such as a two-person rule for all accounts and two-factor authentication via text messages have become mandatory; and administrative changes regarding additional requirements for having addresses and a minimum age for all account holders and users. Switzerland reported that the general terms and conditions of the National Emissions Trading Registry have been updated accordingly. The ERT concluded that, taking into account the confirmed changes in the national registry, Switzerland's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

### **5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol**

99. Switzerland reported that there are no changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The ERT concluded that the information provided continues to be complete and transparent.

100. The ERT identified that Switzerland has reported on its activities in the direction of progressive reduction of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in GHG emitting sectors, and in promoting clean production and assisting developing countries in improving efficiency and diversifying their economies.

## **III. Conclusions and recommendations**

### **A. Conclusions**

101. Table 8 summarizes the ERT's conclusions on the 2013 annual submission of Switzerland, in accordance with the Article 8 review guidelines.

Table 8  
Expert review team's conclusions on the 2013 annual submission of Switzerland

		<i>Cross-references</i>
The ERT concludes that the inventory submission of Switzerland is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources <sup>a</sup>	Complete	
LULUCF <sup>a</sup>	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Switzerland has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the <i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i> , the <i>IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> and the <i>IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>	Yes	
Reporting of information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol is in accordance with decision 15/CMP.1	Yes	83, 86 and table 6
The Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Switzerland provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

*Abbreviations:* Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

<sup>a</sup> The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

## B. Recommendations

102. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified.

Table 9

### Recommendations identified by the expert review team

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph cross-reference</i>
Energy	General	Expand on its QC procedures to avoid errors	22
		Include more information on the reallocation of fuel consumption data	23
		Use the results and outcomes of a planned EF study to reassess the CO <sub>2</sub> EFs and NCVs from liquid fuels in the 2015 submission	24
		Implement the planned improvements to the reference approach in regards to the reporting of fuels used for non-energy purposes	28
	Stationary combustion: liquid fuels – CO <sub>2</sub>	Review, and if necessary update, the CO <sub>2</sub> EF for refinery gas	29
	Stationary combustion: solid fuels – CO <sub>2</sub>	Correct the error in the NIR regarding the CO <sub>2</sub> EF for coal	30
	Other energy industries: biomass – CH <sub>4</sub>	Communicate the correct data for charcoal production to FAO	37
	Oil and natural gas – CO <sub>2</sub> and CH <sub>4</sub>	Estimate and report emissions of CO <sub>2</sub> and CH <sub>4</sub> from natural gas production	42
		Review, and if necessary update, the emissions from natural gas transmission and distribution	43
		Provide improved documentation and information on the methodology, and information on the study under way to assess gas losses of the Swiss gas industry	
	Expand the methodological description on oil systems and flaring	44	



<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph cross-reference</i>
Industrial processes and solvent and other product use	Cement production – CO <sub>2</sub>	Undertake the recalculation of the EF and report thereon in the NIR	47
	Limestone and dolomite use – CO <sub>2</sub>	Use the outcomes of the monitoring of the brick and tile industry to recalculate the emissions time series, and provide detailed documentation justifying the use of the CO <sub>2</sub> EF	51
	Nitric acid production – N <sub>2</sub> O	Include information on the plant-specific EF in the NIR	52
Agriculture	Enteric fermentation – CH <sub>4</sub>	Include the information on conversion factors used for the calculation of energy requirements	58
	Manure management – CH <sub>4</sub>	Include in the NIR the detailed references provided to the ERT during the review for the choice of the MCF of 10.0 per cent	60
LULUCF	General	Continue the efforts to increase the coverage of the AREA database and report on the progress in the NIR	67
		Significantly improve the presentation of the methods in the NIR	70
		Include in the NIR a clear and independent identification of references to the sources of information, including for AD, factors and parameters used	
		Include in the NIR all the necessary verifiable information to justify not reporting certain carbon pools	71
		Report separated carbon pools	72
	Forest land remaining forest land – CO <sub>2</sub>	Switzerland provide transparent and verifiable information, which demonstrates that soil organic carbon is not a net source of emissions in accordance with chapter 4.2.3.1 of the good practice guidance for LULUCF	74
Waste	General	Improve the documentation and explanatory information	77
		Include information in the NIR on waste streams according to the type of waste treatment and data on imports and exports of waste	78
	Solid waste disposal on land – CH <sub>4</sub>	Include information on the composition of MSW and construction waste in the NIR	79
	Other (waste) – CH <sub>4</sub>	Enhance the transparency of emissions for this category by disaggregating emissions for each subcategory in the CRF tables	81

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph cross-reference</i>
KP-LULUCF	Afforestation and reforestation – CO <sub>2</sub>	Improve the explanation in the NIR on the linkage between the reporting of land converted to forest land under the Convention and afforestation and reforestation activities under Article 3, paragraph 3, of the Kyoto Protocol	83
		Pursue the implementation of the same methods for LULUCF and KP-LULUCF and report thereon in the NIR	
		Correct the notation key used for losses in living biomass in units of land harvested	86
		Include documentation on the assumptions and expert judgement for mineral soils	87

*Abbreviations:* AD = activity data, CRF = common reporting format, EF = emission factor, FAO – Food and Agriculture Organization of the United Nations, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, MCF = methane conversion factor, MSW = municipal solid waste, NCV = net calorific value, NIR = national inventory report, QA = quality assurance, QC = quality control.

#### IV. Questions of implementation

103. No questions of implementation were identified by the ERT during the review.

## Annex I

## Background data on recalculations and information to be included in the compilation and accounting database

Table 10  
Recalculations in the 2013 annual submission for the base year and the most recent year

<i>Greenhouse gas source and sink categories</i>	<i>1990</i>	<i>2010</i>	<i>1990</i>	<i>2010</i>	<i>Reason for the recalculation</i>
	<i>Value of recalculation (Gg CO<sub>2</sub> eq)</i>		<i>Per cent change</i>		
<b>1. Energy</b>	39.28	30.53	0.1	0.1	Improved AD and EFs
A. Fuel combustion (sectoral approach)	38.84	51.35	0.1	0.1	
1. Energy industries	8.60	19.22	0.3	0.5	
2. Manufacturing industries and construction	-267.37	-70.48	-4.2	-1.2	
3. Transport	-17.57	-42.57	-0.1	-0.3	
4. Other sectors	315.18	145.17	1.8	0.9	
5. Other		-0.002		-0.002	
B. Fugitive emissions from fuels	0.43	-20.82	0.1	-8.4	
1. Solid fuels					
2. Oil and natural gas	0.43	-20.82	0.1	-8.4	
<b>2. Industrial processes</b>	0.30	59.70	0.01	1.6	Improved EFs
A. Mineral products	0.30	12.79	0.01	0.6	
B. Chemical industry		0.98		0.5	
C. Metal production					
D. Other production					
E. Production of halocarbons and SF <sub>6</sub>					
F. Consumption of halocarbons and SF <sub>6</sub>		45.93		3.6	
G. Other					
<b>3. Solvent and other product use</b>	-1.94	-17.00	-0.4	-7.9	Improved AD and EFs and reallocation
<b>4. Agriculture</b>	-46.20	-41.14	-0.8	-0.7	
A. Enteric fermentation	-21.90	-20.63	-0.8	-0.8	
B. Manure management	0.42	17.03	0.0	1.8	
C. Rice cultivation					
D. Agricultural soils	-10.82	-23.63	-0.5	-1.1	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues	-13.90	-13.90	-100	-100	
G. Other					
<b>5. Land use, land-use change and forestry</b>	691.74	-1 524.33	-18.0	173.1	Improved AD

Greenhouse gas source and sink categories	1990	2010	1990	2010	Reason for the recalculation
	Value of recalculation (Gg CO <sub>2</sub> eq)		Per cent change		
					and EFs
A. Forest land	818.58	-1 798.09	-16.3	83.6	
B. Cropland	-97.54	283.91	-20.2	62.8	
C. Grassland	-57.30	-14.35	-25.9	-4.3	
D. Wetlands	1.52	1.71	8.9	6.3	
E. Settlements	28.74	11.57	7.9	3.5	
F. Other land	-2.25	-9.09	-2.3	-7.5	
G. Other					
<b>6. Waste</b>	16.40	-14.63	1.6	-1.2	Improved AD and EFs, and reallocation
A. Solid waste disposal on land					
B. Wastewater handling		-34.63		-2.7	
C. Waste incineration	13.90	15.76	1.4	1.2	
D. Other	2.50	4.24	0.3	0.3	
<b>7. Other</b>	-16.10	-13.01	-1.6	-1.0	Improved AD
<b>Total CO<sub>2</sub> equivalent without LULUCF</b>	-8.27	4.45	-0.02	0.01	
<b>Total CO<sub>2</sub> equivalent with LULUCF</b>	683.47	-1 519.88	1.4	-2.8	

Abbreviations: AD = activity data, EF = emission factor, LULUCF = land use, land-use change and forestry.

Table 11  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for 2011, including the commitment period reserve**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Commitment period reserve</b>	218 554 562			218 554 562
<b>Annex A emissions for 2011</b>				
CO <sub>2</sub>	41 843 015	41 965 614		41 965 614
CH <sub>4</sub>	3 731 684	3 733 800		3 733 800
N <sub>2</sub> O	3 073 255	3 074 624		3 074 624
HFCs	1 143 778	1 171 451		1 171 451
PFCs	39 362			39 362
SF <sub>6</sub>	164 367			164 367
<b>Total Annex A sources</b>	<b>49 995 460</b>	<b>50 149 216</b>		<b>50 149 216</b>
<b>Activities under Article 3, paragraph 3, for 2011</b>				
3.3 Afforestation and reforestation on non-harvested land for 2011		-19 352		-19 352
3.3 Afforestation and reforestation on harvested land for 2011		-13 204		-13 204
3.3 Deforestation for 2011		233 217		233 217
<b>Activities under Article 3, paragraph 4, for 2011<sup>c</sup></b>				
3.4 Forest management for 2011		-2 936 198		-2 936 198
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for 2010**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2010</b>				
CO <sub>2</sub>	45 889 976	46 028 169		46 028 169
CH <sub>4</sub>	3 764 985	3 767 110		3 767 110
N <sub>2</sub> O	3 132 730	3 134 385		3 134 385
HFCs	1 094 137	1 119 045		1 119 045
PFCs	36 706			36 706
SF <sub>6</sub>	154 769			154 769
<b>Total Annex A sources</b>	<b>54 073 303</b>	<b>54 240 184</b>		<b>54 240 184</b>
<b>Activities under Article 3, paragraph 3, for 2010</b>				
3.3 Afforestation and reforestation on non-harvested land for 2010		-23 670		-23 670
3.3 Afforestation and reforestation on harvested land for 2010		-6 683		-6 683
3.3 Deforestation for 2010		232 427		232 427
<b>Activities under Article 3, paragraph 4, for 2010<sup>c</sup></b>				
3.4 Forest management for 2010		-2 884 023		-2 884 023
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for 2009**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2009</b>				
CO <sub>2</sub>	44 225 555	44 349 294		44 349 294
CH <sub>4</sub>	3 785 850	3 788 022		3 788 022
N <sub>2</sub> O	3 063 696	3 065 857		3 065 857
HFCs	1 038 853	1 065 129		1 065 129
PFCs	35 166			35 166
SF <sub>6</sub>	187 122			187 122
<b>Total Annex A sources</b>	<b>52 336 242</b>	<b>52 490 591</b>		<b>52 490 591</b>
<b>Activities under Article 3, paragraph 3, for 2009</b>				
3.3 Afforestation and reforestation on non-harvested land for 2009		-25 153		-25 153
3.3 Afforestation and reforestation on harvested land for 2009		IE, NO		IE, NO
3.3 Deforestation for 2009		232 228		232 228
<b>Activities under Article 3, paragraph 4, for 2009<sup>c</sup></b>				
3.4 Forest management for 2009		-2 178 558		-2 178 558
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

*Abbreviations:* IE = included elsewhere, NO = not occurring.

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq for 2008**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2008</b>				
CO <sub>2</sub>	45 434 768	45 563 737		45 563 737
CH <sub>4</sub>	3 842 221	3 844 476		3 844 476
N <sub>2</sub> O	3 109 015	3 109 124		3 109 124
HFCs	998 639	1 025 582		1 025 582
PFCs	39 061			39 061
SF <sub>6</sub>	244 717			244 717
<b>Total Annex A sources</b>	<b>53 668 420</b>	<b>53 826 698</b>		<b>53 826 698</b>
<b>Activities under Article 3, paragraph 3, for 2008</b>				
3.3 Afforestation and reforestation on non-harvested land for 2008		-23 021		-23 021
3.3 Afforestation and reforestation on harvested land for 2008		IE, NO		IE, NO
3.3 Deforestation for 2008		100 452		100 452
<b>Activities under Article 3, paragraph 4, for 2008<sup>c</sup></b>				
3.4 Forest management for 2008		-1 374 818		-1 374 818
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

*Abbreviations:* IE = included elsewhere, NO = not occurring.

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.



## Annex II

### Documents and information used during the review

#### A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

“Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

“Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol”. Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

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FCCC/ARR/2012/CHE. Report of the individual review of the annual submission of Switzerland submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/che.pdf>.

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at [http://unfccc.int/kyoto\\_protocol/registry\\_systems/independent\\_assessment\\_reports/items/4061.php](http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php).

**B. Additional information provided by the Party**

Responses to questions during the review were received from Dr. Regine Röhliberger (Federal Department of the Environment, Transport, Energy and Communications), including additional material on the methodology and assumptions used.

## Annex III

### Acronyms and abbreviations

AD	activity data
CH <sub>4</sub>	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs and SF <sub>6</sub> without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MSW	municipal solid waste
N <sub>2</sub> O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NIR	national inventory report
NMVO	non-methane volatile organic compound
NO	not occurring
NO <sub>x</sub>	nitrogen oxide
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10 <sup>15</sup> joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF <sub>6</sub>	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10 <sup>12</sup> joule)
UNFCCC	United Nations Framework Convention on Climate Change