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# Report on the individual review of the inventory submission of the United States of America submitted in 2016*

## Note by the expert review team

*Summary*

Each Party included in Annex I to the Convention must submit an annual greenhouse gas (GHG) inventory covering emissions and removals of GHG emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). This report presents the results of the individual inventory review of the 2016 inventory submission of the United States of America, conducted by an expert review team in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories." The review took place from 19 to 24 September 2016 in Bonn, Germany.

* In the symbol for this document, 2016 refers to the year in which the inventory was submitted, and not to the year of publication.

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# I. Introduction

1. This report covers the review of the 2016 inventory submission of the United States of America organized by the UNFCCC secretariat, in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC review guidelines) and particularly part III, "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention".[1] The review took place from 19 to 24 September 2016 in Bonn, Germany, and was coordinated by Ms. Kyoko Miwa (UNFCCC secretariat). Table 1 provides information on the composition of the expert review team (ERT) that conducted the review of the United States.

Table 1
**Composition of the expert review team that conducted the review of the United States of America**

| *Area of expertise* | *Name* | *Party* |
|---|---|---|
| Generalist | Mr. Mikhail Gitarskiy | Russian Federation |
| | Ms. Batima Punsalmaa | Mongolia |
| Energy | Mr. Christo Christov | Bulgaria |
| | Mr. Amit Garg | India |
| | Ms. Brooke Elizabeth Perkins | Australia |
| IPPU | Mr. Samir Tantawi | Egypt |
| | Mr. David Glen Thistlethwaite | United Kingdom of Great Britain and Northern Ireland |
| Agriculture | Ms. Oksana Butrym | Ukraine |
| | Ms. Hongmin Dong | China |
| | Mr. Fredrick Kossam | Malawi |
| LULUCF | Ms. Rehab Ahmed Hassan | Sudan |
| | Ms. Esther Mertens | Belgium |
| | Mr. Koki Okawa | Japan |
| | Mr. Lucio Santos | Colombia |
| Waste | Mr. Pavel Gavrilita | Republic of Moldova |
| | Mr. Hiroyuki Ueda | Japan |
| Lead reviewers | Mr. Mikhail Gitarskiy | |
| | Ms. Batima Punsalmaa | |

*Abbreviations*: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry.

[1] Annex to decision 13/CP.20.

2. This report contains findings based on the assessment by the ERT of the 2016 inventory submission against the UNFCCC review guidelines. The ERT has made recommendations to resolve those findings related to issues.[2] Other findings, and if applicable, the ERT's encouragements to resolve them, are also included.

3. A draft version of this report was communicated to the Government of the United States which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

4. An overview of the greenhouse gas (GHG) emissions reported under the Convention for the United States is provided in annex I; table 6 shows GHG emissions with and without indirect $CO_2$ emissions for selected years, and tables 7 and 8 show GHG emissions reported under the Convention by gas and by sector, respectively.

5. The review of the 2016 GHG inventory submission is being held in conjunction with the review of the 2015 GHG inventory submission, in accordance with decision 20/CP.21, paragraph 1. To the extent that identical information is presented in both inventory submissions, the ERT has reviewed this information only once and, as appropriate, has replicated the findings below in both the 2015 and 2016 annual review report.

# II. Summary and general assessment of the 2016 inventory submission

6. Table 2 provides the ERT assessment of the inventory submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5 below.

Table 2
**Summary of review results and general assessment of the inventory of the United States of America[a]**

| *Assessment* | | | *Issue ID number(s) in tables 3 and/or 5[a]* |
|---|---|---|---|
| Dates of submission | Original submission: 15 April 2016 (NIR), 15 April 2016, Version 2 (CRF tables)<br>Revised submission: 2 September 2016, Version 4 (CRF tables)<br>The values from the latest submission are used in this report | | |
| Review format | Centralized | | |
| Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable) | Have any issues been identified in the following areas: | | |
| | 1. Identification of key categories | Yes | I.18, L.39 |
| | 2. Selection and use of methodologies and assumptions | Yes | I.9, I.12, I.17, I.24, I.29, I.30, I.31 I.32, A.13, A.18, L.17, W.18 |
| | 3. Development and selection of emission factors | Yes | A.3 |

[2] Issues are defined in decision 13/CP.20, annex, paragraph 81.

| *Assessment* | | | | *Issue ID number(s) in tables 3 and/or 5*[a] |
|---|---|---|---|---|
| | 4. | Collection and selection of activity data | Yes | E.6, E.7, E.8, E.11, E.14, I.14, A.4, A.12, A.14, L.4, L.12, L.15, L.21, L.22, L.25, L.26, L.29, L.30, L.33, L.34, L.43, W.4, W.12 |
| | 5. | Reporting of recalculations | Yes | I.13 |
| | 6. | Reporting of a consistent time series | Yes | G.2 |
| | 7. | Reporting of uncertainties, including methodologies | No | |
| | 8. | Quality assurance/quality control | Yes | G.9, I.7, A.9, L.5, L.24 |
| | 9. | Missing categories/completeness[b] | Yes | G.1, E.2, E.16, E.21, I.1, I.20, I.21, I.22, I.27, L.1, L.2, L.3, L.14, L.27, L.28, L.34, L.40, L.42, W.5, W.8, |
| | 10. | Application of corrections to the inventory | No | |
| Significance threshold | For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines? | | No | W.16 |
| Description of trends | Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable? | | Yes | |
| National inventory arrangements | Have any issues been identified with the effectiveness and reliability of the institutional, procedural and legal arrangements for estimating GHG emissions | | No | |
| Response from the Party during the review | Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties? | | Generally | G.10, I.13, I.27, L.24 |
| Recommendation for an exceptional in-country review | On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review? | | No | |

*Abbreviations*: CRF = common reporting format, ERT = expert review team, GHG = greenhouse gas, NIR = national inventory report, UNFCCC Annex I inventory 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 greenhouse gas inventories", Wetlands Supplement = *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*.

[a] The ERT identified additional issues in the energy, industrial processes and product use, agriculture, land use, land-use change and forestry and waste sectors that are not specifically listed in table 2 but are included in table 3 and/or 5.

[b] Missing categories, for which methods are provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, may affect completeness and are listed in annex II to this document.

# III. Status of implementation of issues raised in the previous review report

7. Table 3 compiles all the recommendations made in the previous review report. Owing to the unique circumstances of the 2015 inventory submission, as described in paragraph 5 above, and the fact that the United States was not subject to an individual inventory review of its 2014 inventory submission, the latest available review report was for the review of the 2013 inventory submission, published on 15 April 2014. For each issue, the ERT specified whether it believes the issue has been resolved by the conclusion of the review of the 2016 inventory submission and provided the rationale for its determination, taking into consideration the publication date of the previous review report and national circumstances.

Table 3
**Status of implementation of issues raised in the previous review report of the United States of America**

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| General | | | |
| G.1 | Annual submission (9, 2013) (8, 2012) Completeness | Improve the completeness of the inventory, in particular for those categories for which there are methodologies in IPCC guidelines for national greenhouse gas inventories | Addressing. A number of categories are reported as "NE" because no data are available (as reported in CRF table 9) for which methodologies are available in the 2006 IPCC Guidelines |
| G.2 | Annual submission (11, 2013) Consistency | Ensure time-series consistency when using GHGRP data directly in its national GHG inventory | Addressing. The United States reported that EPA will continue to assess GHGRP data to improve the inventory |
| G.3 | Inventory management (11, 2013) Completeness | Continue to explore legally binding agreements and/or memorandums of understanding with data provider institutions, especially for categories in the energy and industrial processes sectors which are not part of GHGRP, to ensure the timely availability of data and the consistency of the time series, as well as the full coverage of categories | No longer relevant. The ERT encourages the Party to continue its effort to follow the UNFCCC Annex I inventory reporting guidelines |
| G.4 | QA/QC and verification (13, 2013) Consistency | Report on the results of QA/QC checks using GHGRP data | Resolved. The United States provided some explanations in the sectoral chapters of the NIR 2016 where GHGRP data were used (e.g. p.3-63) |
| G.5 | Methods (table 3, 2013) Transparency | Use the plant-specific emissions from GHGRP to improve the disaggregation of combustion and industrial process emissions | Addressing. For further information, see E.11 below |
| G.6 | Methods (14, 2013) Adherence to UNFCCC Annex I | Allocate emissions from NEU of fuels reported under the energy sector to the correct categories in accordance with the UNFCCC Annex I inventory reporting | Not resolved. For further information, see E.7 below |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | inventory reporting guidelines | guidelines and the Revised 1996 IPCC Guidelines | |
| G.7 | Methods (15, 2013) (36, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Endeavour to follow the UNFCCC Annex I inventory reporting guidelines regarding use of the Revised 1996 IPCC Guidelines and the IPCC good practice guidance | No longer relevant. Use of the 2006 IPCC Guidelines is required by the UNFCCC Annex I inventory reporting guidelines |
| G.8 | Comparability (15 and 48, 2013) (36, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Improve the transparency of the NIR by including justifications for the decision to use default EFs from the 2006 IPCC Guidelines, where relevant | No longer relevant. Use of the 2006 IPCC Guidelines is required by the UNFCCC Annex I inventory reporting guidelines |
| Energy | | | |
| E.1 | 1. General (energy sector) – all fuels – $CO_2$, $CH_4$ and $N_2O$ (28, 2013) (38, 2012) Transparency | Include information on the progress made in the plan to use GHGRP data to: develop more accurate national EFs based on plant-specific measurements; estimate emissions for more detailed categories and subcategories; disaggregate energy consumption data based on the facility-level reporting, and indicate which data have been sourced from GHGRP and which from other sources | Addressing. The United States stated in the NIR2016 (pp.3 and 4) that the "GHGRP dataset and the data presented in this inventory report are complementary and, as indicated in the respective planned improvements sections for categories in this chapter, EPA is analysing how to use facility-level GHGRP data to improve the national estimates presented in this inventory" |
| E.2 | 1.A. Fuel combustion – sectoral approach – all fuels – $CO_2$, $CH_4$ and $N_2O$ (29, 2013) (32 and 51, 2012) Completeness | Collect the necessary AD and EFs to prepare emission estimates for the combustion of biomass and other fuels for these categories, including those used in the United States territories, focusing resources, as appropriate, on improvements in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, and report the corresponding emissions | Not resolved. The United States still has subcategories for which estimates have not been prepared, for example: biomass consumption under the category other (1.A.5.a); gaseous fuels for railways (1.A.3.c) and domestic navigation (1.A.3.d) under the category transport; AD for exploration of oil (1.B.2.a) and exploration and processing (1.B.2.b) under the category oil, natural gas and other emissions from energy production; and AD |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | of $CO_2$ transport and storage (1.C) (see also E.12 in table 5) |
| E.3 | 1.A.5 Other (fuel combustion activities) – solid fuels, gaseous fuels, biomass and other fuels – $CO_2$, $CH_4$ and $N_2O$ (29, 2013) (32, 2012) (36, 2011) Completeness | Ensure that emissions from solid fuels, gaseous fuels, biomass and other fuels used by the military are either estimated or reported or that the appropriate notation key is used | Resolved. The United States has used the notation key "NA" in its 2016 submission |
| E.4 | 1. General (energy sector) – all fuels – $CO_2$, $CH_4$ and $N_2O$ (30, 2013) (20 and 35, 2012) Comparability | Report emissions from all categories and for the full time series at the most disaggregated level, in line with the UNFCCC Annex I inventory reporting guidelines, in particular for manufacturing industries and construction and fugitive emissions | Addressing. The ERT noted that the situation has been gradually improving since the 2013 submission and that individualized emission estimates for petroleum refining (1.A.1.b) and subcategories under manufacturing industries and construction (1.A.2) are now reported for all fuels excluding biomass and other fuels. However, the lack of disaggregation remains in some categories, in particular agriculture/forestry/fisheries (1.A.4.c) under other sectors, venting and flaring under fugitive emissions (1.B.2.c), heavy-duty trucks and buses (1.A.3.b.iii) under the category transport, and commercial and institutional (1.A.4.a) under the category other sectors (see also E. 12 and E.16 in table 5) |
| E.5 | Fuel combustion – reference approach – all fuels – $CO_2$, $CH_4$ and $N_2O$ (32, 2013) (41, 2012) Transparency | Provide a more transparent clarification of how the difference in emissions between the reference and the sectoral approaches is determined and which fuels are subtracted as NEU and feedstocks | Addressing. The United States provided a theoretical explanation of the reference approach, and also indicated in the NIR (p.A-431, annex 4) that "Bunker fuels and feedstocks accounted for in the IPPU chapter are subtracted from these estimates, while fuel consumption in U.S. |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | Territories is added". The ERT notes that transparency is not fully achieved in the information provided for some categories, especially for NEU of fuels in the iron and steel category |
| E.6 | International aviation – liquid fuels– $CO_2$, $CH_4$ and $N_2O$ (35, 2013) Transparency | Harmonize and reconcile the data between the reference and the sectoral approach or furnish an adequate explanation of these inconsistencies, where appropriate | Addressing. The United States indicated in the NIR (p.3-90) that "the feasibility of including data from a broader range of domestic and international sources for bunker fuels, including data from studies such as the Third IMO GHG Study 2014, is being considered" |
| E.7 | Feedstocks, reductants and other NEU of fuels – all fuels – $CO_2$, $CH_4$ and $N_2O$ (38, 2013) (47, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Report only emissions from fuels combusted for the use of energy under fuel combustion, and reallocate the relevant emissions currently reported under the subcategory NEU (other) and part of the fuel used under the subcategory United States territories (other) | Not resolved. In CRF table 1.A.4, the United States reported aggregated data and emissions from liquid fuels, solid fuels and gaseous fuels under the subcategory NEU (other) (see also E.18, I.18 and I.24 in table 5). During the review, the Party explained that it uses a country-specific methodology for the non-energy use of fuels in line with para graph 10 of the UNFCCC Annex I inventory reporting guidelines to most accurately portray emissions from this category for the United States and reported in line with paragraph 35 of the UNFCCC Annex I inventory reporting guidelines. However, noting that paragraph 35 refers to the requirement to report on "how feedstocks and non-energy use of fuels have been accounted for in the inventory, under the energy or industrial processes sector, in accordance with the 2006 IPCC Guidelines, and noting that the 2006 IPCC |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
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| | | | Guidelines", and also noting that this indicates that the reporting of emissions from NEU under the IPPU sector and the emissions of combustion is under the energy sector, with specific exception, e.g., the coke making, the ERT is of the view that the issue identified in paragraph38 of the ARR2014 and paragraph 47 in ARR2012 is not yet resolved |
| E.8 | 1.A. Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – $CO_2$, $N_2O$ and $CH_4$ (39, 2013) Transparency | Complete the collection of AD for the consumption of biomass and other fuels for the years 2010 and 2011 | Not resolved. Consumption of biomass in the subcategory industries (1.A.1c.i) and consumption of liquid, solid, gaseous and biomass fuels in the subcategory other energy industries (1.A.1ciii) under manufacture of solid fuels and other energy industries are reported as "IE", and the Party explained that data are not available to estimate fuel consumption separately from those for the category public electricity and heat production (1.A.1.a)<br><br>The United States indicated in the NIR 2016 (p.3-32) that "In examining data from EPA's GHGRP that would be useful to improve the emission estimates for the $CO_2$ from fossil fuel combustion category, particular attention will also be made to ensure time-series consistency, as the facility-level reporting data from EPA's GHGRP are not available for all inventory years as reported in this Inventory". The Party further explained that in the NIR, "analyses will be conducted to align reported facility- |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | level fuel types and IPCC fuel types per the national energy statistics. Additional work will commence to ensure $CO_2$ emissions from biomass are separated in the facility-level reported data, and maintaining consistency with national energy statistics provided by EIA" |
| E.9 | 1.A. Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – $CO_2$, $N_2O$ and $CH_4$ (40, 2013) (33, 2012) Accuracy | Do not deduct the amount of fuel used for the production of intermediate products that are exported from the United States | Resolved. The United States stated in annex 2.3 to the NIR 2016 ( p. A-104) that "Other parts of the mass balance (described later) provide information on C flows, in some cases based on production data and in other cases based on consumption data. Production data relates only to production within the country; consumption data incorporates information on imports and exports as well as production. Because many commodities are emissive in their use, but not necessarily their production, consumption data is appropriately used in calculations for emissive fates. For purposes of developing an overall mass balance on U.S. non-energy uses of C, for those materials that are non-emissive (e.g., plastics), production data is most applicable. And for purposes of adjusting the mass balance to incorporate C flows associated with imports and exports, it was necessary to carefully review whether or not the mass balance already incorporated cross-boundary flows (through the use of consumption data), and to adjust the import/export |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | balance accordingly" |
| E.10 | 1.A.3.a Domestic aviation – liquid fuels – $CO_2$ (41, 2013) (53, 2012) Transparency | Include more complete justifications for the trend of $CO_2$ emissions from civil aviation | Resolved. The ERT considers the justification provided by the United States in the NIR 2015 to be sufficient |
| E.11 | 1.B.2.c Venting and flaring – oil and natural gas –$CO_2$ and $CH_4$ (44, 2013) Accuracy | Make efforts to use GHGRP data to improve the resolution and disaggregation of fugitive emissions from flaring and venting | Addressing. In the section on planned improvements in the NIR (p.3-66), the United States includes the investigation into the appropriateness of using associated gas venting and flaring data from GHGRP |
| IPPU | | | |
| I.1 | 2. General (IPPU) – $CO_2$ and $CH_4$ (46, 2013) (62 and 75, 2012) Completeness | Improve the completeness of the inventory, in particular for $CO_2$ emissions from calcium carbide production and $CH_4$ emissions from styrene | Addressing. The Party has improved the completeness of IPPU estimates, for example, a new vending machine end-use of HFCs is included within the EPA's Vintaging Model. However, several sources in the IPPU sector are reported as "NE", including $CO_2$ from calcium carbide production (see also I.20 in table 5). The ERT note that 2006 IPCC Guidelines do not provide a methodology for styrene production |
| I.2 | 2.A.1 Cement production – $CO_2$ (49, 2013) Transparency | Include explanations in the NIR for the use of "advanced" data for clinker | Resolved. Since the 2015 submission, the use of the tier 2 methodology is now clearly documented, including the source of AD |
| I.3 | 2.A.2 Lime production – $CO_2$ (60, 2013) Transparency | Provide background information on the nature of the revisions made to quicklime and hydrate lime production data for 2007, 2008 and 2010 to estimate lime production emissions | No longer relevant. This recommendation was for the clarification of recalculations from the 2013 submission. The ERT notes that, in the NIR 2016, the United States reported adequate information on the recalculation of dead burned dolomite production since the 2015 submission |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| I.4 | 2.A.2 Lime production – $CO_2$ (61, 2013) (71, 2012) Accuracy | Either use the assumptions required by the Revised 1996 IPCC Guidelines, or move to the use of higher-tier country-specific EFs and provide appropriate justification for the values used | No longer relevant. The method used is consistent with the 2006 IPCC Guidelines. This is not a key category, and higher-tier country-specific EFs are not applied |
| I.5 | 2.B.1 Ammonia production – $CO_2$ (51, 2013) (73, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Report $CO_2$ emissions from ammonia production in line with the Revised 1996 IPCC Guidelines, or if this is not possible include a detailed $CO_2$ balance showing $CO_2$ emissions from ammonia production and emissions from agricultural and non-agricultural use of urea | No longer relevant. The issue refers to the reporting of emissions under the Revised 1996 IPCC Guidelines (see I.18 below) |
| I.6 | 2.B.2 Nitric acid production – $N_2O$ (62, 2013) Transparency | Make further efforts to enhance the accuracy of the emission estimates and provide clear justification for using the 2006 IPCC Guidelines and a clear description of the methodology used, the trend in emissions and changes in the methodologies and parameters used | Resolved. In the 2016 submission, nitric acid estimates are based on a country-specific method throughout the time series, making use of the new facility-level GHGRP data since 2010 and a country-specific factor by technology type for earlier years. Sufficient information is provided in the NIR 2016 (pp.4-28–4-29) |
| I.7 | 2.B.9 Fluorochemical production – HFC-23 (57, 2013) Adherence to UNFCCC Annex I inventory reporting guidelines | Ensure that the necessary QA/QC and verification measures are implemented at the plant level to ensure that continuous monitoring results in more accurate estimates | Not resolved. The NIR does not describe the QA/QC measures (e.g. QA processes within the GHGRP reporting system) or verification measures at the plant-specific (or source-specific) level |
| I.8 | 2.C.1 Iron and steel production – $CO_2$ (53, 2013) Transparency | Make efforts to report separately the emissions from metallurgical coke production and iron and steel production | Resolved. In the 2015 and 2016 submissions, the NIR (chapter 4.16) presents separate emission estimates for metallurgical coke production and iron and steel production |
| I.9 | 2.C.1 Iron and steel production – $CO_2$ (54, 2013) (69, 2012) Transparency | Include a clear explanation of how natural gas used as fuel in coke plants in the iron and steel production process is reflected in the emission estimates within the inventory and in the carbon balance for activities related to iron and steel production | Addressing. The NIR contains several clarifications of the reporting of natural gas in this category, including where there are gaps in data yet to be addressed. No carbon balance for iron and |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
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| | | | steel production is provided |
| I.10 | 2.C.3 Aluminium production – PFCs (55, 2013) Transparency | Provide explanations for the decrease in the PFC IEFs since 1990 | Resolved. In the 2015 and 2016 submissions, the NIRs provide information on actions taken to reduce the frequency and duration of anode effects (NIR 2016, p.4-70), and details of changes in industry production over the time series and data available for PFC estimates (NIR 2016, p. 4-73) |
| I.11 | 2.C.4 Magnesium production –$SF_6$ (56, 2013) Transparency | Provide clear information on what has led to the decrease in $SF_6$ emissions from magnesium foundries despite the global increase in magnesium demand | Resolved. In the 2015 and 2016 submissions, the NIR (chapter 4.19) presents the data sources, assumptions and gap-filling approaches for deriving $SF_6$ estimates and EFs |
| I.12 | 2.F. Product uses as substitutes for ozone depleting substances – HFCs and $SF_6$ (58, 2013) Transparency | Provide further information on the EPA Vintaging model, and the assumptions and factors used in the model to calculate equipment disposal quantities and equipment disposal emission rates | Addressing. The NIR annex 3.9 provides some insight into the methods used to estimate disposal emissions. However, the ERT noted that the explanatory text provided to the previous ERT (detailed in para. 58 of document FCCC/ARR/2013/USA) is not included |
| Agriculture | | | |
| A.1 | 3.A.1 Cattle – $CH_4$ (69, 2013) (85, 2012) Completeness | Include emissions from calves during the time period when they feed on anything other than milk | Resolved. The emissions from calves during the time period when they feed on anything other than milk are included in the 2015 and 2016 submissions |
| A.2 | 3.B Manure management – $CH_4$ and $N_2O$ (72, 2013) Transparency | Investigate the reasons for the differences between the trends of VS daily excretion and Nex rates per animal type for sheep and swine | Addressing. This information was not provided in the 2016 submission. During the review, the United States explained that the manure management inventory team obtains its data from the CEFM, and that the team will work with the enteric fermentation inventory team |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | to clarify the reasons for the different trends of VS values and Nex rates for sheep and swine |
| A.3 | 3.B.1 Cattle – $CH_4$ and $N_2O$ (71, 2013) Transparency | Include explanations for the trends of VS daily excretion and Nex rates per animal for dairy cattle | Not resolved. This information was not provided in the 2016 submission. During the review, the United States explained that the manure management inventory team obtains its data from the CEFM, and that the team will work with the enteric fermentation inventory team to clarify the reasons for the different trends of VS values and Nex rates of dairy cattle |
| A.4 | 3.D.a.6 Cultivation of organic soils (i.e. histosols) – $N_2O$ (74, 2013) Consistency | Revise the AD and emission estimates for cultivation of histosols in agricultural soils and revise the QC process in order to ensure consistency in the inventory, and provide information on these improvements | Not resolved. The Party did not provide information on the revision or the recalculation to address the recommendation, and the ERT noted that an inconsistency in the area of cultivated organic soil between CRF table 3.D (1,352,082.22 ha) and the NIR (1.21 million ha) (annex p. A-332) still exists in the 2016 submission. During the review, the United States explained that it has experienced multiple problems importing data from its country-specific methods into the new CRF Reporter agriculture modules. The Party indicated that it is investigating options to solve the problems |
| A.5 | 3.D.a.3 Urine and dung deposited by grazing animals – $N_2O$ (75, 2013) (93, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Provide justification for the use of default EFs from the 2006 IPCC Guidelines to estimate $N_2O$ emissions from pasture, range and paddock | No longer relevant. Use of the 2006 IPCC Guidelines is required by the UNFCCC Annex I inventory reporting guidelines |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| A.6 | 3.D.b.2 Nitrogen leaching and run-off – $N_2O$ (76, 2013) (91, 2012) Transparency | Investigate the reasons for the fluctuation of $N_2O$ emissions for N leaching and run-off, and provide these reasons in the NIR | Resolved. The United States provided an explanation for the fluctuation of $N_2O$ from N leaching and run-off in the NIRs of its 2015 and 2016 submissions |
| A.7 | 3.D.b.2 Nitrogen leaching and run-off – $N_2O$ (76, 2013) Consistency | Correct the identified errors in the reported IEF for the category and QC procedures to identify similar problems, and revise the AD as appropriate | Resolved. The United States provided the information on the AD in the documentation box in CRF table 3.D, and explained that N fixation, volatilized N, and N leaching and run-off do not strictly represent AD because they are calculated by the process-based model (DAYCENT). Fractions were not used because a process-based model was used to calculate the emissions |
| A.8 | 3.D.a.3 Urine and dung deposited by grazing animals – $N_2O$ (77, 2013) (92, 2012) Consistency | Resolve the inconsistency in the total N excretion on pasture, range and paddock between CRF table 4.B(b), $N_2O$ emissions from manure management, and CRF table 4.D, agricultural soils | Addressing. The total N excretion on pasture, range and paddock reported in CRF table 3.B(b) and in CRF table 3.D are inconsistent. In addition, the ERT noted that the total N excretion on pasture, range and paddock was reported as 4,265,716,593.73 kg/year in CRF table 3.D, while 3,672 kt N was provided in the NIR (annex table A-223)<br><br>During the review, the Party explained that it had experienced problems in importing data from its country-specific methods in to the new CRF Reporter agriculture modules, and it was investigating options to solve the problems that it continues to experience with CRF Reporter |
| A.9 | 3.D.a.3 Urine and dung deposited by grazing animals – $N_2O$ (77, 2013) (92, 2012) | Improve QC procedures to avoid inconsistencies in the total N excretion on pasture, range and paddock between CRF tables 4.B(b) and 4.D and provide information on these improvements | Addressing. There is some information on QC improvement in the NIR, but inconsistencies in the total N excretion on pasture, range |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | Consistency | | and paddock between CRF table 3.B(b) and CRF table 3.D still exist (see A.8 above). During the review, the Party explained that it had experienced problems in importing data from its country-specific methods in to the new CRF Reporter agriculture modules, and it was investigating options to solve the problems that it continues to experience with CRF Reporter |
| A.10 | 3.D Direct and indirect $N_2O$ emissions from agricultural soils – $N_2O$ (78, 2013) (94, 2012) Transparency | Include weighted national averages for the fractions listed in CRF table 4.D | Resolved. Weighted national averages for the fractions were reported in the additional information in CRF table 3.D |
| LULUCF | | | |
| L.1 | 4. General (LULUCF) – $CO_2$, $CH_4$ and $N_2O$ (80, 2013) (103, 107, 109, 2012) Completeness | Estimate emissions from the carbon stock changes from mineral soils under forest land, living biomass under cropland and grassland, DOM under land converted to cropland and land converted to grassland, land converted to wetlands, SOC under land converted to settlements and land converted to other land; $N_2O$ emissions from disturbance associated with land-use conversion to cropland; $CH_4$ and $N_2O$ emissions from biomass burning (land converted to forest land, cropland, grassland and wetlands); and $CO_2$ emissions from biomass burning (excluding forest land remaining forest land) | Addressing. The United States has newly included, in CRF 2016, estimates for mineral soils under lands converted to forest land and living biomass for forest land converted to non-forest land. However, emissions from living biomass have only been estimated for forest land converted to grassland and cropland. In addition, the following are reported as "NE": estimates of DOM under land converted to cropland, grassland, wetlands, settlements and other land; SOC for land converted to settlements and other lands; and $CO_2$, $N_2O$ and $CH_4$ associated with biomass burning in land converted to forest land, cropland, grassland and wetlands |
| L.2 | 4. General (LULUCF) – $CO_2$ (81, 2013) | Conclude the technical work under way to be able to provide estimates for the carbon stock changes in the living biomass and DOM pools for each conversion | Addressing. The United States has made considerable progress towards a reliable |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | Completeness | category from forest land to any other land use for each year based on a reliable LUC matrix, and report on the achievements made | land tracking system and has provided a complete description of the underlying accounting framework in the NIR (chapter 6.1). However, emissions from DOM have not been estimated, except for forest land remaining forest land. Further improvements regarding the implementation of the new accounting framework for land use are necessary |
| L.3 | 4. General (LULUCF) – $CO_2$, $CH_4$ and $N_2O$ (82, 2013) (97, 2012) Completeness | Include all managed federal lands in the inventory and improve the consistency of the time series of national areas and report on the achievements made | Not resolved. Not all managed federal lands are included in the inventory. The ERT notes that in document FCCC/ARR/2013/USA the United States explained that the inconsistencies arose as a portion of the managed land not included in the CRF tables, although it was reported in the NIR. The ERT notes that the total area reported in the CRF tables in the 2016 submission for all land uses (4.A to 4.E) still fluctuates throughout the period, and an explanation for this has not been provided in the NIR |
| L.4 | 4. General (LULUCF) – $CO_2$, $CH_4$ and $N_2O$ (83, 2013) (97, 2012) Accuracy | Ensure land consistency and accuracy with the use of the LUC matrices, and provide detailed explanations in the NIR on changes in LUC areas over time | Resolved. The United States uses a new accounting framework that enables it to estimate conversion area over time, and this has improved the accuracy of reporting |
| L.5 | Land representation – $CO_2$, $CH_4$ and $N_2O$ (84, 2013) (97 and 98, 2012) Adherence to UNFCCC Annex I inventory reporting guidelines | Check the coherence of reported data on land-use areas reported in the NIR and those reported in the CRF tables, applying the appropriate QC checks | Not resolved. The lack of consistency between the NIR (table 6-6) and CRF table 4.E remains in the 2016 submission (see also L.23 in table 5) |
| L.6 | Land representation – $CO_2$ | Provide all estimates of land conversions to forest land, | Resolved. This has been resolved by applying the new |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | (85, 2013) (97, 2012) Transparency | cropland and grassland in a disaggregated manner | accounting framework |
| L.7 | Land representation – $CO_2$, $CH_4$, $N_2O$ (86, 2013) Transparency | Include information on how the different information data sources were harmonized and used to classify the territory in accordance with the IPCC land-use categories in a consistent manner | Resolved. In the NIR the United States provided information on resolution and on sample frequency of the United States Forest Service Forest Inventory and Analysis, National Program, the United States Department of Agriculture National Resources Inventory and the National Land Cover Dataset surveys (pp.6.13–6.18) (see also L.23 in table 5) |
| L.8 | 4.A.1 Forest land remaining forest land – $CO_2$ (88, 2013) (101, 2012) Accuracy | Conclude the technical work to implement an integrated approach for tracking land-use change and estimate the forest carbon stock and changes for each subcategory of LULUCF year by year, based on the most recent forest inventory data and remotely sensed land-use change information | Resolved. The United States has introduced a new accounting framework, which has increased the accuracy of the reporting, with the use of plot-level carbon density for each IPCC pool based on systematic field observation instead of on model predictions (see also L.26 in table 5) |
| L.9 | 4.A.1 Forest land remaining forest land – $CO_2$ (89, 2013) Consistency | Calculate the carbon stock values at two consecutive points in time in the same area when using the stock change method | Resolved. The United States clarified that it uses carbon stock data that has a land-use classification assigned for each forest and non-forest plot that is measured and uses the carbon stock difference method to estimate emissions and removals associated with the activity identified on the plots. Carbon stock has been estimated at two consecutive points in time in the same area |
| L.10 | 4.A.1 Forest land remaining forest land – $CO_2$ (90, 2013) Transparency | Make every effort to report the carbon stock changes in the mineral soils and organic soils pools separately | Not resolved. During the review, the United States stated that this issue has not yet been addressed. However, the Party expects that organic soil emissions will be minimal in forest land |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | | | remaining forest land |
| L.11 | 4.A.1 Forest land remaining forest land – $CO_2$ (91, 2013) (101, 2012) Accuracy | Conclude the technical approach to implement the integrated approach, based on models and empirical data, to track land-use change, and estimate the changes in soil organic carbon for each subcategory of LULUCF year by year based on the plot-level empirical data and forest floor information | Resolved. The United States has implemented a new methodology (tier 3) to calculate soil carbon stock changes at the plot level from agricultural land and forest land, and has provided the required information in the NIR (annexes 3.12 and 3.13) of the 2015 and 2016 submissions |
| L.12 | 4.B Cropland – $CO_2$, $CH_4$ and $N_2O$ (83, 2013) (108, 2012) Accuracy | Use more recent data as soon as possible | Addressing. In the NIR, the United States explained that data from National Resources Inventory in 2010 were used because newer data were not made available in time to incorporate the additional years into the inventory |
| L.13 | 4.B.1 Cropland remaining cropland – $CO_2$ (15 and 92, 2013) (25 and 106, 2012) Comparability | Reallocate emissions from urea fertilization to the category ammonia production (in the industrial processes sector) in accordance with the Revised 1996 IPCC Guidelines | No longer relevant. $CO_2$ emissions from urea application on agricultural lands have been correctly accounted under cropland remaining cropland |
| L.14 | 4.B.1 Cropland remaining cropland – $CO_2$ (93, 2013) (107, 2012) Completeness | Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series | Not resolved. Living biomass has not yet been estimated in cropland remaining cropland During the review, the Party explained that it plans to include herbaceous and perennial cropland biomass using the IPCC default carbon stock values and, depending on resources, it will develop country-specific carbon stock values in the next two to three years |
| L.15 | 4.E. Settlements – $CO_2$ (94, 2013) Accuracy | Eliminate the overlap between the urban forest inventory and the forest inventory | Not resolved. The United States explained this problem in the improvement plan in the NIR (p.6-84) (see also L.37 in table 5) |
| L.16 | 4.E.2 Land converted to settlements – $CO_2$ (95, 2013) (111, 2012) | Conduct research to develop a land-use change data set on land uses that are converted to settlements, and enhance the transparency of the reporting | Resolved. The United States has estimated AD for land converted to settlements in |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | Transparency | | table 6-7 of the NIR; however, emissions from all pools under land converted to settlements are still reported as "NE". In the NIR (p.6-86) the Party states that it is impossible to separate $CO_2$ fluxes in land converted to settlements from fluxes in settlements remaining settlements (see also L.39 in table 5) |
| L.17 | 4.H Other (LULUCF) – $CO_2$ (96, 2013) (112, 2012) Accuracy | Reflect the intersectoral linkages and document the differences in the decay values for yard trimmings and food scraps | Not resolved. The United States provided information on decay factors in the NIR and also introduced correction factors. However, it remains unclear to the ERT how the correction factors apply to the decay factors and, as such, how consistency with the waste sector is ensured |
| L.18 | 4 (V) Biomass burning – $CH_4$ and $N_2O$ (97, 2013) Consistency | Provide consistent information related to $CH_4$ and $N_2O$ emissions from biomass burning, in the NIR consistent with that contained in the annex, and strengthen QC procedures to avoid inconsistencies in the reporting between the CRF tables and the NIR | Resolved. The specific inconsistencies on biomass burning have been resolved; however, the NIR does not explicitly state that QC procedures have been put in place, and inconsistencies in other categories remain (see L.24, L.31 and L.38 in table 5) |
| L.19 | 4 (V) Biomass burning – $CH_4$ and $N_2O$ (98, 2013) Transparency | Present more transparent information to justify the use of the extra parameter of 92.8 per cent for estimating non-$CO_2$ emissions | Resolved. The United States does not use the extra adjustment factor of 92.8% in its method, which is explained in the NIR of the 2016 submission |
| L.20 | 4.D.1 Wetlands remaining wetlands – $CO_2$ (99, 2013) (118, 2012) Transparency | Improve the consistency between the NIR and the CRF tables and report the areas and the emission estimates in CRF tables 5.D and 5(II) | Resolved. There are no inconsistencies between the NIR and the CRF tables |
| Waste | | | |
| W.1 | 5. General (waste) – $CO_2$, $CH_4$ and $N_2O$ | Provide descriptions of the waste management practices used in the country to improve the transparency | Resolved. A description is provided in the NIR |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| | (101 and 102, 2013)<br>(123, 2012)<br>Transparency | | (pp.7-13–7-14). However, there is another issue related to the information (see W.9 in table 5) |
| W.2 | 5.A Solid waste disposal on land – $CH_4$<br>(103, 2013)<br>(124, 2012)<br>Accuracy | Report on the trend of total waste generated, provide explanations, and revise the data, if necessary | Addressing. Some information is provided in the NIR (p.7-14) (see also W.10 in table 5) |
| W.3 | 5.A Solid waste disposal on land – $CH_4$<br>(101 and 104, 2013)<br>(125, 2012)<br>Accuracy | Revise the estimates of emissions from solid waste disposal on land by incorporating the revised DOC values into the emission estimation | Addressing. The United States reports some effort to address the issue in the NIR (e.g. revision of the DOC value for landfilled pulp and paper on p. 7-11). However, during the review, the Party confirmed that the constant value is used in the entire time series. The ERT considers that if a constant value is used, the emission estimation does not capture the changing waste composition over the time series |
| W.4 | 5.A Solid waste disposal on land – $CH_4$<br>(104, 2013)<br>(125, 2012)<br>Transparency | Report the composition of waste landfilled, with the amounts/shares and corresponding coefficients, including DOC | Addressing. No relevant information on the composition of waste landfilled is provided in the NIR. In the NIR (p.7-8), the United States explains that the information on the amount and composition of waste placed in every MSW and industrial waste landfill for each year of a landfill's operation is not available. In the NIR (p.7-9), the Party also reports that it is currently compiling the waste composition studies and data that have been performed in the past decade and may revise the default waste composition applied to MSW landfilled in the FOD model in future inventory estimates |

| *ID#* | *Issue classification*[a] | *Recommendation made in previous review report*[b] | *ERT assessment and rationale* |
|---|---|---|---|
| W.5 | 5.D.2 Industrial wastewater – $CH_4$ (105, 2013) Completeness | Include information on the non-estimation of $CH_4$ emissions from sludge under industrial wastewater | Not resolved. No information is provided in the NIR. During the review, the United States explained that continuous efforts are under way to ensure the completeness of the Party's inventory |
| W.6 | 5.D.1 Domestic wastewater – $CH_4$ (106, 2013) (127, 2012) Transparency | Enhance QC procedures to avoid the inconsistencies between the NIR and CRF table 6.B | Resolved. The inconsistencies between the NIR and CRF table 6.B has been addressed |
| W.7 | 5.D.1 Domestic wastewater – $N_2O$ (107, 2013) Accuracy | Make efforts to collect country-specific data on annual per capita protein intake for the years 2005–2012 to estimate emissions of $N_2O$ from human sewage | Resolved. Data on annual per capita protein intake published in 2016 were provided by the United States Department of Agriculture Economic Research Service. Protein consumption data for the years 2011–2014 were extrapolated from data for the years 1990–2010 |
| W.8 | 5.C.1 Waste incineration –$CH_4$ and $N_2O$ (101 and 108, 2013) Completeness | Make efforts to collect the necessary AD for the emission estimation of $CH_4$ and $N_2O$ from non-hazardous industrial waste and medical waste incineration, and to include these estimates in future inventory submissions, providing all necessary explanations in the NIR | Not resolved. In the NIR (p.7-32) the Party indicated that data are not readily available to estimate emissions from incineration of non-hazardous industrial waste, while annual emissions from medical waste incineration would be below 500 kt $CO_2$ eq. During the review, no justification was provided for the insignificance of emissions from medical waste (see also W.16 in table 5) |

*Abbreviations*: AD = activity data, ARR = annual review report, CEFM = cattle enteric fermentation model, CRF = common reporting format, DOC = degradable organic carbon, DOM = dead organic matter, EIA = United States Energy Information Administration, EF = emission factor, EPA = United States Environmental Protection Agency, ERT = expert review team, FOD = first order decay, GHG = greenhouse gas, GHGRP = Greenhouse Gas Reporting Program of the EPA, IE = included elsewhere, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPPU = industrial processes and product use, LUC = land-use change, LULUCF = land use, land-use change and forestry, MSW = municipal solid waste, N = nitrogen, NA = not applicable, NE = not estimated, NEU = non-energy use, Nex = nitrogen excretion, NIR = national inventory report, QA/QC = quality assurance/quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, SOC = soil organic carbon, UNFCCC Annex I inventory 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 greenhouse gas inventories", VS = volatile solids, 2006 IPCC Guidelines = 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) where the issue was raised. Issues are further classified as defined in decision 13/CP.20, annex, paragraph 81.

[b] For the United States, the review of the 2016 inventory submission is being held in conjunction with the review of the 2015 inventory submission, and as such, the 2015 annual review report was not available at the time of this review. In addition, the United States was also not subject to an individual inventory review in 2014. Therefore, the recommendations reflected in table 3 are from the 2013 annual review report. For the same reason, the years 2014 and 2015 are excluded from the list of years in which the issue has been identified.

# IV. Issues identified in three successive reviews and not addressed by the Party

8. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2016 inventory submission of the United States, and have not been addressed by the Party.

Table 4
**Issues identified in three successive reviews and not addressed by the United States of America**

| *ID#*[a] | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[b] |
|---|---|---|
| General | | |
| G.1* | Improve the completeness of the inventory, in particular for those categories for which there are methodologies in the IPCC Guidelines for the national greenhouse gas inventories | 3 (2012–2015/2016) |
| Energy | | |
| E.1 | Include information on the progress made in the plan to use GHGRP data to: develop more accurate national EFs based on plant-specific measurements; estimate emissions for more detailed categories and subcategories; disaggregate energy consumption data based on the facility-level reporting, and indicate which data have been sourced from GHGRP and which from other sources | 3 (2012–2015/2016) |
| E.2* | Collect the necessary AD and EFs to prepare emission estimates for the combustion of biomass and other fuels for these categories, including those used in the United States territories, focusing resources, as appropriate, on improvements in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, and report the corresponding emissions | 3 (2012–2015/2016) |
| E.4 | Report emissions from all categories and for the full time series at the most disaggregated level, in line with the UNFCCC Annex I inventory reporting guidelines, in particular for manufacturing industries and construction and fugitive emissions | 3 (2012–2015/2016) |

| *ID#*[a] | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[b] |
|---|---|---|
| E.5 | Provide a more transparent clarification of how the difference in emissions between the reference and the sectoral approaches is determined and which fuels are subtracted as NEU and feedstocks | 3 (2012–2015/2016) |
| E.7 | Report only emissions from fuels combusted for the use of energy under fuel combustion, and reallocate the relevant emissions currently reported under the subcategory NEU (other) and part of the fuel used under the subcategory United States territories (other) | 3 (2012–2015/2016) |
| IPPU | | |
| I.1* | Improve the completeness of the inventory, in particular for $CO_2$ emissions from calcium carbide production | 3 (2012– 2015/2016) |
| I.9 | Include a clear explanation of how natural gas used as fuel in coke plants in the iron and steel production process is reflected in the emission estimates within the inventory and in the carbon balance for activities related to iron and steel production | 3 (2012– 2015/2016) |
| Agriculture | | |
| A.8 | Resolve the inconsistency in the total N excretion on pasture, range and paddock between CRF table 4.B(b), $N_2O$ emissions from manure management, and CRF table 4.D, agricultural soils | 3 (2012–2015/2016) |
| A.9 | Improve QC procedures to avoid inconsistencies in the total N excretion on pasture, range and paddock between CRF tables 4.B(b) and 4.D and provide information on these improvements | 3 (2012–2015/2016) |
| LULUCF | | |
| L.1* | Estimate emissions from the carbon stock changes from mineral soils under forest land, living biomass under cropland and grassland, DOM under land converted to cropland and land converted to grassland, land converted to wetlands, SOC under land converted to settlements and land converted to other land; $N_2O$ emissions from disturbance associated with land-use conversion to cropland; $CH_4$ and $N_2O$ emissions from biomass burning (land converted to forest land, cropland, grassland and wetlands); and $CO_2$ emissions from biomass burning (excluding forest land remaining forest land) | 3 (2012–2015/2016) |
| L.3* | Include all managed federal lands in the inventory and improve the consistency of the time series of national areas and report on the achievements made | 3 (2012–2015/2016) |
| L.5 | Check the coherence of reported data on land-use areas reported in the NIR and those reported in the CRF tables, applying the appropriate QC checks | 3 (2012–2015/2016) |
| L12* | Use more recent data as soon as possible | 3 (2012–2015/2016) |
| L.14* | Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series | 3 (2012–2015/2016) |
| L.17* | Reflect the intersectoral linkages and document the differences in the decay values for yard trimmings and food scraps | 3 (2012–2015/2016) |
| Waste | | |

| | | |
|---|---|---|
| W.2* | Report on the trend of total waste generated, provide explanations, and revise the data, if necessary | 3 (2012–2015/2016) |

| *ID#*[a] | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[b] |
|---|---|---|
| W.3* | Revise the estimates of emissions from solid waste disposal on land by incorporating the revised DOC values into the emission estimation | 3 (2012–2015/2016) |
| W.4 | Report the composition of waste landfilled, with the amounts/shares and corresponding coefficients, including DOC | 3 (2012–2015/2016) |

*Abbreviations*: AD = activity data, CRF = common reporting format, DOC = degradable organic carbon, DOM = dead organic matter, EF = emission factor, GHGRP = Greenhouse Gas Reporting Program of the United States Environmental Protection Agency, IPCC good practice guidance = *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPPU = industrial processes and product use, LUC = land-use change, LULUCF = land use, land-use change and forestry, N = nitrogen, NEU = non-energy use, NIR = national inventory report, QC = quality control, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, SOC = soil organic carbon, UNFCCC Annex I inventory 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 greenhouse gas inventories".

[a] An asterisk is included after any issue ID# where the underlying issue is related to accuracy or completeness of a key category, a missing category or a potential key category, as indicated in decision 13/CP.20, annex, paragraph 83.

[b] For the United States, the review of the 2016 inventory submission is being held in conjunction with the review of the 2015 inventory submission. Since the reviews of the 2015 and 2016 inventory submissions are not "successive" reviews, but are rather being held in conjunction, for the purpose of counting successive years in table 4, 2015/2016 are considered as one year. In addition, the United States was also not subject to an individual inventory review in 2014. Therefore, 2014 is excluded from this table. The ERT noted that this table 4 is the same as table 4 in the 2015 ARR for the United States, modified to reflect the combined 2015/2016 review.

# V. Additional findings made during the 2016 technical review

9. Table 5 contains findings made by the ERT during the technical review of the 2016 inventory submission of the United States that are additional to those identified in table 3 above.

Table 5
**Additional findings made during the 2016 technical review of the inventory submission of the United States of America[a]**

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
|---|---|---|---|
| General | | | |
| G.9 | QA/QC and verification | The Party submitted revised CRF tables (version 4) for its 2016 submission on 2 September 2016, explaining this as an attempt to address the data import issues encountered during submission in April 2016 (this submission included the initial CRF tables). However, the ERT noted that some inconsistencies still exist between the NIR and the CRF tables (version 4) as well as within the NIR (see, for example, I.13, I.14, A.11, A.15, L.21, L.22 and W.11 below). In response to further questions raised by the ERT during the review, the Party stated that the issues with data import to CRF Reporter are under investigation so as to improve the consistency of the CRF tables with the NIR. The Party also provided the ERT with documentation and screenshots of the challenges encountered in testing CRF Reporter prior to submission in April 2016.<br><br>The ERT encourages the Party to continue these investigations and update QA/QC procedures that are relevant for the latest CRF Reporter software to further improve the consistency of its reporting in the NIR and the CRF tables | Not an issue |
| G.10 | Inventory management | The ERT notes that some of the follow-up questions sent during the review week (regarding the agriculture, LULUCF and waste sectors) were answered by the Party six days after the review week or not answered during the review (see, for example, I.13, I.27, and L.24 below). The ERT considers that this has limited its ability to fully assess whether the Party is adhering to the UNFCCC Annex I inventory reporting guidelines<br><br>Noting paragraph 27(c) of the UNFCCC Annex I inventory reporting guidelines, the ERT encourages the Party to ensure that sufficient resources are available to respond in a timely manner to ERT questions during the review week | Not an issue |
| Energy | | | |
| E.12 | 1.A. Fuel combustion – sectoral approach – all fuels – $CO_2$, $CH_4$ and $N_2O$ | As indicated in E.2 (table 3), the ERT found that a number of categories in the 2016 inventory submission continue to be reported as "NE" owing to a lack of relevant AD. There has been an improvement in that the number of categories reported as "NE" by the United States over the last three reviews has been reduced. The ERT recognizes that the United States is working to address these issues and continue these efforts. However, the following categories are still reported as "NE": $CO_2$, $CH_4$ and $N_2O$ emissions from gaseous fuel use in railways and navigation; $CH_4$ and $N_2O$ emissions from the use of biomass in other, under the category stationary fuel combustion (for which the United States territories are not fully | Not an issue |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
|---|---|---|---|
| | | covered); and $N_2O$ emissions from oil flaring under the category venting and flaring (1.B.2.c). In addition, "IE" is reported for the consumption of fuels (e.g. biomass for the subcategory manufacture of solid fuel (1.A.1.c.i) and consumption of liquid, solid, gaseous and biomass fuels under other energy industries (1.A.1.c.iii) under the category manufacture of solid fuels and other energy industries (1.A.1.c), and the Party explained that data are not available to estimate fuel consumption separately from fuel consumption for the category public electricity and heat production (1.A.1.a)<br><br>Noting the recommendations made in previous review reports that the United States collect the necessary AD and EFs to prepare emission estimates for these categories (see E.2 in table 3), further recommendations to some specific categories under the energy sector are made in this table | |
| E.13 | 1.A. Fuel combustion – sectoral approach – all fuels – $CO_2$, $CH_4$ and $N_2O$ | Previous review reports have noted that the inventory for the energy sector of the United States is not sufficiently transparent, given that emissions from consumption of all fuel types for some categories were aggregated and reported under the subcategory other, under manufacturing industries and construction. During the review, the United States pointed out that it has reported disaggregated emissions to the extent possible given the break in data collection by industrial classification with currently available data. The Party also indicated that some of the emissions under transport (1.A.3), for example emissions from heavy-duty trucks and buses, are disaggregated in the CRF tables of the Party's 2016 submission<br><br>Referring to the recommendation in previous review reports that the Party estimate emissions from all categories and for the full time series at the most disaggregated level, in line with the UNFCCC Annex I inventory reporting guidelines, the ERT recommends that the Party report disaggregated categories to the level where the EFs are distinguished (e.g. heavy-duty trucks and buses under road transport, referred to in E.14 below, and also the categories and subcategories referred to in E.2, E.4 and E.8 in table 3 and E.18 below) | Yes. Transparency |
| E.14 | 1.A.3.b Road transportation – liquid fuels – $CO_2$ | The NIR states that the number of vehicle miles travelled by light-duty motor vehicles (passenger cars and light-duty trucks) increased by 37% from 1990 to 2014 as a result of a confluence of factors, including population growth, economic growth, urban sprawl and periods of low fuel prices. However, the $CO_2$ emissions from light-duty trucks have remained almost the same during this period. One of the reasons provided by the Party in response to a question raised by the ERT during the review is an increased share of new vehicles in the respective total stocks, resulting in better fuel economy of the respective vehicular stock. However, these details are not provided in the NIR. During the review, the United States also provided additional information on penetration, sales and fuel efficiency of new road vehicles over the years. The ERT considered that this helps to clarify the downward trends to a certain | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | extent<br><br>The ERT recommends that the United States reference data provided in annex 3.2 to the NIR when discussing trends in $CO_2$ emissions from road transportation by vehicle mode and provide more information on the national average fuel economy for each major road transport mode at a disaggregated level where the EFs (e.g. passenger cars, light-duty trucks, heavy-duty trucks, buses) are distinguished for each inventory year | |
| E.15 | 1.A.3.b Road transportation – liquid fuels – $CH_4$ and $N_2O$ | $N_2O$ emissions from road transport are a key category for the United States in 2014. The ERT noted that the IEFs for $N_2O$ emissions from gasoline have consistently declined from 8.78 kg/TJ in 1990 to 2.55 kg/TJ in 2014. Similarly, the IEFs for $CH_4$ emissions have consistently declined from 14.55 kg/TJ in 1990 to 3.57 kg/TJ in 2014. The reasons for this are not transparently explained in the NIR. During the review, the Party provided additional information on penetration, sales and fuel efficiency of new road vehicles over the years of the inventory. The ERT considered that this helps to clarify the downward trends to a certain extent<br><br>The ERT recommends that, in order to improve the transparency of its reporting, the Party reference data in annex 3.2 when discussing trends in $CH_4$ and $N_2O$ emissions from road transportation by vehicle mode and provide information on penetration, sales and fuel efficiency of new road vehicles over the years of the inventory in its NIR to demonstrate the decrease in $CH_4$ and $N_2O$ emissions is due to an increase in VMT percentage by vehicles with lower emission factors (i.e. LEV and EPA tier 2) | Yes. Transparency |
| E.16 | 1.A.3.c Railways – gaseous fuels – $CO_2$, $CH_4$ and $N_2O$ | In CRF table 9, the United States has used the notation key "NE" with the explanation: "It is unlikely that gaseous fuels are used by railways, but if small uses occur this fuel use is reported under the aggregated commercial category". The ERT noted that, in the absence of any further information, this explanation is not sufficiently transparent to allow the ERT to consider whether the Party should be using the notation key "NE" or "IE" (i.e. included in the subcategory commercial/institutional under other sectors, as reported in CRF table 9) (see also E.4 in table 3)<br><br>The ERT recommends that the Party provide an explanation as to why $CO_2$, $CH_4$ and $N_2O$ emissions from gaseous fuels used in railways have not been estimated in both the NIR and CRF table 9, in accordance with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines and in a transparent manner. Further, the ERT recommends that, if the emissions from the small uses of gaseous fuels are considered to be insignificant, the Party provide in the NIR justification for the exclusion in terms of the likely level of emissions, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| E.17 | 1.A.3.d Domestic navigation – gaseous fuels – $CO_2$, $CH_4$ and $N_2O$ | In CRF table 9, the United States has used the notation key "NE" with the explanation: "It is unlikely that gaseous fuels are used by shipping, but if small uses occur this fuel use is reported under the aggregated commercial category". The ERT noted that, in the absence of any further information, this explanation is not sufficiently transparent to allow the ERT to consider whether the Party should be using the notation key "NE" or "IE" (i.e. included in the subcategory commercial/institutional under other sectors, as reported in CRF table 9)<br><br>The ERT recommends that the Party provide an explanation as to why $CO_2$, $CH_4$ and $N_2O$ emissions from gaseous fuels used by shipping have not been estimated in both the NIR and CRF table 9, in accordance with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines and in a transparent manner. Further, the ERT recommends that, if the emissions from the small uses of gaseous fuels are considered to be insignificant, the Party provide in the NIR justification for the exclusion in terms of the likely level of emissions, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines | Yes. Transparency |
| E.18 | 1.A.5. Other (not specified elsewhere) – liquid, solid and gaseous fuels – $CO_2$ | The United States reported aggregated data and emissions from NEU of liquid fuels, solid fuels and gaseous fuels under Other (1.A.5). In the NIR, the Party explains that the consumption data of fuels have been adjusted to subtract those relating to industrial processes and product use, which are reported under the IPPU sector, and NEU which are reported under Other (1.A.5). The ERT noted that, in a footnote in the NIR, the Party explained "some degree of double counting may occur between these estimates of NEU of fuels and process emissions from petrochemical production presented in the IPPU sector". Further, the Party explained, in the same footnote, "data integration is not feasible at this time as feedstock data from EIA used to estimate NEU of fuels are aggregated by fuel type, rather than disaggregated by both fuel type and particular industries (e.g. petrochemical production), as currently collected through GHGRP and used for the petrochemical production category"<br><br>Noting that, according to the 2006 IPCC Guidelines, only emissions from fuels combusted for the use of their energy should be reported under fuel combustion, the ERT recommends that the Party reallocate the emissions from NEU of fuels and process emissions currently reported under the subcategory NEU (other) under the energy sector to the relevant categories under the energy and IPPU sectors in order to avoid underestimation or overestimation of emissions | Yes. Comparability |
| E.19 | 1.B Fugitive emissions from fuels – $CO_2$ | The United States reported $CO_2$ fugitive emissions from coal mining and natural gas exploration as "NE", and "IE" is reported for oil exploration, in CRF tables 1.B.1 and 1.B.2. In CRF table 9, the Party indicated that emissions from these categories are not estimated because of difficulties in obtaining data, and the inclusion of emissions from these categories will be investigated for future inventories. During the review, the Party further informed the ERT that $CO_2$ emissions from exploration is included in production emissions, and due to | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | overlap in exploration and production data and emissions sources, these emissions will continue to be reported in production<br><br>The ERT recommends that the Party correct the notation key for $CO_2$ emissions from the natural gas exploration (from "NE" to "IE") to reflect that those emissions are included in the $CO_2$ from natural gas production | |
| E.20 | 1.B.2.c Venting and flaring – $CO_2$ and $CH_4$ | The United States used the notation key "IE" for $CO_2$ and $CH_4$ emissions from venting and flaring activities under the category venting and flaring (1.B.2.c), and included the emissions under the fugitive subcategories of oil (1.B.2.a) and gas (1.B.2.b). However, the ERT noted that, in the NIR, the Party reports that the vented $CH_4$ and $CO_2$ emissions account for a large portion of the emissions from production operations. For example, it is indicated in the NIR that the flare emissions from crude oil refining accounts for slightly more than 94% of the total $CO_2$ emissions in petroleum systems. NIR tables 3-36 to 3-39 present the values for $CO_2$ and $CH_4$ emissions from various venting operations in petroleum systems. During the review, the Party explained that data are unavailable to estimate the split between venting, flaring and fugitives for these sources<br><br>Noting that the Party indicates that $CH_4$ emissions from petroleum systems is a key category, the ERT recommends that the United States enhance the transparency in reporting these emissions in accordance with the UNFCCC Annex I inventory reporting guidelines | Yes. Transparency |
| E.21 | 1.C Carbon dioxide transport and storage – $CO_2$ | In the NIR (p. 3-67), the Party explained that facilities conducting geologic sequestration of $CO_2$ are required to develop and implement an EPA-approved site-specific monitoring, reporting and verification plan, and to report the amount of $CO_2$ sequestered using a mass balance approach. The Party further explains that available GHGRP data relevant for this inventory estimate consists of national-level annual quantities of $CO_2$ captured and extracted for EOR applications for 2010 to 2014. Table 3-44 in the NIR provide the amount of potential emissions from $CO_2$ capture and extraction for EOR operations. However, the United States reported $CO_2$ emissions from $CO_2$ transport, injection and storage as "NE", explaining that preliminary data were used to develop an estimate of potential emissions from this category, and that the availability of data to estimate emissions from this category continues to be evaluated for inclusion in future inventories. During the review, the United States explained that $CO_2$ emissions are currently included in the sections on natural gas systems and ammonia production of the NIR<br><br>The ERT recommends that the United States update the notation key from "NE" to "IE" to address how emissions from $CO_2$ transport injection and storage are estimated | Yes. Completeness |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| IPPU | | | |
| I.13 | 2. General (IPPU) – all gases | The ERT noted that the information provided in the CRF tables and the NIR on recalculations was inconsistent. Data presented in the NIR (table 9-1) did not match the data presented within the CRF tables (e.g. table 8.s.1 and 8.s.4) for several IPPU categories. For example, CRF table 8.s.4 reports 2013 recalculations for HFC emissions from 2.F.4 aerosols, and recalculations from an unspecified mix of HFCs and PFCs from 2.F.6 other applications, but neither of these recalculations is referenced in NIR table 9-1. The ERT also noted typographical errors in the recalculations table (table 9.1) in the NIR and also in the completion of CRF table 2(I).A-Hs1 (interchanging of rows of production data in 2.B). During the review, the United States indicated that it has experienced multiple problems in importing data into the new CRF Reporter software. However, the Party did not respond to questions regarding the errors in the NIR and a request for revised recalculations data. As a result, the ERT was not provided with a full and transparent description of the recalculations in the 2016 submission, and hence was unable to review the rationale and accuracy of recalculations in the IPPU sector<br><br>The ERT recommends that the Party report full and detailed explanations of all recalculations to IPPU categories in the NIR, and provide information on changes to methods, assumptions, AD and EFs across all years as well as the rationale for the recalculations | Yes. Transparency |
| I.14 | 2. General (IPPU) – $CO_2$ | Annex 2 to the NIR (p.A-31) describes the derivation of petroleum coke energy and NEU allocations; petroleum coke use in the IPPU sector is subtracted from the overall energy balance, based on reported AD estimates for five IPPU categories. However, in CRF tables 1.A(b) and 1.A(d) the "carbon excluded" for petroleum coke is reported as "NO". This is not consistent with the information in annex 2 to the NIR and within the IPPU chapter, which indicate that petroleum coke is used in several emissive non-energy applications. During the review, the United States provided a time series of the adjustments made to the energy data for petroleum coke use in the production of titanium dioxide, silicon carbide, aluminium, ferroalloys and ammonia. The Party also noted that it had experienced multiple problems importing data into the new CRF Reporter software<br><br>The ERT recommends that the Party correct the reference approach calculations for petroleum coke in accordance with the 2006 IPCC Guidelines, and report the relevant information in a consistent way in the energy and IPPU chapters of the NIR and in the CRF tables. The ERT also encourages the Party to improve its QA/QC of the reference approach calculations for all commodities in the IPPU sector where emissive non-energy applications are evident. The ERT also recommends that, to improve the transparency of the data sources and data checks conducted, the Party include the information provided to the ERT during the | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | review week, including the adjustments made to the energy data for petroleum coke use in the production of titanium dioxide, silicon carbide, aluminium, ferroalloys and ammonia, in future submissions | |
| I.15 | 2. General (IPPU) – all gases | The ERT noted that the inventory of the United States is not complete, because there are categories that are not estimated and the NIR referred to gaps in the inventory. The ERT also noted that the list of sources "not included" in the inventory for the IPPU sector presented in annex 5 to the NIR is inconsistent with the information presented in CRF table 9. For example, CRF table 9 lists categories that are not mentioned in annex 5 to the NIR, in particular: $CO_2$ from iron and steel pellet production; $CO_2$ from ceramics production; $CO_2$ from non-metallurgical magnesium production; $SF_6$ from other product use; HFCs and $SF_6$ from photovoltaics and heat transfer fluids; and PFCs from other product use. Furthermore, the ERT notes that the NIR does not include the justification required by paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines for the following categoriesthat are reported as "NE": $CH_4$ from direct reduced iron; $CO_2$ from ceramics and non-metallurgical magnesium production; $CO_2$ from iron and steel pellet production; and $N_2O$ from glyoxal and glyoxylic acid production. The ERT further noted that, in the NIR, the United States indicates the estimation of F-gases from heat transfer fluids and the GHG emissions from pellet production as the priorities of the planned improvements | Yes. Completeness |
| | | The ERT recommends that the Party estimate and report emissions from those categories currently reported as "NE" in the next submission to improve completeness and consistency of the inventory. When the Party continues to report any of those categories as "NE" because of a disproportionate amount of effort needed to obtain the GHG emission estimates from them, the ERT encourages the Party to justify in its NIR the reasons for not estimating those categories in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines | |
| I.16 | 2.A.1 Cement production – $CO_2$ | The ERT notes that cement production estimates are based on a tier 2 method, applying a country-specific EF based on the judgment of the USGS minerals commodity expert for cement, who confirmed the country-specific EF to be a reasonable assumption. In previous submissions, the United States had indicated that, from 2015 onwards, GHGRP data would be available for use in the estimation method for this key category in order to improve accuracy. However, the ERT noted that this potential improvement has not yet been implemented. In the NIR 2016, the Party indicated that this is because of the prevalent use of Continuous Emission Monitoring Systems by cement facilities in reporting combined energy and process emissions to GHGRP. The Party further explained that the combined reporting of combustion and process emissions by operators makes it difficult to disaggregate GHGRP | Not an issue |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | data to develop a country-specific EF to be used to derive emission estimates for cement process emissions that meet the reporting requirements of the 2006 IPCC Guidelines<br><br>The ERT encourages the United States to prioritize improvements to this key category, continuing with efforts to analyse GHGRP data and consult with industry experts to develop more accurate emission estimates and/or to validate the use of (1) the country-specific EF applied and (2) the assumptions and default factor for cement kiln dust applied, and report on progress in the next submission | |
| I.17 | 2.A.4 Other process uses of carbonates – $CO_2$ | The ERT noted that the NIR describes several difficulties in accessing accurate and complete AD for this key category, primarily from the USGS statistical publications, including: extensive reporting of "unspecified uses" for crushed stone (limestone and dolomite); suppression of confidential data on limestone and dolomite end uses; and no data available for limestone and dolomite use in production of ceramics and non-metallurgical magnesium. As a result, the ERT notes that: (1) emissions from ceramics and non-metallurgical magnesium production are reported as "NE"; and (2) the derivation of complete and accurate AD for other emissive uses of limestone and dolomite is subject to considerable uncertainty, as evidenced by the large recalculation of 2013 data. For example, the estimated AD for total limestone and dolomite use in this category in 2013 reported in the 2016 submission are 220% higher than those in the 2015 submission, and the emissions for this category for 2013 are 235% higher in the 2016 submission than in the 2015 submission<br><br>During the review, the United States stated that EPA has assessed data availability but has not found alternative sources of data for carbonate consumption in the country. The Party also stated that GHGRP data at the facility level are incomplete and rarely include carbonate consumption by type, and that EPA will continue its efforts to work with USGS on opportunities to improve existing surveys and to seek alternative data sources<br><br>The ERT recommends that the Party conduct further research and consultation with industry, state-level regulators and/or statistical agencies to access additional AD and EFs and/or to seek verification of the current method and assumptions, and report on progress in the NIR. The ERT further encourages the Party to improve institutional frameworks (e.g. implementing data supply agreements) to secure access to more complete, accurate AD, through coordination with agencies such as USGS (e.g. to gain access to confidential data for the purposes of national inventory compilation) and state-level regulators, and/or to consult with trade associations and plant operators to obtain production or plant capacity data | Yes. Completeness |
| I.18 | 2.B.1 Ammonia production – $CO_2$ | The ERT noted that in the NIR, the United States indicates that all emissions from fuels consumed for energy purposes during ammonia production are accounted for in the energy | Yes. Comparability |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | sector. During the review, the Party explained that it uses a country-specific approach to estimate the $CO_2$ emissions from ammonia production to avoid double counting, consistent with paragraphs 10 and 11 of UNFCCC Annex I inventory reporting guidelines. The ERT also noted that this is not consistent with the 2006 IPCC Guidelines, which state, "in the case of ammonia production no distinction is made between fuel and feedstock emissions with all emissions accounted for in the IPPU sector" (volume 3, Chapter 3, section 3.2.2). The ERT further noted that the IEF for ammonia production (0.90 t/t) is one of the lowest of all reporting Parties (range: 0.06–3.27 t/t). The ERT is of the view that it is likely that this category will be identified as key by a level assessment, if the allocation of emissions is performed in accordance with the 2006 IPCC Guidelines<br><br>The ERT noted that the NIR indicates planned work to determine which EFs to include in both fuel and feedstock $CO_2$ emissions, and to improve the accuracy of the emission estimates based on the enhanced use of the GHGRP data<br><br>The ERT recommends that the Party provide the information, in both IPPU and energy chapters, on the country-specific approach used to estimate $CO_2$ emissions from ammonia production, justify the reason for its methodological choice and explain why it is unable to implement the estimates following the 2006 IPCC Guidelines as outlined in paragraph 11 of UNFCCC Annex I inventory reporting guidelines | |
| I.19 | 2.B.1 Ammonia production – $CO_2$ | In addition to the above finding in ID# I.18 above, the ERT noted that, during the review, the United States indicated that it is working with appropriate energy data (EIA) institutions and GHGRP to obtain the necessary data to improve the country-specific approach and enhance its consistency with the 2006 IPCC Guidelines. The ERT commends the Party for the planned improvements and recommends that the Party allocate emissions from all fossil fuel uses (i.e. fuel and feedstock use) for ammonia production under subcategory 2.B.1 of the IPPU sector in accordance with the 2006 IPCC Guidelines. The ERT encourages the Party to continue its efforts to improve the accuracy of the country-specific EFs applied, and to avoid gaps or double counting in the energy balance data for fossil fuels used in ammonia production (see also I.27 below) | Yes. Transparency |
| I.20 | 2.B.4 Caprolactam, glyoxal and glyoxylic acid production – $CO_2$ and $N_2O$ | The ERT noted that all subcategories under this category are reported as "NE". However, international statistical data[c] indicate that the United States is potentially one of the largest producing countries for caprolactam. During the review, the Party indicated that the EPA has reviewed data availability and obtained annual production data on caprolactam for 2004 to 2015 from the American Chemistry Council<br><br>The ERT recommends that the Party estimate emissions from caprolactam production in accordance with the method provided in the 2006 IPCC Guidelines and with the use of | Yes. Completeness |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | available AD, and report on the emissions from this category in its next inventory submission | |
| I.21 | 2.B.5 Carbide production – $CO_2$ and $CH_4$ | The ERT noted that emissions from calcium carbide production are reported as "NE", although the lack of emission estimates for this category has been the subject of recommendations in all review reports since 2008. During the review, the ERT provided information on calcium carbide production plants in the United States based on public domain data from the United States Chemical Safety and Hazard Investigation Board report of February 2013. The Party stated that the existing statistical and trade publications do not include national time-series data on calcium carbide production, however, some recent literature references were identified during the compilation of the 2015 NIR that provide some information on potential calcium carbide production at specific facilities in the country (including information cited by the ERT and information on associated facilities that had closed)<br><br>The ERT recommends that the Party progress with research and consultation (e.g. with regulators, plant operators, statistical agencies) to obtain AD (e.g. based on reported production capacities for the known operating plant) and report emission estimates based on methods consistent with the 2006 IPCC Guidelines across the time series | Yes. Completeness |
| I.22 | 2.B.8 Petrochemical and carbon black production – $CH_4$ and $N_2O$ | The ERT noted that the NIR 2016 (chapter 4.12) indicates that a subset of facilities reporting under GHGRP use alternative methods to the carbon balance approach (e.g. Continuous Emission Monitoring Systems or other engineering approaches) to monitor $CO_2$ emissions, and that these facilities are required to report $CH_4$ and $N_2O$ emissions as well. However, the ERT noted that $CH_4$ and $N_2O$ from combustion and flaring are currently not included in the national inventory estimates. During the review, the United States explained that the EPA coordinator for the IPPU inventory has requested the provision of aggregated and quality-checked data on $CH_4$ and $N_2O$ emissions where reported from the GHGRP coordinator, with a view to integrating these data in future submissions to improve the completeness of national inventory estimates<br><br>The ERT recommends that the Party progress its plans to analyse GHGRP data and include emissions from those installations not currently included in the inventory | Yes. Completeness |
| I.23 | 2.B.8 Petrochemical and carbon black production – $CO_2$ and $CH_4$ | The ERT noted that, according to the NIR (p.4-45), tier 1 methods are used to estimate emissions from the production of acrylonitrile and methanol, and that the aggregation of facility-level GHGRP data for inventory estimates has not yet been progressed owing to the limited number of production plants and consequential commercial confidentiality concerns<br><br>The ERT encourages the United States either to use GHGRP data to improve the accuracy of the submission for these categories, while protecting the data confidentiality (e.g. by | Not an issue |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | reporting emissions in the NIR aggregated across products and only providing product-specific data to ERTs), or to use GHGRP data to validate the use of tier 1 default EFs and report on a comparison of the tier 1 estimates and GHGRP data in the NIR to the extent that the inclusion of comparison in the NIR will not reveal information considered confidential | |
| I.24 | 2.B.8 Petrochemical and carbon black production – $CO_2$ and $CH_4$ | The ERT noted that the NIR 2016 (chapters 3.2 and 4.12) highlights that the United States inventory currently may include double counting of emissions between NEU of fuels in the energy sector and petrochemical production in the IPPU sector. The NIR (p.3-40) transparently states that data integration (i.e. between the energy balance, GHGRP data and the GHG inventory) is not feasible because the EIA data on feedstock (i.e. NEU data) within the energy balance are presented by commodity only, with no resolution of data by industry sector (such as petrochemical production), whereas GHGRP data provide feedstock type for each installation only, and not the AD that underpin reported emissions. The ERT noted that emissions from fuels and feedstocks used for energy purposes are accounted for in the energy sector (NIR p.4-42), which is not consistent with the 2006 IPCC Guidelines (volume 3, chapter 3, section 3.9.1, "allocation and reporting"), and therefore that the estimates for petrochemical production emissions are not comparable with those of other reporting Parties<br><br>The ERT recommends that, in both the IPPU and energy chapters of the NIR, the Party provide information on the country-specific approach used to estimate $CO_2$ emissions from petrochemical production, justify the reason for its methodological choice and explain why it was unable to implement the estimates following the 2006 IPCC Guidelines as outlined in paragraphs 10 and 11 of the UNFCCC Annex I inventory reporting guidelines | Yes. Transparency |
| I.25 | 2.B.8 Petrochemical and carbon black production – $CO_2$ and $CH_4$ | In addition to the recommendation in ID# I.24 above, the ERT further recommends that the Party develop a methodology that is consistent with the 2006 IPCC Guidelines as soon as is practicable, allocating all relevant fuel and feedstock emissions within the IPPU sector<br><br>Noting that such improvements may take time to implement, the ERT encourages the Party to continue to seek improvements in the accuracy of the inventory through efforts to coordinate AD on fuel and feedstock use from GHGRP data with the EIA energy balance team and the EPA regulatory and national inventory teams, to reconcile the parallel reporting streams to avoid gaps or double counting between IPPU and energy sector estimates | Yes. Comparability |
| I.26 | 2.B.8 Petrochemical and carbon black production – $CO_2$ | The ERT noted that the country-specific EF for ethylene production that is derived from GHGRP data and applied to AD from 1990 to 2009 is among the lowest of all reporting Parties. The ERT also noted that the IEFs derived from GHGRP data decline from 0.84 t $CO_2$/t ethylene in 2010 to 0.74 t $CO_2$/t ethylene in 2014. During the review, the United | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | States provided additional information on the category-specific QC, including the consultation with the industry experts that indicates that there have been no significant changes to the processes over time and hence the IEFs derived from GHGRP are the best available for the whole time series, and that the GHGRP reporting provides a largely complete picture of emissions and production information. The ERT further notes that the Party's approach in using IEFs derived from a country-specific method (e.g. GHGRP data for the feedstock component) across the time series appears to be justified<br><br>The ERT recommends that the Party provide an explanation for its country-specific approaches using the EFs derived from GHGRP data, including the outcome of consultation with industry experts, and the results of the quality checks between GHGRP production estimates and data from trade association membership surveys | |
| I.27 | 2.C.1 Iron and steel production – $CO_2$ | In addition to the issues noted in I.9 in table 3, the ERT noted that the NIR (p.4-60) indicates that data on natural gas consumption and coke oven gas production at merchant coke plants are not available and are therefore omitted from the inventory emission estimates. The ERT considers that, because the Party did not provide a carbon balance for coke production and iron and steel production within the NIR and did not respond to the ERT's request for further information during the review, it is not feasible for the ERT to fully assess the completeness and comparability of the Party's submission; for example, regarding the allocation of emissions across categories in the energy sector and the IPPU sector<br><br>The ERT recommends that the Party conduct further research and consultation with industry, regulators and statistical agencies as necessary in order to access complete AD on natural gas consumption and coke oven gas production at merchant coke plants, and obtain EFs and/or emission estimates | Yes. Completeness |
| I.28 | 2.C.1 Iron and steel production – $CO_2$ | The ERT noted that the IPPU chapter of the NIR indicates that $CO_2$ emissions from coke production are allocated in the IPPU sector together with iron and steel production emissions instead of the energy sector as outlined in the 2006 IPCC Guidelines. The NIR provides a transparent explanation of the country-specific approach used for the allocation of these emissions. However, the ERT noted that the NIR is unclear about the fate of other by-product emissions from coke production and iron and steel production such as secondary gases (notably blast furnace gas) that may be used to provide process heat or for power generation at integrated iron and steel facilities<br><br>According to the 2006 IPCC Guidelines (sections 4.2.2.5 and 4.2.4.2), the relationship between the emissions reported under the energy and IPPU sectors are to be clearly managed and reported to avoid the risks of gaps and double counting, and "a clear explanation of the | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | linkage with the source category 1A (Fuel Combustion) estimate for integrated coke production emissions" has to be provided "to demonstrate that double counting or missing emissions have not occurred", if the tier 2 method was used<br><br>In order to improve the transparency of the reporting in the NIR and the CRF tables, the ERT recommends that the Party explain the allocation of the emissions from coke production and iron and steel production across both the energy and IPPU sectors, including the amount of carbon stored in the products of iron and steel production. This could be done, for example, through the provision of a quantitative summary of the carbon balance that the Party uses to compile and quality check the inventory estimates | |
| I.29 | 2.F. Product uses as substitutes for ozone depleting substances – HFCs and PFCs | The ERT noted that the NIR (annex 3.9) provides a wealth of useful information on the models used to estimate emissions from this category, including the Refrigeration and Air-Con model, but that other key information to ensure transparency of the method and model assumptions is missing. For example, the chemical recovery rates applied in the calculations for disposal emissions in the Refrigeration and Air-Con model are not detailed, and although tables A-169 and A-170 provide a lot of detailed data, the explanation of the estimation methodologies and the application of the tabulated data within the model calculations is not clear. During the review, the United States provided many detailed clarifications on the model calculations, references and the application of data from the tables in the NIR<br><br>The ERT recommends that the Party improve the documentation of the Refrigeration and Air-Con model by including the clarifications on model assumptions, data sources and calculation methodologies provided to the ERT during the review, including: the assumed linear substitution trend between "start" and "full penetration" dates for substitution gases; the information on the annual growth rates cited in the NIR are the average annual growth rate for individual market sectors from the base year to 2030 that are applied within the model; the model calculation approach for overlapping equipment technology substitutions; details of country-specific circumstances and key references for the annual emission rates for servicing and leaks applied; and assumed recovery, re-use and recycling of fluids at end of life (e.g. for fire extinguishers) | Yes. Transparency |
| I.30 | 2.F.1 Refrigeration and air conditioning – HFCs and PFCs | The ERT noted that there is no methodological information in the NIR to explain the derivation of emission estimates from the manufacture of new products for sectors including refrigeration and air conditioning, although emissions are reported in CRF table 2(II).B-Hs2. During the review, the Party clarified that it considers that there should not be any emissions from the manufacture of new refrigeration and air-conditioning equipment, based on the assumption that emissions during equipment manufacture are essentially negligible. The Party explained that the values in the CRF table are incorrect owing to a spreadsheet formula | Yes. Accuracy |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | error when the foam sector was disaggregated into closed-cell and open-cell foams in the model that converts outputs from the EPA's Vintaging Model to the CRF Reporter software. In this case, the emissions estimated for servicing activities for commercial refrigeration and domestic refrigeration were attributed to "Actual emissions from manufacturing" rather than a component of "Actual emissions from stocks". The ERT notes that the assumption that there are no emissions in the product manufacture stage for refrigeration and air-conditioning sources is not consistent with the 2006 IPCC Guidelines (volume 2, chapter 7, section 7.5.2.1). Furthermore, the ERT notes that the Party also highlighted that many cold storage and retail food units in the United States are large systems with kilometres of piping and hundreds of joints and component connections that are prone to leakage; therefore, the ERT considers that initial charging losses are highly likely to occur where new industrial units are charged in situ<br><br>The ERT recommends that the Party either review and update its assumptions regarding product manufacture losses or provide information in the NIR to justify the assumption that all such losses are "negligible" and accurately reflect country-specific circumstances. The ERT encourages the Party to strengthen the QA/QC of the model calculations (e.g. through peer review of the model) in order to ensure that the stated assumptions and data inputs are processed and reported from the model accurately | |
| I.31 | 2.F.2 Foam blowing agents – HFCs and PFCs | The ERT noted that in the NIR (table A-175), the sum of model losses for extruded polystyrene sheet foam totals 90%, whereas for all other foams (with the exception of insulation that is assumed to be landfilled) 100% leakage is estimated. Further, the ERT noted that the model assumes that no foam products are collected at the end of their use and the F-gases are either recovered or destroyed to avoid release. During the review, the United States clarified that the reason for the extruded polystyrene sheet foam total of 90% is not known, and confirmed that the model does not take into account the recovery or destruction of blowing agents at end of life, because this is not required by federal regulations and because, at end of life, foam insulation is removed from decommissioned buildings and typically landfilled. The Party further noted that there are several incentive schemes to promote the recovery of HFC blowing agents in building insulation foams, and destruction facilities that recover blowing agents from domestic refrigeration foam, for example through the EPA's voluntary Responsible Appliance Disposal Program. The model does not account for these activities as they are not regarded as widespread in the United States<br><br>The ERT recommends that the Party review the model assumptions and QA/QC of the model to eliminate the unexplained inconsistencies regarding the fate of foam blowing agents, and update assumptions to reflect national practices (e.g. to recover or destroy foam blowing agents). Furthermore, the ERT recommends that the Party include in the NIR clarifications | Yes. Accuracy |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | regarding how the model accounts for end-of-life practices for foam blowing agents | |
| I.32 | 2.F.5 Solvents – HFCs and PFCs | The ERT noted that, in the method description for emissions from solvents provided in annex 3.9 (p.A-247) to the NIR, the Party applies an assumption that only 90% of solvents are emitted. This is not consistent with the 2006 IPCC Guidelines (section 7.2.2, chapter 7), which indicate that emissions from solvent applications are typically 100% emitted within two years of initial use. In order to estimate emissions in such cases, it is necessary to determine the total amount of each HFC or PFC chemical sold in solvent. Furthermore, the ERT noted that the use of the notation key "NA" to report emissions from solvents in the CRF tables is not correct | Yes. Accuracy |
| | | The ERT recommends that the Party either review and update its assumptions regarding solvent emissions or provide country-specific information to justify the assumption that only 90% of solvents are emitted, and revise the reporting of emissions from solvents within the CRF tables | |
| I.33 | 2.F.6 Other applications (product uses as substitutes for ozone depleting substances) – HFCs and PFCs | The ERT noted that CRF table 2(II) of the 2016 submission reports emissions from an unspecified mix of HFCs and PFCs in the subcategory other applications (2.F.6) under the category product uses as substitutes for ODS (2.F.6) for which no details are provided in the NIR, and that these emissions constitute about 5.8% of the total for the highest-emitting key category in the IPPU sector in 2013. Furthermore, the ERT noted that the emissions data presented for each of the subcategories under product uses as substitutes for ODS (2.F) in CRF table 2(I)s2 are not consistent with the subtotals presented in table 4-96 of the NIR, and that this inconsistency appears to be caused (at least in part) by the reporting of the "unspecified mix" of gases in the CRF table. During the review, the Party clarified that the "unspecified mix" of gases are aggregated and treated as confidential information because they are produced or imported by a small number of chemical providers and in such small quantities or for such discrete applications that reporting national data would result in disclosure of confidential information | Yes. Transparency |
| | | The ERT recommends that the Party provide in the NIR detailed information including the, quality checks for all gases and sources included in the unspecified mix of HFCs and PFCs in the subcategory other applications under the category product uses as substitutes for ODS. The ERT encourages the Party to seek to report emissions of an unspecified mix of HFCs and PFCs under the relevant subcategories in accordance with the 2006 IPCC Guidelines as far as practicable without releasing commercially confidential data | |
| I.34 | 2.F.6 Other applications (product uses as substitutes for | In addition to the recommendation in ID# I.33 above, the ERT recommends that the Party improve the consistency between its NIR and CRF tables for the reporting of subcategories of product uses as substitutes for ODS | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | ozone depleting substances)<br>– HFCs and PFCs | | |
| Agriculture | | | |
| A.11 | 3.A.1 Cattle – $CH_4$ | In CRF table 3.As1 of the 2016 submission, the United States chose option C for reporting $CH_4$ emissions under this category. According to footnote 4 of CRF table 3.As1, option C should be used when Parties want to report a more disaggregate livestock categorization compared with option A and option B. However, the Party reported only dairy cattle and non-dairy cattle emissions under option C, and the cells for all other subcategories of cattle were reported as "IE". Further, the ERT noted that, in CRF table 9 in which emissions reported as "IE" are allocated should be explained by the Party, information is not complete. During the review, the Party stated that it can investigate updating the information provided in the CRF tables. The Party also explained that it had made attempts to present disaggregated data during the initial CRF input phase of the 2016 submission. However, since it experienced problems in data input, it took the approach of previous years of inputting those data as "IE"<br><br>If the Party does not use more disaggregate livestock categorization in estimating emissions, the ERT recommends the Party use option A in reporting data and emissions for cattle. The ERT, however, encourages the Party to apply Option C, and in this case, the ERT recommends the Party report the values for population size, average gross energy intake, Ym and estimated emissions for all other subcategories of option C, such as dairy cows, bulls and heifers, rather than reporting "IE" in CRF table 3.As1 | Yes. Transparency |
| A.12 | 3.A.1 Cattle – $CH_4$ | The United States applied a tier 2 methodology with regional feed digestibility and Ym to estimate enteric $CH_4$ from dairy cattle and beef cattle, and in the NIR 2015 (p.A-255), it stated that daily EFs were estimated for each animal type and state regions. Information such as cattle population, typical animal mass, weight gain at country level, dairy lactation rates, feed digestibility and Ym at state level and regional level was included in the NIR and/or its annexes. However, the ERT considers that the transparency could be further improved by including the average gross energy intake and EFs for each animal type, by state. In addition, in the NIR (pp.A-266–A-267) the Party explained that Ym values were determined for 1990 using the Donovan and Baldwin model (1999), and the values for 1990 were used as the baseline to estimate for 1991 and beyond by scaling Ym values for each diets with the COWPOLL model. The scaling factor is shown as Ym = Ym(1990)EXP[1.22/(YEAR–1980)]/EXP[1.22/(1990–1980)], but the NIR does not provide information on the development of the scaling factor equation and related verification. During the review, the Party stated that it will include in the NIR population, average gross energy intake and EFs | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | for each animal type, by state, and provide information on Ym, which will include detailed procedures for and verification of the development of Ym | |
| | | The ERT recommends that the Party include in the NIR the values of population, average gross energy intake and EFs for each animal type, by state, as well as information on the procedure. The ERT encourages the Party to conduct verification activities on the development of the Ym scaling factor equation | |
| A.13 | 3.A.1 Cattle – $CH_4$ | In the NIR (p.5-4), the United States stated that the CEFM was used to estimate $CH_4$ emissions from cattle enteric fermentation. It also indicated that significant scientific literature exists and, in its emission estimations, the Party incorporated information and analyses of livestock population, feeding practices and production characteristics. In annex 3 to the NIR 2016, the Party explained that the CEFM was developed based on recommendations provided in the 2006 IPCC Guidelines. However, the NIR does not provide information that explains how the CEFM is compatible with the methodologies in the 2006 IPCC Guidelines, as required by paragraph 10 of the UNFCCC Annex I inventory reporting guidelines. During the review, the Party stated that it will provide information on the compatibility of the CEFM with the methodologies provided by the 2006 IPCC Guidelines | Yes. Transparency |
| | | The ERT recommends that the Party report in its NIR on the compatibility of estimates obtained using the CEFM with estimates obtained using methodologies from the 2006 IPCC Guidelines | |
| A.14 | 3.B Manure management – $CH_4$ and $N_2O$ | The ERT noted that in the NIR (p.5-11) and its annex 3.11 (pp.A.286–A.288), the amount of MMS usage has not been updated for several years (e.g. the most recent data for cattle are from a publication dated 2000, and those for swine are dated 2007). In the NIR 2015 (p.5-15) the Party stated that the 2012 Agricultural Census data will be incorporated into the inventory and will be used to update county-level animal population and MMS estimates. During the review, the Party stated that it plans to update the MMS data in future inventories, and that EPA is working with the United States Department of Agriculture to obtain updated data | Yes. Accuracy |
| | | The ERT recommends that the Party obtain updated MMS data and estimate emissions using the updated MMS usage data in its submission. If this is not possible, the ERT recommends that the Party report on progress in its effort to update the MMS data | |
| A.15 | 3.B.1 Cattle – $CH_4$ | As for enteric fermentation (see A.11 above), the United States chose option C for reporting $CH_4$ emissions from cattle manure management in CRF tables 3.B(a)s1 and 3.B(a)s2. According to the footnotes of these CRF tables, option C should be used when Parties want to report a more disaggregated livestock categorization compared with option A and option B. However, the Party reported only values for dairy cattle and non-dairy cattle under option | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | C, and the cells for all other subcategories of cattle were reported as "IE", except for location in warm regions, which was reported as "NO". During the review, the Party stated that it can investigate updating the information provided in the CRF tables. The Party also explained that it had made attempts to present disaggregated data during the initial CRF input phase of the 2016 submission in order to apply a more disaggregated approach for livestock categorization. However, since it experienced problems in data input, it took the approach of previous years of inputting those data as "IE"<br><br>If the Party does not use more disaggregate livestock categorization in estimating emissions, the ERT recommends the Party use option A in reporting data and emissions from cattle in reporting the information in the CRF tables. The ERT, however, encourages the Party to apply Option C, and in this case, the ERT recommends the Party report the values for population size, allocation by climate region in cool and temperate regions, typical animal mass, volatile solid daily excretion and methane producing potential for all other cattle subcategories of option C in CRF tables 3.B(a)s1 and 3.B(a)s2 | |
| A.16 | 3.B.1 Cattle – $N_2O$ | As for A.15 above, the United States chose option C for reporting $N_2O$ emissions from cattle manure management in CRF table 3.B(b). According to footnote 5 of CRF table 3.B(b), option C should be used when Parties want to report a more disaggregate livestock categorization compared with option A and option B. However, the Party reported only values for dairy cattle and non-dairy cattle under option C, and the cells for all other subcategories of cattle were reported as "IE", except for composting, digesters and burned for fuel or as waste, which were reported as "NO". During the review, the Party stated that it can investigate updating the information provided in the CRF table<br>The ERT encourages the Party to report values of nitrogen excretion from all MMS of all other cattle subcategories under option C in CRF table 3.B(b) | Not an issue |
| A.17 | 3.D.a.3 Urine and dung deposited by grazing animals – $N_2O$ | The ERT noted an inconsistency between CRF table 3.D and the NIR regarding the N input from manure applied to soils (table A-223) and N input from sewage sludge applied to soils (table A-227). During the review, the United States explained that it has experienced multiple problems importing data derived from its country-specific methods into the new CRF Reporter agriculture modules. The Party also indicated that it is investigating options to solve the problems<br><br>The ERT recommends that the Party ensure consistency between the data provided in CRF table 3.D and the data provided in the NIR regarding the N input from manure applied to soils and N input from sewage sludge applied to soils | Yes. Consistency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| A.18 | 3.D.b Indirect $N_2O$ emissions from managed soils – $N_2O$ | The ERT noted that the United States, in response to a previous recommendation (see A.10 in table 3), corrected the AD and provided a documentation box in CRF table 3.D in the 2016 submission, explaining in the NIR that "N fixation, volatilized N, and N leached and run-off do not strictly represent AD because they are calculated by the process-based model (DAYCENT). Fractions were not used because a process-based model was used to calculate emissions." During the review, the Party explained that it estimated the N volatilized and N lost through leaching and run-off using the DAYCENT model, and it reported these values in the inventory worksheets, which could be made available to the ERT during an in-country review, and that these values can be included in the next NIR in annex 3.12 (methodology for estimating $N_2O$ emissions). In addition, the Party stated that indirect soil $N_2O$ emissions are estimated using a tier 1 method for a small percentage of the N inputs, such as fertilization and organic amendments to vegetable and perennial crops, as well as federal grasslands<br><br>The ERT recommends that the Party provide an explanation of how its methodology and the use of the DAYCENT model to estimate N volatilized and N loss is both compatible with the 2006 IPCC Guidelines and based on science | Yes. Transparency |
| A.19 | 3.J Other ($CO_2$ emissions from liming, urea application and other carbon-containing fertilizers) – $CO_2$ | In CRF table 3G-I, the United States reported $CO_2$ emissions from liming and urea application as "IE", and information on $CO_2$ emissions from liming and urea application was included under the LULUCF sector in the NIR. During the review, the Party stated that emissions from liming and urea fertilization will be reported under the agriculture sector in the 2017 submission<br><br>The ERT recommends that the Party report $CO_2$ emissions from liming and urea fertilization under the agriculture sector | Yes. Comparability |
| LULUCF | | | |
| L.21 | 4. General (LULUCF) – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted discrepancies between land-use areas in the time series reported in the CRF tables. For instance, in CRF table 4.1, the final area at the end of year and the initial area on the subsequent year are different for all land categories except for unmanaged forest land. The ERT also noted that in the 2016 submission the United States introduced a new FCAF (Woodall et al., 2015[d]) for land tracking of areas of land use and land-use change for the entire time series (see also L.24 below). Further, the ERT noted that in the NIR (chapter 6.1), the Party stated that approximately 46,213 kha are considered unmanaged, whereas in CRF table 4.1, the total unmanaged land (46,213.27 kha) does not match the sum of unmanaged forest land (9,634.34 kha), grassland (25,782.12 kha) and wetlands ("IE"). During the review, the United States explained that this problem would be resolved and clarified in the 2017 submission | Yes. Consistency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | The ERT recommends that the Party resolve the inconsistencies in land-use areas in the time series reported in the CRF tables and the inconsistences in information on land-use areas between the NIR and CRF table 4.1 by subcategorizing the managed lands for which estimates are calculated in order to separate them from those for which there are currently no methodologies available, noting that the Party can use the notation keys "NE" or "NA" for the latter subcategory | |
| L.22 | Land representation – $CO_2$, $CH_4$ and $N_2O$ | The United States states in the NIR that the total area of forest land remaining forest land in table 6-12 (271,719 kha) does not correspond with the total area reported in chapter 6.1 (table 6-7) (294,051 kha for 2014) under the land representation for forest land, explaining that this is due to the fact that a part of the managed land of Alaska (interior of Alaska) and all of Hawaii's forest lands have not been estimated owing to limited data on land management in the interior of Alaska and on all of Hawaii's forests. In CRF table 4.A, the reported area is 271,719 kha. The ERT considers that this discrepancy could be prevented in the future by including the different territories (49 states, Hawaii and Alaska) and by using the notation keys "NA" or "NE" for carbon fluxes for Alaska and for all of Hawaii's forests in CRF table 4.A | Yes. Transparency |
| | | The ERT recommends that the Party augment the transparency of the NIR and CRF table 4.A by reporting the territories not included separately as "NA" or if it is not possible, provide the additional documentation to explain why there is a discrepancy between the areas shown in CRF table 4.A and NIR table 6-12 | |
| L.23 | Land representation – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that the total national area, as reported in CRF table 4.1 for all land uses, is not constant in the period 1990–2014, fluctuating between 719,564.15 kha (1990) and 714,948.55 kha (2010), which is a variation of 5,227.59 kha (7%). As identified in document FCCC/ARR/2011/USA, the United States used several data sources to construct the land area representation: an NRI survey for 1998 data; available data from FIA (years of which are different for the various states, ranging from 2002 to 2012); and the NLCD, a land cover classification scheme, with data available for 1992, 2001 and 2006. The Party explains in the NIR 2016 that the NRI and FIA have different criteria for classifying forest land in addition to different sampling designs, leading to discrepancies in the resulting estimates of land area for non-federal land. Similarly, there are discrepancies between the NLCD and the FIA data for defining and classifying forest land on federal lands. FIA has the main database for forest statistics, and data from the NRI and NLCD are adjusted to achieve consistency with FIA estimates of forest land | Yes. Transparency |
| | | In the NIR 2016 the United States specified that, for harmonization purposes, the non-forest land-use area had been updated in proportion to the total forest land area from FIA. However, | |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | the ERT noted that the information is not sufficient for it to understand how the data referring to various years, coverage and resolution, with different classification systems, have been harmonized and used to classify the territory according to the IPCC land-use categories. During the review, the United States explained that cropland areas were based solely on the NRI data for non-federal lands, on NLCD data for federal lands, and that cropland areas were not adjusted in the harmonization process<br><br>The ERT recommends that the United States, when providing detailed information in the NIR on how the different data sources were harmonized, provide explicit information on how the model ensures consistent integration of the three data sources; for example, by including a visual flow chart of data processing during the harmonization process | |
| L.24 | 4. General (LULUCF) – $CO_2$ | The United States introduced the new FCAF[d] to estimate consistent and reliable land-use change in the 2016 inventory submission (see also L.21 and L.23 above). The United States mentioned in the annex 8 to the NIR (table A-304) that verification measurements have been implemented for the majority of the underlying methodology, calculations and models that are contained in the NIR. During the review, the Party explained that the FCAF has been previously used for a regional analysis, and provided the reference to the peer reviewed paper (Coulston et al., 2015[e]) of that regional analysis. Furthermore, the Party explained that the model used for the FCAF has not been compared with similar models used by other countries. During the review, the ERT did not receive information on the type of verification measures that have been implemented (e.g. information on peer reviews or sensitivity analysis of the model implemented on a national scale)<br><br>The ERT recommends that the Party include the information on the use of the model for the regional analysis in the QA/QC and verification section of chapter 6.1 of the NIR. The ERT also encourages the United States to conduct further verification through a comparison with similar models by other countries, peer review and/or sensitivity analysis of the new accounting approach to calculate the $CO_2$ fluxes | Yes. Transparency |
| L.25 | 4. General (LULUCF) – $CO_2$ | The ERT noted that, in the NIR (p.6-57), the Party reported the difference between the stocks reported as the stock change under the assumption that the change occurred in the year of the conversion, and those areas are also reflected in CRF tables 4.B and 4.C. However, the area in CRF tables 4.B and 4.C and NIR table 6 should cover the entire area lost from forest land conversion to cropland or forest land conversion to grassland over a 20-year timespan according to footnote 2 of CRF table 4.B, which indicates that areas for land converted to cropland shall be reported as the cumulative area (over 20 years) remaining in the category in the reporting year. In response to a question raised by the ERT, the United States explained that because the 2016 submission was the first to include forest land conversions, many of the | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | noted issues were identified at a point where it was not possible to correct them. The Party indicated that these issues have been addressed and the corrections will be applied in the 2017 submission | |
| | | The ERT recommends that the United States estimate emissions from forest land converted to another land use over a 20-year timespan by subdividing the conversion category into area actually converted and area converted during the past 19 years. The ERT also recommends that the Party ensure consistency in reporting of land area between the NIR and CRF tables 4.B and 4.C | |
| L.26 | 4.A.1 Forest land remaining forest land – $CO_2$ | The United States explained in the NIR that the FCAF is fundamentally driven by the annual forest inventory system conducted by FIA programme, and the FCAF system comprises a forest dynamics module and a land-use dynamics module. The forest dynamics module assesses forest sequestration, forest ageing and disturbance effects. The land-use dynamics module assesses carbon stock transfers associated with afforestation and deforestation. The required inputs are estimated from more than 625,000 forest and non-forest observations in the FIA national database. Model predictions for before or after the annual inventory period are constructed from the FCAF system using the annual observations. However, since carbon density estimations (tonnes per hectare) for live trees, by type and by region, are not explicitly mentioned in the NIR, the ERT was not able to verify the accuracy of the estimations for carbon stocks and $CO_2$ fluxes. During the review, the Party provided the ERT with background information on the FIA survey methods, specifically on age classes, classification, and classification by forest and non-forest for the sample plots | Yes. Transparency |
| | | The ERT recommends that the United States include in the NIR the background information provided to the ERT on the FIA survey methods, specifically on age classes, classification, and classification by forest and non-forest for the sample plots, in order to allow the ERT verify the accuracy of the estimations for carbon stocks and $CO_2$ fluxes. The ERT also recommends that the Party annex to the NIR detailed tables on average carbon fluxes by region and type (e.g. the region and forest type classifications described in Smith et al. (2006)[f] and used for estimates for downed deadwood and understory, which might better reflect the diversity of forest types and age classes). Furthermore, the ERT recommends that the United States disaggregate the carbon fluxes by region and type in the CRF tables, which will ensure transparency and repeatability of methods | |
| L.27 | 4.A.2 Land converted to forest land – $CO_2$ | The United States has not estimated removals in the biomass pool from regrowth (reforestation/afforestation) in CRF table 4.A and states in its NIR that research is under way to include those removals. The Party also clarifies the need to revise the length of time a land remains in a conversion category after change. The ERT noted that the calculation of carbon | Yes. Completeness |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | stock change in living biomass in land converted to forest land is mandatory under the 2006 IPCC Guidelines. In the NIR (p.6-27), the Party explained that the forest dynamics module assesses carbon stock transfers (removals) associated with afforestation. However, during the review, the Party clarified that those removals from afforestation have not been reported in forest land remaining forest land, and in CRF table 4.A, "NA" is reported under all land converted to forest land<br><br>The ERT recommends that the Party complete the emission estimates of living biomass for land converted to forest land in accordance with the 2006 IPCC Guidelines | |
| L.28 | 4.A.2 Land converted to forest land – $CO_2$ | The ERT noted that the United States reported "NA" for deadwood and litter in its reporting for land converted to forest land. These pools are mandatory under the 2006 IPCC Guidelines. During the review, the United States explained that it elected to remove the estimates from the submission because of a problem identified shortly before submission. Emissions and removals for all carbon pools in the category land converted to forest land will be included in the 2017 submission and will be based on a 20-year default using a conversion matrix<br><br>The ERT recommends that the United States estimate carbon stock change for deadwood and litter in land converted to forest land in accordance with the 2006 IPCC Guidelines | Yes. Completeness |
| L.29 | 4.B Cropland – $CO_2$ | In the NIR (table 6-23), the United States clarifies in a footnote that estimates after 2010 are based on projections using NRI data for 2010 and therefore may not fully reflect changes occurring in the latter part of the time series. The United States explained that more recent information is currently available but data were not available in time to incorporate them into the 2016 inventory submission<br><br>The ERT recommends that the Party apply the most recent information and data obtained since 2010 for the emission estimates under this category | Yes. Accuracy |
| L.30 | 4.B.1 Cropland remaining cropland – $CO_2$ | In the NIR (p.6-43), the United States explains that NRI survey locations are classified according to land-use histories starting in 1979; consequently, the classifications are based on fewer than 20 years from 1990 to 1998, and this may have led to an overestimation of the area of cropland remaining cropland. The ERT considers that this is not in line with the 2006 IPCC Guidelines, which indicate the default land transition value to be 20 years. Further, the ERT notes that an overestimation of cropland in the remaining class may underestimate emissions if higher carbon stocks occurred in the previous land use before 1979. During the review, the United States explained that additional carbon losses would likely be minimal because cropland area has been declining over the past three decades owing to the expansion of forests and urban areas. During the review, the Party further informed the ERT of the on- | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | going effort to develop a land representation dataset from early generation Landsat imagery to investigate the possibility of extending the time series for the land use data from 1979 to 1970. The Party also indicated alternative options for extrapolating the trends in land use back to the 1970s using agricultural and forestry statistics or other relevant information | |
| | | Noting that it is important to avoid potential overestimation or underestimation of estimates in all IPCC categories, the ERT recommends that the Party progress its efforts to obtain data of land-use histories starting from 1971 or earlier for input to the land-use change matrices for cropland, and apply those data for the emission estimates | |
| L.31 | 4.B.1 Cropland remaining cropland – $CO_2$ | The ERT noted that the areas of mineral and organic soils reported in CRF table 4.B (616.61 kha and 151,388.48 kha, respectively) have been interchanged for cropland remaining cropland (a total of 152,005.09 kha) compared with the areas reported in the NIR (annex 3.12, table A-217) (151.39 Mha for mineral soils and 0.62 Mha for organic soils). In response to a question raised by the ERT, the Party acknowledged the error and stated that QC measures are in place but had not been completed prior to the submission of the CRF tables | Yes. Adherence to UNFCCC Annex I inventory reporting guidelines |
| | | The ERT recommends that the United States apply the appropriate QC check to ensure consistency of the areas of mineral and organic soils reported in CRF table 4.B and the NIR | |
| L.32 | 4.B.2.1 Forest land converted to cropland – $CO_2$ | The ERT noted that in CRF table 4.B the implied carbon stock change factor for 2014 for living biomass for forest land converted to cropland (–65.53 t C/ha) is high compared with other implied carbon stock change factors from neighbouring countries. For instance, Canada has reported –0.95 t C/ha, which is 50 times lower than the factor reported by the United States. The ERT also noted that, in the NIR (p.6-57), the Party explained that it calculates the difference between the stocks reported as the stock change under the assumption that the change occurred in the year of the conversion | Yes. Transparency |
| | | The ERT recommends that the Party include a transparent explanation of how the losses (–3,129 kt C in CRF table 4.B for forest land converted to cropland) have been calculated based on carbon densities in forest land, and amend the information on biomass carbon stock changes in the NIR (p.6-57) | |
| L.33 | 4.C.2 Land converted to grassland – $CO_2$ | The ERT noted, in CRF table 4.C, an implied carbon stock change factor for mineral soils under forest land converted to grasslands of 0.13 t C/ha in 2013. For the conversion from grasslands to forest land an implied carbon stock change factor for mineral soils increases annually by 0.10 t C/ha. Both conversions would lead to an increase in carbon stock. In the planned improvements provided in the NIR, the United States explains that different tier level methods are used for estimating carbon stock changes in forest land, grassland and cropland. The ERT noted that this could result in inconsistent implied carbon stock factors for mineral | Yes. Accuracy |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | soils for those categories. Recognizing this, the Party indicates in the NIR that it plans to update and revise the estimates of emissions and removals from mineral soils in conversions from forest land to grasslands<br><br>The ERT recommends that the Party revise the estimates for carbon stock change in mineral soils under forest land converted to grasslands using the updated data for mineral soils and report the result in the NIR. The ERT encourages the Party to transparently report, in CRF table 4.C, the estimates at the most disaggregated level in accordance with different management systems, environmental variations or estimation methods (tier 2 or tier 3) | |
| L.34 | 4.D.1 Wetlands remaining wetlands – $CO_2$, $CH_4$ and $N_2O$ | The United States reported an area of peatland remaining peatland in CRF table 4.D for 2014 of 5.31 kha. The ERT notes that the Party reported the data for peat production in Alaska separately from the data for the other 48 states reporting areas of peatland in the NIR, due to methodological differences in data collection and calculation. The areas of peatland are not reported separately in the NIR and CRF table 4.D, with only the national total being reported. The ERT also noted that in CRF table 4(II), "NE" is reported for the areas of peat extraction lands, although $N_2O$ and $CH_4$ emissions from drained organic soils are reported, for which the ERT considers that the same area should be used for on-site $CO_2$ and estimating $CO_2$ emissions during peat extraction, according to information in the NIR (p.6-76).<br><br>The ERT recommends that the Party provide consistent information on the calculation of the total managed peatland and on how the calculation relates to the extracted area in the CRF tables and in the NIR. Noting that the Party is aware of the need for determining the quantity of peat harvested per hectare and the total area undergoing peat extraction, the ERT recommends that the Party provide the respective AD and IEFs for on-site $CH_4$ and $N_2O$ emission estimates in CRF table 4(II) for organic soils under peat extraction. In order to improve transparency, the ERT encourages the Party to provide a separate estimation of emissions from peatland for Alaska in the NIR | Yes. Completeness |
| L.35 | 4.D.2.3 Land converted to wetlands – $CO_2$, $CH_4$ and $N_2O$ | The United States has not estimated emissions for wetlands remaining wetlands separately from land converted to wetlands. The Party explained in the NIR that it was not able to separate $CH_4$, $CO_2$ and $N_2O$ emissions for wetlands remaining wetlands and land converted to wetlands. The Party also explained in the NIR that research to track GHG fluxes across wetlands remaining wetlands and land converted to wetlands is ongoing, and until such time that reliable and comprehensive estimates of GHG fluxes across these LULUCF categories can be produced, it is not possible to separate $CO_2$, $CH_4$ and $N_2O$ fluxes on land converted to wetlands from fluxes on wetlands remaining wetlands<br><br>The ERT recommends that the Party use the AD reported in table 6-7 of the NIR to separate | Yes. Comparability |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | $CO_2$, $CH_4$ and $N_2O$ emissions from land converted to wetlands and wetlands remaining wetlands | |
| L.36 | 4.D.2.3 Land converted to wetlands – $CO_2$, $CH_4$ and $N_2O$ | The ERT encourages the Party to use the Wetlands Supplement in preparing its annual inventories for estimating emissions from land converted to wetlands and wetlands remaining wetlands in future annual submissions | Not an issue |
| L.37 | 4.E.1 Settlements remaining settlements – $CO_2$ | The ERT noted that the implied carbon stock change factor in living biomass gains from urban activity in the category settlements remaining settlements is reported as 2.31 t C/ha, which is high compared with other Parties; for example, 1.57 t C/ha for Canada, 0.01 t C/ha for the European Union and 0.80 t C/ha for the Russian Federation. The ERT also noted that the losses in carbon stock in living biomass are reported as "NO" or "IE" in CRF table 4.E, but no further information on the use of these notation keys is provided in the NIR | Not an issue |
| | | The ERT encourages the United States to include information in the NIR to justify the comparatively high carbon stock change factor for living biomass gains from urban activity and to increase transparency through disaggregation of the category in CRF table 4.E | |
| L.38 | 4.E.1 Settlements remaining settlements – $CO_2$ | The United States reported changes in the carbon stocks in landfills relating to yard trimming and food scraps under settlements remaining settlements in CRF table 4.E. In the NIR (chapter 6.14, "Other (IPCC Source category 4.H)"), the Party included details on which methodologies were used for these subcategories, but no reference is given in chapter 6.10 ("Settlements remaining settlements"). During the review, the Party explained that, for its next submission, it will report the information for carbon stocks in landfills relating to yard trimming and food scraps under the section on settlements in the NIR | Yes. Consistency |
| | | The ERT recommends that the United States check the coherence of reported data, applying the appropriate QC checks, in order to ensure consistency between the CRF tables and the NIR | |
| L.39 | 4.E.2.5 Other land converted to settlements – $CO_2$ | The United States reports carbon stock changes as "NE" for all pools under land converted to settlements, and explains in the NIR that, given the lack of available information, it is not possible to separate $CO_2$ or $N_2O$ fluxes on land converted to settlements from fluxes on settlements remaining settlements at this time. Noting that $CO_2$ from landfilled yard trimming and food scraps and urban tree soils under settlements remaining settlements is a key category, the ERT finds that land converted to settlements might become a key category if the Party were to estimate these emissions because according to the NIR (p.6-86), land under a number of uses undergoes urbanization in the United States each year | Yes. Transparency |
| | | The ERT recommends that the Party estimate carbon stock changes in living biomass and | |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | dead organic matter. If this is not possible, the ERT recommends that the United States use the notation key "IE" for area under land converted to settlements in order to be consistent with the information in the NIR stating that other lands converted to settlements cannot be separated from settlements remaining settlements | |
| L.40 | 4(I) Direct $N_2O$ emissions from nitrogen inputs to managed soils – $N_2O$ | In CRF table 4(I), the United States reports, for the entire time series, $N_2O$ emissions from land converted to forest land as "IE" and "NA", from wetlands as "NA", and from land converted to settlements as "NA". However, the ERT noted that the direct and indirect $N_2O$ emissions from managed soils under land converted to forest land have been included in forest land remaining forest land (NIR, table 6-19). Similarly, the NIR states that $N_2O$ fluxes for lands converted to settlements are reported under settlements remaining settlements. Under flooded wetlands, $N_2O$ emissions have not been estimated. The Party provided, during the review, information showing that it avoids double counting for N in peat that is used as fertilizer in horticulture peat (applied to agricultural soils) | Yes. Completeness |
| | | The ERT recommends that the Party use the notation key "NE" and/or "IE" in reporting AD and $N_2O$ emissions from land converted to forest land, wetlands, and land converted to settlements, , as appropriate, in order to be consistent with the explanation provided in the NIR, and provide information showing how it avoids double counting for N, without omitting N input in peat | |
| L.41 | 4 (III) Direct $N_2O$ emissions from N mineralization/ immobilization – $N_2O$ | The ERT noted that in CRF table 4(III) the United States reported direct $N_2O$ emissions from mineralization/immobilization for all land categories as "NA", but the LULUCF chapter of the NIR does not include a section that provides information on the use of the notation key "NA" for reporting the direct $N_2O$ emissions resulting from land use or management of mineral soils | Yes. Transparency |
| | | The ERT recommends that the Party include an explanation in the NIR for the reporting of "NA" for all land categories for direct $N_2O$ emissions from mineralization/immobilization. The ERT encourages the United States to investigate the possibility of emissions/removals under this category and report them, if appropriate, by using the default tier 1 method described in the 2006 IPCC Guidelines (chapter 11, equation 11.8) | |
| L.42 | 4 (V) Biomass burning – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that the United States has provided $CH_4$ and $N_2O$ emissions from forest fires in forest land remaining forest land only. Emissions from biomass burning under other land categories are reported as "NE" or "NA", except for $N_2O$ emissions from cropland remaining cropland and from grassland, which are reported as "IE". For the category forest land remaining forest land, the United States has mentioned in the improvement plan the use of country-specific combustion factors to calculate emissions from burning and stated that the | Yes. Completeness |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | information is provided by the Monitoring Trends in Burn Severity data summaries. Currently those data are unused for the emission estimates for this category. During the review, the Party stated that it is working on research for country-specific factors and the work will be used as it matures<br><br>Noting that $CH_4$ and $N_2O$ emissions from forest fires are key categories, the ERT recommends that the United States estimate $CH_4$ and $N_2O$ emissions from biomass burning in land converted to forest land, land converted to wetlands, cropland, grassland, and settlements, and populate CRF table 4(V) to improve completeness. The ERT encourages the Party to use a country-specific combustion factor in calculating these emissions | |
| L.43 | 4.G Harvested wood products – $CO_2$ | The United States used the production accounting approach to report $CO_2$ emissions relating to HWP. Under the production approach, carbon in exported wood was estimated as if it remains in the United States, and carbon in imported wood was not included in the estimates. A tier 3 approach based on the use of country-specific data and methods to estimate HWP variables was used for the emission estimates. During the review, the United States explained that the criteria in the WOODCARB II model that were used to estimate the HWP contribution to forest carbon sinks and emissions are fixed and were developed using country-specific data. The United States also stated that exports represent an estimated 9% of total production in the United States. The ERT noted that the Party has not provided the AD on production, imports and exports of wood needed to estimate the HWP variables (i.e. HWP in products in use – domestic consumption (1.A), HWP in products in use – domestic harvest (2.A), carbon in annual imports of HWP ($P_{IM}$), carbon in annual exports of HWP ($P_{EX}$) and carbon in annual harvest of roundwood (H)) for 1961 to the present, which is not in line with the good practice in the 2006 IPCC Guidelines, which require this information to be provided in CRF table 4.Gs2<br><br>The ERT recommends that the United States provide in the NIR information showing that data on the life cycle of exported HWP for those countries to which most of its products are exported are comparable with country-specific data, or adjust the data accordingly | Yes. Accuracy |
| Waste | | | |
| W.9 | 5. General (waste) – $CO_2$, $CH_4$ and $N_2O$ | In previous review reports the ERTs recommended that the United States provide descriptions of the waste management practices used in the country. During the current review the United States explained that boxes 7-3, 7-4 and 7-5 of the NIR with accompanying tables, graphs and charts describe and depict the waste management practices in the United States. The ERT commends the United States for its efforts. The ERT noted that, as described in the NIR (box 7-3), the Party uses two sources of data on solid waste | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue?[b] If yes, classify by type |
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| | | management: BioCycle and Earth Engineering Center of Columbia University's *State of Garbage in America surveys* and the EPA's *Municipal Solid Waste in the United States Facts and Figures*. The Party indicates that the data on waste management, waste composition and the recovery of degradable waste presented in the NIR (box 7-4) are taken from an EPA facts and figures report that is not consistent with the *State of Garbage* surveys, which the Party indicates in the NIR is the preferred data source for estimating waste generation and disposal amounts in the inventory. The ERT considers that this has created an inconsistency issue within the NIR. For example, the United States reported in chapter 7 of the NIR that landfilling accounts for 53% of total waste management practices while in annex 3.14 to the NIR the same information is reported as 63%. The reported trend for landfilled waste from 1990 to 2013 is also different (see also W.10 and W.15 below)<br><br>The ERT recommends that the Party provide background information that is consistent with the data actually used for the emission estimates, including the waste management practices, in a clear manner | |
| W.10 | 5.A Solid waste disposal on land – $CH_4$ | The United States provided in its NIR some information explaining the trend of total waste generated (see also W.2 in table 3). In response to a question from the ERT during the review, the Party also provided a memorandum[g], "Review of State of Garbage data used in the U.S. Non-$CO_2$ Greenhouse Gas Inventory for Landfills", which helped the ERT to review the trend of generated waste<br><br>The ERT recommends that the United States include in the NIR a summary of information on the actual trend of total waste generated as contained in the memorandum "Review of State of Garbage data used in the U.S. Non-$CO_2$ Greenhouse Gas Inventory for Landfills", which was provided to the ERT during the review | Yes. Transparency |
| W.11 | 5.A.1.a Anaerobic – $CH_4$ | The ERT identified that the United States reported total MSW generated and not total waste landfilled in CRF table 5.A. During the review, the Party explained that issues with data import to the CRF Reporter software are under investigation in order to improve the consistency of the CRF tables<br><br>The ERT recommends that the United States strengthen its QA/QC procedures related to consistency checks between information reported in CRF table 5.A on AD and the NIR, in order to avoid similar errors in future submissions | Yes. Transparency |
| W.12 | 5.A.1.a Anaerobic – $CH_4$ | The NIR states that the United States assumes over 99% of the organic waste placed in industrial waste landfills originates from the food processing (meat, vegetables, fruits) and pulp and paper industries (EPA, 1993)[h], and therefore estimates of industrial landfill emissions focused on these two industries. The ERT noted that in the section on planned | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | improvements in the NIR (p.7-12), the Party includes a possible revision to the waste disposal factor currently used for the pulp and paper industry to use production data from pulp and paper facilities obtained from GHGRP, and the possible addition of other industries (e.g. metal foundries, petroleum refineries and chemical manufacturing facilities). The ERT considers that the share of organic waste placed in industrial landfills may be different from that assumed in 1993<br><br>Therefore, the ERT recommends that the Party obtain up-to-date data on the type and fractions of organic waste placed in industrial waste landfills and revise the $CH_4$ estimates from all major industrial waste landfills | |
| W.13 | 5.A.1.a Anaerobic – $CH_4$ | The United States reports the notation key "IE" for $CH_4$ flared from this category. CRF table 9 does not indicate where the emissions from flaring are reported. In the NIR, the Party explains that the landfill gas recovered from flares and/or landfill gas-to-energy projects at MSW landfills was estimated based on a combination of four databases: GHGRP, EIA, a database of the flare and landfill gas-to-energy projects, and a flare vendor database. The method used to avoid overestimation or double counting of recovery is reported in the NIR; however, separated volumes of recovery for energy and flaring are not reported. During the review, the Party explained that issues with importing data to the CRF Reporter software are under investigation in order to improve the consistency of the CRF tables. Notably, issues with data import for notation keys and documentation boxes were experienced in attempting to use CRF Reporter<br><br>The ERT notes that the 2006 IPCC Guidelines require the reporting of emissions from flaring under the waste sector (volume 5, chapter 3, p.3.18), and for flaring and energy recovery to be documented separately. Therefore, the ERT encourages the Party to report emissions from flaring separately under the waste sector. The ERT also encourages the United States to provide in CRF table 9 information indicating where all emissions reported as "IE" are included | Not an issue |
| W.14 | 5.B.2 Anaerobic digestion at biogas facilities – $CH_4$ | The United States reports the notation key "IE" for $CH_4$ emissions from anaerobic digestion at biogas facilities. During the review, the Party explained that disaggregated data are not available and it is assumed that $CH_4$ emissions are included in the aggregated data reported under the category managed waste disposal sites (5.A.1). The ERT noted that, according to the 2006 IPCC Guidelines (volume 5, chapter 5, section 4.1), the emissions from unintentional leakages during anaerobic digestion should be reported in the waste sector and, also according to the 2006 IPCC Guidelines, in the absence of further information, it is recommended to use a default value of 5% | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?*[b] *If yes, classify by type* |
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| | | The ERT recommends that the United States estimate and report $CH_4$ emissions from unintentional leakages using the default value of 5% provided by the 2006 IPCC Guidelines | |
| W.15 | 5.C.1 Waste incineration – $CO_2$, $CH_4$ and $N_2O$ | The ERT identified a few inconsistencies within the NIR. For example, the United States reported in figure 7-2 of the NIR that 13% of waste was incinerated in 2013 while NIR tables 3-26s and A-272 of the NIR both report 7.6% for the same year. During the review, the Party explained that multiple references were utilized to estimate $CO_2$ emissions from waste incineration (focused on fossil-derived waste) and then for $CH_4$ and $N_2O$ emissions from waste incineration (based on total mass). The Party stated that steps will be taken to better coordinate waste references across all categories in the next inventory submission | Yes. Transparency |
| | | The ERT recommends that the Party provide in the NIR consistent information on the data that are used for the estimation of emissions from waste incineration | |
| W.16 | 5.C.1 Waste incineration – $CO_2$, $CH_4$ and $N_2O$ | In the previous review report the ERT recommended that the United States estimate emissions from the incineration of non-hazardous industrial waste and medical waste (see W.8 in table 3). In the current NIR, the Party indicated that data are not readily available to estimate emissions from the incineration of non-hazardous industrial waste and that, based on a report from RTI,[i] medical waste incineration would be below 500 kt $CO_2$ eq per year, which the Party considered to be insignificant for the purpose of inventory reporting | Yes. Transparency |
| | | The ERT recommends that the Party provide in annex 5 to the NIR a specific reference to the RTI report justifying the insignificance of the emissions from the incineration of medical waste, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines | |
| W.17 | 5.D Wastewater treatment and discharge – $CH_4$ | The United States reports the notation key "IE" for $CH_4$ flared from domestic wastewater (5.D.1) and other (5.D.3). During the review, the Party explained that aggregated data were reported under "amount of $CH_4$ for energy recovery" | Yes. Transparency |
| | | The ERT recommends that the United States provide information in CRF table 9 to indicate where all emissions reported as "IE" are included | |
| W.18 | 5.D.1 Domestic wastewater – $N_2O$ | The ERT noted that the equation used to estimate $N_{EFFLUENT}$ explained in the NIR is not consistent with the method provided in the 2006 IPCC Guidelines (volume 5, chapter 5, box 6.1) for estimating emissions from advanced centralized wastewater treatment plants. During the review, the Party explained that it uses the equation to estimate emissions from domestic wastewater effluent (equation 6.7) with the total annual amount of N in the wastewater effluent estimated using equation 6.8 provided in the 2006 IPCC Guidelines. To reflect the $N_2O$ emissions from domestic wastewater treated in the centralized treatment plant prior to | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue?[b] If yes, classify by type* |
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| | | discharge as effluent, the United States subtracted the N associated with such plant emissions from the total $N_2O_{EFFLUENT}$ which was estimated using equation 6.8. During the review, the United States agreed that, in applying equation 6.8 provided in the 2006 IPCC Guidelines, an adjustment should be made to the $N_2O_{EFFLUENT}$ equation used to estimate emissions so as to properly back-calculate and subtract N associated with $N_2O$ emissions from centralized treatment plants, and suggested a revised equation which considers the underestimation of N treated by biological denitrification. Further, the Party explained that the revised equation, which adjusts the over-deduction of N treated by biological denitrification, still does not consider N discharge from the percentage of the population which uses a septic system because the septic systems in the United States do not discharge to aquatic environments | |
| | | The ERT recommends that the Party estimate the $N_2O$ emissions using the revised equations and report the emissions with the background information in the next submission | |

*Abbreviations*: AD = activity data, CEFM = cattle enteric fermentation model, CRF = common reporting format, EF = emission factor, EIA = United States Energy Information Administration, EOR = enhanced oil recovery, EPA = United States Environmental Protection Agency, ERT = expert review team, FCAF = forest carbon accounting framework, FIA = United States Forest Service Forest Inventory and Analysis National Program, F-gas = fluorinated gas, GHG = greenhouse gas, GHGRP = Greenhouse Gas Reporting Program of the EPA, HWP = harvested wood products, IE = included elsewhere, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, LEV = low emission vehicle, LULUCF = land use, land-use change and forestry, MMS = manure management system, MSW = municipal solid waste, N = nitrogen, NA = not applicable, NE = not estimated, NEU = non-energy use, NIR = national inventory report, NLCD = National Land Cover Dataset, NO = not occurring, NRI = United States Department of Agriculture National Resources Inventory, ODS = ozone depleting substances, QA/QC = quality assurance/quality control, UNFCCC Annex I inventory 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 greenhouse gas inventories", USGS = United States Geological Survey, VMT = vehicle miles traveled, 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Wetlands Supplement = *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, Ym = average methane conversion rate.

[a] The review of the 2015 GHG inventory submission is being held in conjunction with the review of the 2016 inventory submission, in accordance with decision 10/CMP.11, paragraph 1. The ERT has reviewed both the 2015 and the 2016 inventory submission, and, in accordance with the conclusions from the 13th meeting of greenhouse gas inventory lead reviewers (para. 9), has started with the review of the 2016 submission. This table includes all findings that are relevant for both the 2015 and the 2016 annual submission (i.e. this table excludes findings that, although they may have been relevant for the 2015 annual submission, had already been resolved in the 2016 annual submission).

[b] Recommendations are related to issues as defined in decision 13/CP.20, annex, paragraph 81, identified by the ERT during the review. Encouragements are made to the Party to address all findings not related to issues.

[c] See <http://www.fibre2fashion.com/industry-article/6/global-caprolactam-production-capacity?page=2>.

[d] Woodall CW, Coulston JW, Domke GM, Walters BF, Wear DN, Smith JE, Andersen H-E, Clough BJ, Cohen WB, Griffith DM, Hagen SC, Hanou IS, Nichols MC, Perry CH, Russell MB, Westfall J and Wilson BT. 2015. *The US Forest Carbon Accounting Framework: Stocks and Stock change 1990–2016.* Gen. Tech. Rep. NRS-154. Newtown Square, PA: United States Department of Agriculture, Forest Service, Northern Research Station.

[e] Coulston JW, Wear DN and Vose JM. 2015. Complex forest dynamics indicate potential for slowing carbon accumulation in the southeastern United States. *Scientific Reports.* 5: p.8002.

[f] Smith JE, Heath LS, Skog KE and Birdsey RA. 2006. *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States.* Gen. Tech. Rep. NE-343. Newtown Square, PA: United States Department of Agriculture, Forest Service, Northeastern Research Station.

[g] RTI. 2013. "Review of State of Garbage data used in the U.S. Non-$CO_2$ Greenhouse Gas Inventory for Landfills". Memorandum prepared by K Weitz and K Bronstein (RTI) for R Schmeltz, 25 November, 2013.

[h] EPA. 1993. *Anthropogenic Methane Emissions in the United States, Estimates for 1990: Report to Congress.* Washington, DC: United States Environmental Protection Agency, Office of Air and Radiation. EPA/430-R-93-003. April 1993.

[i] RTI. 2009. "GHG Inventory Improvement – Construction and Demolition Waste DOC and Low Value". Memorandum prepared by J Coburn and K Bronstein (RTI) for R Schmeltz, 15 April 2010.

# Annex I

## Overview of greenhouse gas emissions and removals for the United States of America for submission year 2016

Table 6 shows total greenhouse gas (GHG) emissions, including and excluding land use, land-use change and forestry and, for Parties that have decided to report indirect carbon dioxide ($CO_2$) emissions, with and without indirect $CO_2$. Tables 7 and 8 show GHG emissions reported under the Convention by the United States of America by gas and by sector, respectively.

Table 6
**Total greenhouse gas emissions for the United States of America, 1990–2014**[a]
($kt\ CO_2\ eq$)

| | *Total GHG emissions excluding indirect $CO_2$ emissions* | | *Total GHG emissions including indirect $CO_2$ emissions*[b] | |
|---|---|---|---|---|
| | *Total including LULUCF* | *Total excluding LULUCF* | *Total including LULUCF* | *Total excluding LULUCF* |
| 1990 | 5 659 191.71 | 6 397 144.49 | 5 659 191.71 | 6 397 144.49 |
| 1995 | 6 046 118.19 | 6 748 528.93 | 6 046 118.19 | 6 748 528.93 |
| 2000 | 6 575 954.49 | 7 258 973.12 | 6 575 954.49 | 7 258 973.12 |
| 2010 | 6 219 032.82 | 6 985 457.05 | 6 219 032.82 | 6 985 457.05 |
| 2011 | 6 103 377.85 | 6 865 397.90 | 6 103 377.85 | 6 865 397.90 |
| 2012 | 5 893 325.84 | 6 643 010.58 | 5 893 325.84 | 6 643 010.58 |
| 2013 | 6 040 395.20 | 6 799 979.30 | 6 040 395.20 | 6 799 979.30 |
| 2014 | 6 107 975.75 | 6 870 446.09 | 6 107 975.75 | 6 870 446.09 |

*Abbreviations*: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.
[a] Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions.
[b] The Party has not reported indirect $CO_2$ emissions in common reporting format table 6.

Table 7

**Greenhouse gas emissions by gas for the United States of America, excluding land use, land-use change and forestry, 1990–2014**[a]

(kt $CO_2$ eq)

| | $CO_2$[b] | $CH_4$ | $N_2O$ | *HFCs* | *PFCs* | *Unspecified mix of HFCs and PFCs* | $SF_6$ | $NF_3$ |
|---|---|---|---|---|---|---|---|---|
| 1990 | 5 115 095.05 | 773 854.90 | 406 228.53 | 46 288.81 | 24 255.67 | 293.21 | 31 080.41 | 47.92 |
| 1995 | 5 441 599.23 | 767 943.41 | 420 585.75 | 71 273.93 | 18 640.47 | 1 764.73 | 26 638.17 | 83.24 |
| 2000 | 5 992 438.04 | 717 473.94 | 401 400.22 | 109 295.25 | 15 918.78 | 4 367.23 | 17 873.92 | 205.74 |
| 2010 | 5 688 756.01 | 722 410.57 | 410 314.24 | 141 633.80 | 4 536.22 | 7 762.14 | 9 481.91 | 562.17 |
| 2011 | 5 559 507.66 | 717 423.69 | 416 521.78 | 146 080.60 | 7 026.63 | 8 178.47 | 9 990.15 | 668.93 |
| 2012 | 5 349 220.95 | 714 401.17 | 409 285.58 | 147 249.75 | 6 054.95 | 8 584.42 | 7 581.76 | 631.99 |
| 2013 | 5 502 550.71 | 721 475.06 | 403 349.75 | 149 922.39 | 5 858.17 | 8 993.81 | 7 229.07 | 600.34 |
| 2014 | 5 556 006.58 | 730 828.66 | 403 501.46 | 157 237.34 | 5 582.94 | 9 449.89 | 7 348.78 | 490.44 |
| **% change 1990–2014** | **8.6** | **–5.6** | **–0.7** | **239.7** | **–77.0** | **3 123.0** | **–76.4** | **923.4** |

[a] Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

[b] The United States did not report indirect $CO_2$ emissions in common reporting format table 6.

Table 8
**Greenhouse gas emissions by sector for the United States of America, 1990–2014**[a, b]
(kt $CO_2$ eq)

| | *Energy* | *IPPU* | *Agriculture* | *LULUCF* | *Waste* | *Other* |
|---|---|---|---|---|---|---|
| 1990 | 5 324 939.72 | 340 887.68 | 532 034.81 | –737 952.78 | 199 282.28 | NA |
| 1995 | 5 632 114.68 | 368 154.91 | 552 335.76 | –702 410.74 | 195 923.57 | NA |
| 2000 | 6 165 082.21 | 384 608.86 | 544 457.31 | –683 018.62 | 164 824.73 | NA |
| 2010 | 5 884 638.08 | 352 951.79 | 582 341.91 | –766 424.23 | 165 525.27 | NA |
| 2011 | 5 743 974.42 | 370 466.23 | 583 121.90 | –762 020.05 | 167 835.35 | NA |
| 2012 | 5 533 909.93 | 360 095.00 | 583 297.79 | –749 684.73 | 165 707.86 | NA |
| 2013 | 5 693 473.13 | 363 481.59 | 575 246.74 | –759 584.10 | 167 777.85 | NA |
| 2014 | 5 746 203.31 | 379 225.55 | 573 626.02 | –762 470.34 | 171 391.22 | NA |
| **% change 1990–2014** | **7.9** | **11.2** | **7.8** | **3.3** | **–14.0** | **NA** |

*Abbreviations*: IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] Emissions/removals reported in the sector other (sector 6) are not included in total greenhouse gas emissions.

[b] The United States did not report indirect $CO_2$ emissions in common reporting format table 6.

# Annex II

## Additional information to support findings in table 2

## A. Missing categories that may affect completeness

The categories for which methods are included in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* were reported as "NE" (not estimated) or for which the expert review team otherwise determined that there may be an issue with the completeness of reporting in the Party's inventory are the following:

Energy sector

(a) Carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$) from gaseous fuels for railways under the category transport (1.A.3.c);

(b) $CO_2$, $CH_4$ and $N_2O$ from gaseous fuels for domestic navigation under the category transport (1.A.3.d);

(c) $CO_2$, $CH_4$ and $N_2O$ from biomass consumption under United States territories under stationary combustion under the category other (1.A.5.a);

(d) $CH_4$ fugitive emissions from coal mining activities under surface mines under coal mining and handling (1.B.1.a ii);

(e) $CO_2$ fugitive emissions from natural gas exploration under the category oil and natural gas and other emissions from energy production (1.B.2.b);

(f) $N_2O$ emissions from flaring under the category venting and flaring (1.B.2.c);

(g) $CO_2$ emissions from $CO_2$ transport (1.C).

Industrial processes and product use sector

(a) $CO_2$ emissions from other process use of carbonates, including ceramics and non-metallurgical magnesium production (2.A.4), reported as "NE";

(b) $N_2O$ from all subcategories under caprolactam, glyoxal and glyoxylic acid production (2.B.4);

(c) $CO_2$ from calcium carbide production under carbide production (2.B.5);

(d) $CO_2$, $CH_4$ and $N_2O$ from combustion and flaring under petrochemical and carbon black production (2.B.8);

(e) $CO_2$ from coke plants in iron and steel production and $CH_4$ from direct reduced iron and pellet under iron and steel production (2.C.1);

(f) Hydrofluorocarbons (HFCs) and sulphur hexafluoride ($SF_6$) from photovoltaics and heat transfer fluids (2.E);

(g) HFCs and perfluorocarbons from solvents (2.F.5);

(h) $SF_6$ from other product use (2.G.2).

Land use, land-use change and forestry sector

(a) Carbon stock change in living biomass, deadwood and litter in land converted to forest land (4.A.2);

(b) Carbon stock changes in above-ground living biomass under cropland remaining cropland (4.B.1), and living biomass and dead organic matter under land converted to cropland (4.B.2), except for forest land converted to cropland (4.B.2.i);

(c) Carbon stock changes in living biomass and dead organic matter under land converted to grassland (4.C.2), except for forest land converted to grassland (4.C.2.i);

(d) Carbon stock changes in living biomass under land converted to wetlands (4.D);

(e) Carbon stock changes in all pools under land converted to settlements (except for living biomass owing to changes in urban trees under settlements remaining settlements) (4.E);

(f) Carbon stock changes in all pools under all land converted to other lands (4.F);

(g) $CO_2$, $CH_4$ and $N_2O$ emissions from drainage and rewetting and other management of organic and mineral soils, under wetlands (4.D) and settlements (4.E), except for drained organic soils in the peat extraction lands under wetlands remaining wetlands;

(h) $CO_2$, $CH_4$ and $N_2O$ emissions from biomass burning in land converted to forest land, cropland grassland, wetlands, settlements and land converted to other lands (4).

Waste sector

(a) $CO_2$, $CH_4$ and $N_2O$ emissions from incineration of non-hazardous industrial waste and medical waste (5.C);

(b) $CH_4$ emissions from sludge under industrial wastewater (5.D.2).

# Annex III

## Documents and information used during the review

## A. Reference documents

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at <http://unfccc.int/resource/webdocs/agi/2015.pdf>

Annual status report for Party for 2016. Available at <http://unfccc.int/resource/docs/2016/asr/usa.pdf>.

FCCC/ARR/2013/USA. Report on the individual review of the annual submission of the United States of America submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/usa.pdf>.

FCCC/ARR/2012/USA. Report on the individual review of the annual submission of the United States of America submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/usa.pdf>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories". Annex to decision 24/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=4>.

"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention". Annex to decision 13/CP.20. Available at <http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=6>.

Intergovernmental Panel on Climate Change. 2006. *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. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. Available at <http://www.ipcc-nggip.iges.or.jp/public/wetlands/index.html>.

## B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Hockstad (United States Environmental Protection Agency), including additional material on the methodology and assumptions used. The following documents[1] were also provided by the United States of America:

A.G. Hashimoto, et al. 1981. *Ultimate Methane Yield from Beef Cattle Manure: Effect of Temperature, Ration Constituents, Antibiotics and Manure Age*. Agricultural wastes 0141–4607/81/0003-0241/302-50 pp.241-255

A.G. Hashimoto. 1984. *Methane from Swine Manure: Effect of Temperature and Influent Substrate Concentration on Kinetic Parameter* (*K*). Agricultural Wastes 9(1984) pp.299–308.

[1] Reproduced as received from the Party.

D.T. Hill. 1982. *Design of Digestion Systems for Maximum Methane Production*. Transactions of the American Society of Agricultural Engineers. pp.226-236.

D.T. Hill. 1984. *Methane Productivity of the Major Animal Waste Types*. American Society of Agricultural Engineers 0001-2351/84/2702-0530502.00. pp. 530-533.

EPA (1993) *Anthropogenic Methane Emissions in the United States, Estimates for 1990: Report to Congress*, U.S. Environmental Protection Agency, Office of Air and Radiation. Washington, D.C. EPA/430-R-93-003. April 1993.

Nowak, D.J., et al. (2013) Carbon Storage and Sequestration by Trees in Urban and Community Areas of the United States. Environmental Pollution 178: 229-236. March 12, 2013.

Smith, J.E. et al. (2006) *Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States.* Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p.

Woodall, C.W. et al. (2015) The US Forest Carbon Accounting Framework: Stocks and Stock change 1990-2016. Gen. Tech. Rep. NRS-154. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.

# Annex IV

## Acronyms and abbreviations

| | |
|---|---|
| AD | activity data |
| CEFM | cattle enteric fermentation model |
| $CH_4$ | methane |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq | carbon dioxide equivalent |
| CRF | common reporting format |
| DOC | degradable organic carbon |
| DOM | dead organic matter |
| EF | emission factor |
| EIA | United States Energy Information Administration |
| EPA | United States Environmental Protection Agency |
| ERT | expert review team |
| FCAF | forest carbon accounting framework |
| FIA | United States Forest Service Forest Inventory and Analysis National Program |
| F-gas | fluorinated gas |
| GHG | greenhouse gas |
| GHGRP | Greenhouse Gas Reporting Program of the EPA |
| HFC | hydrofluorocarbon |
| HWP | harvested wood products |
| IE | included elsewhere |
| IEF | implied emission factor |
| IPCC | Intergovernmental Panel on Climate Change |
| IPPU | Industrial processes and product use |
| kt | kilotonne (1 kt = 1 gigagram (Gg)) |
| LEV | low emission vehicle |
| LUC | land-use change |
| LULUCF | land use, land-use change and forestry |
| MMS | manure management system |
| MSW | municipal solid waste |
| N | nitrogen |
| $N_2O$ | nitrous oxide |
| NA | not applicable |
| NE | not estimated |
| NEU | non-energy use |
| Nex | nitrogen excretion |
| $NF_3$ | nitrogen trifluoride |
| NIR | national inventory report |
| NLCD | National Land Cover Dataset |
| NO | not occurring |
| NRI | United States Department of Agriculture National Resources Inventory |
| ODS | ozone-depleting substances |
| PFC | perfluorocarbon |
| QA/QC | quality assurance/quality control |
| $SF_6$ | sulphur hexafluoride |
| SOC | soil organic carbon |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USGS | United States Geological Survey |
| VMT | vehicle miles travelled |
| VS | volatile solids |
| Ym | average methane conversion rate |