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Report on the individual review of the inventory submission of the United States of America submitted in 2018*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas inventory covering emissions and removals of greenhouse gas 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 2018 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 5 to 10 November 2018 in Washington, D.C.

* In the symbol for this document, 2018 refers to the year in which the inventory was submitted, not to the year of publication.

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Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
EPA	United States Environmental Protection Agency
ERT	expert review team
FIA	United States Forest Service Inventory and Analysis Program
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program of the United States Environmental Protection Agency
GREET	Greenhouse Gases, Regulated Emissions and Energy Use in Transportation
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
LULUCF	land use, land-use change and forestry
MMS	manure management system
MOVES	Motor Vehicle Emission Simulator
MSW	municipal solid waste
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NEU	non-energy use
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
NRI	United States Department of Agriculture National Resources Inventory
NRMM	non-road mobile machinery
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
SF_6	sulfur hexafluoride
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”
UNFCCC review guidelines	“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”
VMT	vehicle miles travelled
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
Ym	average methane conversion rate

I. Introduction

1. This report covers the review of the 2018 inventory submission of the United States of America organized by the secretariat in accordance with the UNFCCC review guidelines, particularly part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 5 to 10 November 2018 in Washington, D.C., and was coordinated by Mr. Roman Payo and Mr. Vitor Gois Ferreira (secretariat). Table 1 provides information on the composition of the 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. Marcelo Theoto Rocha	Brazil
Energy	Mr. David Glen Thistlethwaite	United Kingdom of Great Britain and Northern Ireland
IPPU	Mr. Koen E.L. Smekens	Belgium
Agriculture	Mr. Bernard Hyde	Ireland
LULUCF	Mr. Sandro Federici	San Marino
Waste	Mr. Mikael Szudy	Sweden
Lead reviewers	Mr. Theoto Rocha	
	Mr. Smekens	

2. The basis of the findings in this report is the assessment by the ERT of the consistency of the Party's 2018 inventory submission with the UNFCCC review guidelines. The ERT notes that the individual inventory review of the United States' 2017 inventory submission did not take place in 2017 owing to insufficient funding for the review process.

3. The ERT has made recommendations that the United States resolve the findings related to issues.[1] Other findings, and, if applicable, the encouragements of the ERT to the United States to resolve them, are also included.

4. 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.

5. Annex I shows annual GHG emissions for the United States, including totals excluding and including the LULUCF sector, indirect CO_2 emissions and emissions by gas and by sector.

II. Summary and general assessment of the 2018 inventory submission

6. Table 2 provides the assessment by the ERT of the inventory submissions 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.

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

Table 2
Summary of review results and general assessment of the inventory of the United States of America

Assessment			*Issue ID#(s) in table 3 and/or 5*[a]
Date of submission	Original submission: 12 April 2018 (NIR), 12 April 2018, version 1 (CRF tables)		
Review format	In country		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	Yes	E.22, E.25, I.7, I.12, I.20, I.28, I.29, I.33, L.39, L.47, L.48
	(c) Development and selection of EFs	Yes	E.18, E.21, E.26, E.29, I.26, I.35, A.18, A.20, L.23, L.31, L.40, L.42, L.44, W.3, W.7
	(d) Collection and selection of AD	Yes	E.24, E.32, A.5, A.19, A.21, A.26, A.33, L.10, L.27, L.41, L.45, L.63
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	Yes	A.8, L.7, L.50
	(g) Reporting of uncertainties, including methodologies	Yes	A.16, A.25
	(h) QA/QC	Yes	A.9
	(i) Missing categories/completeness[b]	Yes	E.6, E.20, E.27, E.33, I.5, I.10, I.16, I.31, I.37, A.30, L.2, L.3, L.18, L.35, L.46, L.51, L.53, L.56, L.57, L.61, L.62, W.14
	(j) 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	I.20
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, including the changes to the national inventory arrangements since the previous annual submission?	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?	Yes	
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	

[a] The ERT identified additional issues in all sectors that are not listed in this table but are included in tables 3 and/or 5.

[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex II.

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

7. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 29 June 2017.[2] For each issue, the ERT specified whether it believes the issue has been resolved by the conclusion of the review of the 2018 inventory submission and provided the rationale for its determination, which takes 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, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
General			
G.1	Inventory submission (G.1, 2016) (G.1, 2015) (9, 2013) (8, 2012) Completeness	Improve the completeness of the inventory, in particular for those categories for which there are methodologies in the 2006 IPCC Guidelines.	Addressing. The United States has included in CRF table 9 and annex 5 to the NIR a list of categories not estimated (and reported as "NE") including, where feasible, assessments of the insignificance of the GHG emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. However, the ERT identified several categories still not estimated (see annex II for a list of the completeness issues identified by the ERT). The ERT noted that the Party's planned improvements include incorporating some of these categories in future submissions and/or additional documentation on significance. During the review, the ERT and the Party discussed whether some of these emissions could be classified as insignificant.
G.2	Methods (G.5, 2016) (G.5, 2015) (table 3, 2013) Transparency	Use the plant-specific emissions data from facility-level reporting to improve the disaggregation of combustion and industrial process emissions.	Resolved. The Party has addressed this recommendation on transparency by reporting in its NIR (p.3-49) a planned improvement to analyse the fuel and feedstock data from facility-level reporting (petrochemical production) as a way to potentially better disaggregate CO_2 emissions.
G.3	Methods (G.6, 2016) (G.6, 2015) (14, 2013) Adherence to the UNFCCC Annex I inventory reporting guidelines	Allocate emissions from NEU of fuels reported under the energy sector to the correct categories in accordance with the UNFCCC Annex I inventory reporting guidelines.	Resolved. The ERT noted that the United States reported emissions from several categories under NEU of fuels in the energy sector. Those should be reported under IPPU to be consistent with the 2006 IPCC Guidelines. However, the ERT considers that this is not a general issue but an issue specific to the energy and IPPU sectors (see ID#s E.4, I.11 and I.12 below).

[2] FCCC/ARR/2016/USA. The ERT notes that the individual inventory review of the United States' 2017 inventory submission did not take place in 2017. As a result, the previous published annual review report reflects the findings of the review of the Party's 2016 inventory submission.

ID#	*Issue classification*[a, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
G.4	Time series (G.2, 2016) (G.2, 2015) (11, 2013) Consistency	Ensure time-series consistency when using GHGRP data directly in the national GHG inventory.	Resolved. The Party has reported information on the use of GHGRP data in its NIR (e.g. boxes 1.1, 3.2, 3.4, 4.2 and 7.2). The NIR refers to the IPCC technical bulletin on the use of facility-specific data and places an emphasis on time series considerations where GHGRP data use is discussed.
Energy			
E.1	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.1, 2016) (E.1, 2015) (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.	Resolved. The Party has reported in its NIR (box 3-2 on p.3-4 and box 3-4 on p.3-31) the approaches it used to integrate GHGRP data into the inventory, including to develop country-specific EFs.
E.2	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.4, 2016) (E.4, 2015) (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.	Resolved. The Party has improved the disaggregation of its reporting to align it with the UNFCCC Annex I inventory reporting guidelines in several areas, including reporting emissions from exploration for oil (1.B.2.a.i) and gas (1.B.2.b.i). Further, the United States has added new estimates to improve the reporting of emissions from liquefied petroleum gas and gaseous fuel use in cars (1.A.3.b.i) and from gaseous fuel use in light-duty vehicles (1.A.3.b.ii).
E.3	Fuel combustion – reference approach – all fuels – CO_2 (E.5, 2016) (E.5, 2015) (32, 2013) (41, 2012) Transparency	Provide a more transparent clarification of how the difference in emissions between the reference and the sectoral approach is determined and which fuels are subtracted as NEU and feedstocks.	Addressing. More information on the iron and steel adjustment for NEU of fuels has been included in annex 2 to the NIR, and table A-262 in annex 4 lists the magnitude of NEU adjustments, aggregated by fuel. However, CRF table 1.A(c) presents the same data for "apparent energy consumption" and "apparent energy consumption (excluding NEU, reductants and feedstocks)" for the reference approach, and the energy data presented in table A-264 of the NIR for sectoral approach fuel consumption of gaseous and petroleum fuels do not match the data presented in CRF table 1.A(c). These inconsistencies could be clarified in the NIR to facilitate comparison.
E.4	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2 (E.7, 2016) (E.7, 2015) (38, 2013) (47, 2012) Comparability	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).	Addressing. The ERT notes that the Party reports emissions from NEU of fuels using a country-specific approach (NIR, box 3-6, p.3-50) allocating the emissions from the use of feedstocks and reductants under energy. The Party reports emissions from NEU of fuels under 1.A.5 (other), which should be reported under IPPU, according to the 2006 IPCC Guidelines (volume 3, chapter 1, section 1.3, table 1.6), including

ID#	*Issue classification*[a, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
			emissions from calcium carbide, lubricants and paraffin waxes. The emissions are transparently reported, and the IPPU categories are reported as "IE". During the review, the Party further clarified that its country-specific approach to the allocation of fuels in the NIR is explained in the introduction of the IPPU chapter and in annex 2. If emissions cannot be reported under NEU due to national circumstances this should be further clarified in the NIR. While the ERT acknowledges that reallocating the emissions to IPPU may not improve the overall accuracy of the United States inventory, the ERT maintains that it would improve the comparability against other reporting Parties.
E.5	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.6, 2016) (E.6, 2015) (35, 2013) Transparency	Harmonize and reconcile the data between the reference and the sectoral approach or furnish an adequate explanation of inconsistencies, where appropriate.	Addressing. The Party has indicated in the NIR (p.3-105) that the feasibility of including data from a broader range of domestic and international sources for bunker fuels, including data from studies, is being considered. During the review, the Party clarified that EPA continues to evaluate the use of data from other sources for the reference approach, and that it will provide appropriate updates in a future submission.
E.6	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.2, 2016) (E.2, 2015) (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 the following categories, including those used in the United States territories, focusing resources, as appropriate, on improvements in line with the 2006 IPCC Guidelines, and report the corresponding emissions: (a) CO_2, CH_4 and N_2O emissions from gaseous fuel use in rail transport; (b) CO_2, CH_4 and N_2O emissions from gaseous fuel use in navigation; (c) CH_4 and N_2O emissions from gaseous fuel use in other transportation (pipeline transport); (d) CH_4 and N_2O emissions from the use of biomass in the United States territories in the category other (stationary fuel combustion); (e) CO_2, CH_4 and N_2O emissions from solid and gaseous fuel and biomass use in other mobile (military); (f) N_2O emissions from oil flaring.	Addressing. The Party clarified that AD are not available to estimate emissions from biomass use in United States territories, and that the use of biofuels in non-transportation mobile applications is considered to be insignificant and the corresponding data are not available. The ERT notes that, if the United States considers any emissions to be insignificant, it should provide in the NIR a justification for their exclusion in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The Party has reported: (a) CO_2, CH_4 and N_2O emissions from gaseous fuel use in rail transport as "IE" and explained where the emissions are reported, so the ERT considers this issue to have been resolved (see ID# E.11 below); (b) CO_2, CH_4 and N_2O emissions from gaseous fuel use in navigation as "NE", "IE" and "IE", respectively, and explained where the emissions are reported, so the ERT considers this issue to have been resolved (see ID# E.12 below); (c) CH_4 and N_2O emissions from gaseous fuel use in other transportation (pipeline transport) as "NE", so the ERT considers this issue not to have been resolved; (d) CH_4 and N_2O emissions from the use of biomass in the category other (stationary

ID#	*Issue classification*[a, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
			fuel combustion) (United States territories) as "NE", so the ERT considers this issue not to have been resolved; (e) CO_2, CH_4 and N_2O emissions from solid and gaseous fuel and biomass use in 1.A.5.b (other mobile (military)) as "NA", so the ERT consider this to no longer be a completeness issue (see ID# E.31 in table 5); (f) N_2O emissions from oil flaring as "NE" (see ID# E.33 in table 5), so the ERT considers this issue not to have been resolved.
E.7	1.A Fuel combustion – sectoral approach – biomass and other fossil fuels – CO_2, CH_4 and N_2O (E.8, 2016) (E.8, 2015) (39, 2013) Transparency	Complete the collection of AD for the consumption of biomass and other fossil fuels for 2010 and 2011.	Resolved. The Party transparently reports AD and CO_2, CH_4 and N_2O emissions from biomass as "IE" for subcategories 1.A.1.a.ii, 1.A.1.a.iii, 1.A.1.c.i, 1.A.1.c.ii and 1.A.1.c.iii; liquid, solid, gaseous and other fossil fuels as "IE" for subcategories 1.A.1.a.ii and 1.A.1.a.iii; and liquid, solid and gaseous fuels as "IE" for categories 1.A.1.c.ii and 1.A.1.c.iii. During the review, the Party clarified that the consumption of biomass is reported as "IE" in subcategory 1.A.1.c, as data are not available to separate fuel consumption from that under the category public electricity and heat production (1.A.1.a). Further, the Party clarified that due to national circumstances it is not possible to break out biomass fuels for 1.A.1.a.ii or 1.A.1.a.iii. The Party also indicated in the NIR (p.3-36) that as far as practicable, facility-level reported data are considered to enable disaggregation of the biomass and other fuel reporting while maintaining consistency with national energy statistics. The ERT notes that the Party has implemented significant improvements in data resolution across the time series for the categories and fuels in response to the original issue (ARR 2013, para. 39), as far as possible and considers this issue resolved.
E.8	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.13, 2016) (E.13, 2015) Transparency	Report disaggregated categories to the level where the EFs are distinguished (e.g. heavy-duty trucks and buses under road transport, referred to in table 5, ID# E.14, and also the categories and subcategories referred to in table 3, ID#s E.2, E.4 and E.8, and table 5, ID# E.18 of the previous review report).	Resolved. The Party has reported emissions disaggregated to the level of the available AD and EFs. The reasons for reporting emissions sources as "IE" or "NE" are transparently described in CRF table 9. The ERT notes that the reporting in the CRF tables on emissions from heavy-duty trucks and buses is in accordance with the disaggregation required by the UNFCCC Annex I inventory reporting guidelines.
E.9	1.A.3.b Road transportation – liquid fuels – CO_2 (E.14, 2016)	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	Resolved. In the NIR (p.3-22), the Party has included a reference to the information presented in annex 3.2 that explains the trends in CO_2 emissions from road

ID#	Issue classification[a, b]	Recommendation made in previous review report[b]	ERT assessment and rationale
	(E.14, 2015) Transparency	average fuel economy for each major road transport mode at a disaggregated level where the EFs (e.g. for passenger cars, light-duty trucks, heavy-duty trucks, buses) are distinguished for each inventory year.	transportation. Extensive information is presented in the tables in annex 3.2 on road transport fleet composition, penetration of new technologies and VMT by vehicle type. Further, the NIR includes information on the time series of national average fuel economy for major transport modes (NIR, pp.3-21 to 3-25, including figures 3-13 and 3-14).
E.10	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O (E.15, 2016) (E.15, 2015) Transparency	Reference data in annex 3.2 when discussing trends in CH_4 and N_2O emissions from road transportation by vehicle mode; provide information on penetration, sales and fuel efficiency of new road vehicles over the years of the inventory in the NIR to demonstrate that the decrease in CH_4 and N_2O emissions is due to an increase in the percentage of VMT by vehicles with lower EFs.	Resolved. The Party provided a reference to the data presented in annex 3.2, in the NIR (p.3-26), when discussing the trends in CH_4 and N_2O emissions from road transportation. The ERT considers that the description in the NIR sufficiently references and discusses updates to the CH_4 and N_2O EFs for mobile sources and explains impacts on emission trends. Tables A-101 to A-103 and tables A-105 to A-111 in annex 3.2 present details on the United States road transport fleet, penetration of new technologies, VMT percentage by detailed technology type and the CH_4 and N_2O EFs applied for each technology type.
E.11	1.A.3.c Railways – gaseous fuels – CO_2, CH_4 and N_2O (E.16, 2016) (E.16, 2015) Transparency	Provide an explanation as to why CO_2, CH_4 and N_2O emissions from gaseous fuels used in category 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; if the emissions from the small uses of gaseous fuels are considered to be insignificant, 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.	Resolved. The Party has reported the emissions as "IE" in CRF table 1.A(a)s3. It has sufficiently explained the use of that notation key in CRF table 9. The Party indicated that, should any emissions from gaseous fuel use in railways occur, they would be included under category 1.A.2, 1.A.3 or 1.A.4.
E.12	1.A.3.d Domestic navigation – gaseous fuels – CO_2, CH_4 and N_2O (E.17, 2016) (E.17, 2015) Transparency	Provide an explanation as to why CO_2, CH_4 and N_2O emissions from gaseous fuels used in 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.	Resolved. In CRF table 1.A(a)s3, the Party has reported the AD for use of gaseous fuels in domestic navigation as "NE", the emissions of CO_2 as "NE" and the emissions of CH_4 and N_2O as "IE". It has sufficiently explained the use of the notation key for CO_2, CH_4, and N_2O in CRF table 9.
E.13	1.A.5 Other (not specified elsewhere) – liquid, solid and gaseous fuels – CO_2 (E.18, 2016) (E.18, 2015) Comparability	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.	Resolved. While some emissions from NEU of fuels are still reported in CRF table 1.A(a)s4 under 1.A.5.a (other stationary) (see ID# E.4 above), the Party has explained (NIR, p.3-51) that emissions from many NEU industrial activities are reported under the IPPU sector for seven fuel categories: coking coal, distillate fuel, industrial other coal, petroleum coke, natural gas, residual fuel oil and other oil. During the review, the Party explained the methodology applied. The ERT considers this approach to avoid

ID#	*Issue classification*[a, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
			the possible underestimations and overestimations and therefore it considers this issue to have been resolved, with any remaining concerns covered in ID# E.4 above.
E.14	1.B Fugitive emissions from fuels – CO_2 (E.19, 2016) (E.19, 2015) Transparency	Correct the notation key used for CO_2 emissions from natural gas exploration (from "NE" to "IE") to reflect that the emissions are included under CO_2 from natural gas production.	Resolved. The Party has separated the emissions from natural gas exploration from the emissions from natural gas production. Emissions of CO_2 and CH_4 are reported in CRF table 1.B.2.
E.15	1.B.2.c Venting and flaring – oil and natural gas – CO_2 and CH_4 (E.11, 2016) (E.11, 2015) (44, 2013) Comparability	Make efforts to use GHGRP data to improve the resolution and disaggregation of fugitive emissions from flaring and venting.	Resolved. The Party has reported (NIR, p.3-69) using GHGRP data to improve the estimates of emissions from associated gas venting and flaring and miscellaneous production flaring. Furthermore, recalculations of estimates for venting and flaring have been made using GHGRP data (NIR, p.3-63), and emissions data of improved resolution are presented in NIR tables 3.36 and 3.37. The ERT notes that the emissions from venting and flaring are transparently reported under 1.B.2.c as "IE", with the emissions being included under oil production (1.B.2.a.2), gas production (1.B.2.b.2), gas processing (1.B.2.b.3) and gas transmission and storage (1.B.2.b.4), and that the transparency issue ID# E.16 below covers this reporting issue, and hence considers this recommendation to use GHGRP data to be resolved.
E.16	1.B.2.c Venting and flaring – CO_2 and CH_4 (E.20, 2016) (E.20, 2015) Transparency	Enhance transparency in reporting CH_4 emissions from petroleum systems from venting and flaring, in accordance with the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party has indicated (NIR, p.A-497) that, with the available data and methods, it cannot develop an accurate split of vented, flaring and leak emissions across natural gas and petroleum systems. The ERT commends the United States for the implementation of several inventory improvements, including new estimates for venting and flaring sources as indicated in section 3.6 of the NIR. The descriptions of recalculations made using improved data and methods (e.g. NIR, pp.3-64 to 3-65 and 3-77 to 3-78), including several data tables, indicate that data are available on emissions from several venting and flaring sources in the oil and gas sector for across the time series, including associated gas venting and flaring; miscellaneous production flaring; oil tanks with flares; flaring emissions specific to natural gas production, gas processing and petroleum production; and flaring at transmission and storage stations. The United States clarified during the review that while there are improved data for several flaring and venting subsources, the United States does not have

ID#	*Issue classification[a, b]*	*Recommendation made in previous review report[b]*	*ERT assessment and rationale*
			disaggregated data on flaring for some of the larger sources such as gathering stations.
E.17	1.C CO_2 transport and storage – CO_2 (E.21, 2016) (E.21, 2015) Completeness	Update the notation key from "NE" to "IE" to address how emissions from CO_2 transport injection and storage are estimated.	Resolved. The Party has changed the notation key to "IE" and transparently described the reporting of CO_2 from transport, injection and storage in CRF table 9 and the NIR (box 3-7 on p.3-76 and tables 3-52 and 3-53).
IPPU			
I.1	2. General (IPPU) – CO_2 and CH_4 (I.1, 2016) (I.1, 2015) (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.	Resolved. Regarding calcium carbide production, the Party has changed the notation key reported for CO_2 emissions from 2.B.5.b (calcium carbide) in CRF table 2(I).A-Hs1 from "NE" to "IE" and explained that these emissions are reported under the energy sector. The ERT considers the completeness issue to have been resolved because the emissions are included in the inventory, even if they are reported as "IE" (for the allocation issue, see ID# I.32 in table 5). Regarding styrene, the ERT notes that the 2006 IPCC Guidelines do not provide a methodology for estimating CH_4 emissions from styrene production.
I.2	2. General (IPPU) – all gases (I.13, 2016) (I.13, 2015) Transparency	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.	Resolved. The Party has reported on recalculations for the IPPU sector in its NIR (pp.4-23, 4-27, 4-30, 4-41, 4-44, 4-50, 4-75, 4-89, 4-108, 4-117 and 4-123) and in CRF table 8, including on changes to methods, assumptions, AD and EFs, and provided the rationale for the recalculations.
I.3	2. General (IPPU) – all gases (I.15, 2016) (I.15, 2015) Completeness	Estimate and report emissions for categories currently reported as "NE", or justify in the NIR the reasons for not estimating those categories in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party has reported on emissions reported as "NE" in annex 5 to the NIR and CRF table 9. Annex 5 includes the likely levels of emissions for categories reported as insignificant (e.g. ranging from 0.0045 to 0.0185 Mt CO_2 eq in 2011–2016 for manufacturing micro-electro-mechanical systems).
I.4	2. General (IPPU) – CO_2 (I.14, 2016) (I.14, 2015) Transparency	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; include information on the adjustments made to the energy data for petroleum coke use in the production of titanium dioxide, silicon carbide, aluminium, ferroalloys and ammonia, to improve the transparency of the data sources used and data checks conducted.	Resolved. The Party has reported in its NIR (annex 2) on adjustments made to the energy data for petroleum coke use in the production of titanium dioxide, silicon carbide, aluminium, ferroalloys and ammonia in the energy sector.
I.5	2.A.4 Other process uses of carbonates – CO_2 (I.17, 2016) (I.17,	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	Addressing. The Party continues to report AD and CO_2 emissions for categories 2.A.4.a (ceramics) and 2.A.4.c (non-metallurgical magnesium production) as

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	2015) Completeness	current method and assumptions for estimating emissions from ceramics, non-metallurgical magnesium production and from other limestone and dolomite use); and report on progress in the NIR.	"NE" in CRF table 2(I).A-Hs1. The Party has reported in its NIR (pp.4-22 and 4-23) that it still faces challenges in estimating AD for other unspecified uses. Further, the NIR (p.4-22) provides information on how "unspecified uses" are accounted for within estimates. The Party reported its continuing efforts to improve data coverage. During the review, the Party explained that it is striving to clarify the "unspecified uses" of crushed stone (limestone and dolomite) but that it lacks robust alternative data sources. The United States explained that it plans to focus on improving AD for known larger uses (prioritized by resource and significance consistent with the 2006 IPCC Guidelines).
I.6	2.B.1 Ammonia production – CO_2 (I.18, 2016) (I.18, 2015) Comparability	Provide information, in both the IPPU and energy chapters of the NIR, on the country-specific approach used to estimate CO_2 emissions from ammonia production, justify the reason for the methodological choice and explain why it is not possible to estimate emissions following the 2006 IPCC Guidelines as outlined in paragraph 11 of the UNFCCC Annex I inventory reporting guidelines.	Resolved. In the NIR (pp.4-25 and 4-26), the Party has explained that the country-specific methodology it uses to estimate process emissions from ammonia production takes into account emission removals for ammonia production, which results in only net process CO_2 emissions being reported for this category. The ERT notes that the emissions reported are based on an EF based on Fertilizers Europe (2000) that only covers the feedstock part to avoid double counting of emissions with the method used to estimate emissions from NEU (see ID# I.29 in table 5). The Party has justified in its NIR (p.4-25) why it has not been able to estimate CO_2 emissions from ammonia production using total fuel use.
I.7	2.B.1 Ammonia production – CO_2 (I.19, 2016) (I.19, 2015) Comparability	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.	Addressing. The Party has transparently reported in its NIR that it uses a country-specific methodology to estimate emissions from ammonia production consistent with paragraphs 10 and 11 of the UNFCCC Annex I inventory reporting guidelines. The ERT notes that this methodology only accounts for emissions from feedstock use to avoid double counting of emissions with the combustion emissions. For the IPPU sector the Party has reported only process emissions from ammonia production estimated using a country-specific methodology that also takes into account emission removals for ammonia production.
I.8	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.20, 2016) (I.20, 2015) Completeness	Estimate and report emissions from caprolactam production in accordance with the method provided in the 2006 IPCC Guidelines and using available AD.	Resolved. The Party has reported N_2O emissions from caprolactam production in its NIR (pp.4-38 to 4-41) and in CRF table 2(I)s1.

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I.9	2.B.5 Carbide production – CO_2 and CH_4 (I.21, 2016) (I.21, 2015) Completeness	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 estimate and report emissions using methods consistent with the 2006 IPCC Guidelines across the time series.	Resolved. The Party reported AD as "IE", CO_2 emissions as "IE" and CH_4 emissions as "NA" in CRF table 2(I).A-Hs1 (these were all reported as "NE" in the 2016 submission). The Party explained in its NIR (table 8-288) that CO_2 emissions are implicitly accounted for in the storage factor calculation for NEU of petroleum coke in the energy sector.
I.10	2.B.8 Petrochemical and carbon black production – CH_4 and N_2O (I.22, 2016) (I.22, 2015) Completeness	Progress with plans to analyse new data reported by facilities (i.e. GHGRP data) and include emissions from combustion and flaring from installations not currently included in the inventory.	Addressing. The 2016 NIR (chapter 4.13) indicated that a subset of facilities reporting under GHGRP are required to report CH_4 and N_2O emissions. CH_4 and N_2O emissions from combustion and flaring were not included in the 2016 submission. The Party has reported on its progress towards estimating emissions of all relevant gases for this category in its NIR (pp.4-52 and 4-53). The ERT notes that the CRF table format does not allow for reporting of N_2O emissions from combustion of process off-gas under category 2.B.8 (the cell is greyed in the CRF tables). If such emissions occur they should be reported under category 2.B.10. The Party indicated that the methodologies used in the estimation are referred to in NIR section 4.13, footnote 43.
I.11	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.24, 2016) (I.24, 2015) Transparency	In both the IPPU and energy chapters of the NIR, provide information on the country-specific approach used to estimate CO_2 emissions from petrochemical production, justify the reason for the methodological choice and explain why the Party was unable to estimate emissions following the 2006 IPCC Guidelines as outlined in paragraphs 10 and 11 of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party has reported in its NIR (p.4-5, pp.4-50 to 4-56, table A-288, and annex 2) on the approach followed, which incorporates an IPCC default and country-specific approach. However, there are still comparability issues related to the corrections made to the reporting of NEU of fuels in the energy sector based on the methodology applied for IPPU (see ID# I.12 below).
I.12	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.25, 2016) (I.25, 2015) Comparability	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.	Addressing. The Party has reported in its NIR (p.4-5, pp.4-50 to 4-56, table A-288 and annex 2) on the approach followed. However, there are still comparability issues related to the corrections made to the reporting of NEU in the energy sector based on the methodology applied for IPPU. If, due to national circumstances, emissions cannot be reported under NEU, this should be further clarified in the NIR consistent with paragraphs 10 and 11 of the UNFCCC Annex I inventory reporting guidelines.
I.13	2.B.8.b Ethylene – CO_2 (I.26, 2016) (I.26, 2015) Transparency	Provide an explanation for the country-specific approaches using the EFs for ethylene production 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.	Addressing. The Party has reported in its NIR (pp.4-53 and 4-54) on the approach taken. While the Party has improved its reporting on the approach, additional information on results of the country-specific quality checks, as well as on uncertainties, should be reported in future inventory submissions to provide a more

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			complete explanation of methods to derive and check country-specific EFs from facility-level reporting used as a basis for estimating emissions from ethylene production (see NIR, table A-288).
I.14	2.B.9 Fluorochemical production – HFC-23 (I.7, 2016) (I.7, 2015) (57, 2013) Adherence to the UNFCCC Annex I inventory reporting guidelines	Ensure that the necessary QA/QC and verification measures are implemented at plant level to ensure that continuous monitoring results in more accurate estimates.	Resolved. The Party has reported on the QA/QC procedures in its NIR (pp.4-58 and 4-59) and provided information on the accuracy requirements of the measurement instruments, as well as on the frequency of the calibration of such instruments.
I.15	2.C.1 Iron and steel production – CO_2 (I.9, 2016) (I.9, 2015) (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.	Resolved. The Party has included emission estimates for coke production including the use of natural gas in the NIR (pp.4-69 and 4-70), except for merchant coke plants (see ID# I.16 below); however, the Party has reported in its NIR that data on natural gas consumption and coke oven gas production at merchant coke plants were not available and were excluded from the emission estimate (see NIR, pp.4-69, 4-70, 4-75 and 4-76). Also, CRF table 2(I).A-Hs1 contains AD (on consumption, not production) and CO_2 emissions from coke. The ERT considers the issue of the inclusion of natural gas for coke production to have been resolved. The Party applied a country-specific approach in which emissions from gas use in coke production were reported under IPPU instead of under energy as per the 2006 IPCC Guidelines, as reported in the NIR.
I.16	2.C.1 Iron and steel production – CO_2 (I.27, 2016) (I.27, 2015) Completeness	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.	Addressing. The Party has reported in its NIR (pp.4-69 and 4-70) that data on natural gas use and coke oven gas production at merchant coke production plants were not included in the emission estimates due to data unavailability. The Party indicated during the review that it will assess GHGRP data to identify data related to merchant coke plants.
I.17	2.C.1 Iron and steel production – CO_2 (I.28, 2016) (I.28, 2015) Transparency	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.	Addressing. The Party has not reported a carbon balance supporting the allocation of emissions from coke production and iron and steel production across both the energy and IPPU sectors. However, the Party has transparently reported in its NIR (pp.4-66 to 4-76) how emissions and carbon stored from iron and steel production have been allocated. During the review, the Party explained that it was currently developing a carbon balance and presented a draft

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			thereof. The ERT further noted that what remains to be addressed to enhance transparency of the NIR is to include all the conversion factors to allow the reported CO_2 emission estimate to be reproduced.
I.18	2.F Product uses as substitutes for ozone-depleting substances – HFCs and SF_6 (I.12, 2016) (I.12, 2015) (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.	Resolved. The Party has improved its reporting on the assumptions regarding the time frames of substance substitution for various appliances and disposal rates used in the Vintaging model to calculate equipment disposal quantities and equipment disposal emission rates (NIR, annex 3.9). During the review, the Party explained that it will continue to improve the transparency and completeness of its description of the Vintaging model in the next submission (see ID# I.20 below).
I.19	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.29, 2016) (I.29, 2015) Transparency	Improve the documentation of the refrigeration and air-conditioning model by including the clarifications on model assumptions, data sources and calculation methodologies provided to the ERT during the 2016 review, including (1) the assumed linear substitution trend between "start" and "full penetration" dates for substitution gases; (2) additional information on the annual growth rates cited in the NIR; (3) the model calculation approach for overlapping equipment technology substitutions; (4) details of country-specific circumstances and key references for the annual emission rates for servicing and leaks applied; and (5) information on assumed recovery, reuse and recycling of fluids at end of life (e.g. for fire extinguishers).	Addressing. The Party has reported in its NIR (annex 3.9 and pp.A-505 and A.506) (1) the assumed linear substitution trend between "start" and "full penetration" dates for substitution gases, (2) the average annual growth rates for individual market sectors and (3) the calculation approach relevant to overlapping equipment. However, there was no information provided on the annual emission rates applied for servicing and leaks, or on assumed recovery, reuse and recycling of fluids at end of life (see also ID# I.20 below). During the review, the Party explained that it will improve the transparency of the reporting on the EPA Vintaging model in its next submission.
I.20	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.30, 2016) (I.30, 2015) Accuracy	Either review and update the 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.	Addressing. The Party has not justified its assumption that emissions from product manufacture losses are "negligible" and accurately reflect country-specific circumstances, which would mean reporting the EF as "NO". During the review, the Party explained that it will improve the transparency of its reporting on the key parameters of the Vintaging model in its 2019 submission based on peer review of the model.
I.21	2.F.2 Foam blowing agents – HFCs and PFCs (I.31, 2016) (I.31, 2015) Accuracy	Review the model assumptions and QA/QC of the model to eliminate the unexplained inconsistencies regarding the fate of foam blowing agents; update assumptions to reflect national practices (e.g. to recover or destroy foam blowing agents); and include in the NIR clarifications regarding how the model accounts for end-of-life practices for foam blowing agents.	Resolved. The Party has reported in its NIR (annex 3.9) on the revised Vintaging model assumptions regarding foam blowing.
I.22	2.F.5 Solvents – HFCs and PFCs	Either review and update the assumptions regarding solvent emissions, or provide	Addressing. The Party has reported in its NIR (annex 3.9) that only 90 per cent of the

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	(I.32, 2016) (I.32, 2015) Transparency	country-specific information to justify the assumption that only 90 per cent of solvents are emitted.	fluorinated gases used as solvents are emitted and the remaining 10 per cent are entrained in waste/sludge flow and consequently destroyed, but it has not provided a justification for this assumption. During the review, the Party provided a peer-reviewed study (EPA, 2004) that supported the 90 per cent assumption applied. The Party explained that that assumption has been reviewed and confirmed and will be documented in the NIR of the next submission.
I.23	2.F.5 Solvents – HFCs and PFCs (I.32, 2016) (I.32, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Revise the reporting of emissions from solvents in the CRF tables (reported as "NA").	Not resolved. The Party continues to report fluorinated gas emissions from solvents as "NA" in CRF tables 2(I)s2 and 2(II).
I.24	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs and PFCs (I.33, 2016) (I.33, 2015) Transparency	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 ozone-depleting substances.	Not resolved. The Party has not reported in its NIR on specific quality checks conducted for all gases and sources included in the unspecified mix of HFCs and PFCs for this subcategory. During the review, the Party explained that because some confidential information on specific chemicals is known to apply to only one end use, supplying emission estimates relevant to those chemicals would allow for back-calculations that would link the confidential information to individual companies. Therefore, the Party groups such emission estimates together under other applications. The Party indicated that it will include, in the QA/QC and verification procedures section of the IPPU chapter of the NIR, a description of the quality checks conducted for all gases and sources included in the unspecific mix of HFCs and PFCs, for which the data are confidential, for this subcategory.
I.25	2.F.6 Other applications (product uses as substitutes for ozone-depleting substances) – HFCs and PFCs (I.34, 2016) (I.34, 2015) Transparency	Improve the consistency between the NIR and CRF tables for the reporting of subcategories of product uses as substitutes for ozone-depleting substances.	Resolved. The Party has reported consistent information for this subcategory in the NIR and CRF tables.
Agriculture			
A.1	3.A.1 Cattle – CH_4 (A.11, 2016)	If not using a more disaggregated livestock categorization in estimating emissions, use option A in reporting data and emissions for	Resolved. The United States has reported emissions and all other related information on average gross energy intake and Ym in

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	(A.11, 2015) Transparency	cattle; if applying option C, 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.	CRF table 3.As1 using option C. The Party reported 11 country-specific categories for cattle.
A.2	3.A.1 Cattle – CH_4 (A.12, 2016) (A.12, 2015) Transparency	Include in the NIR values for population, average gross energy intake and EFs for each animal type, by state, as well as information on the procedure.	Resolved. The United States has reported in its NIR (annex 3.10) values for cattle population, gross energy intake and EFs by animal type and Ym, by state.
A.3	3.A.1 Cattle – CH_4 (A.13, 2016) (A.13, 2015) Transparency	Report in the NIR on the compatibility of estimates obtained using the cattle enteric fermentation model with estimates obtained using methodologies from the 2006 IPCC Guidelines.	Resolved. The United States has reported in its NIR (annex 3.10) additional information on the assumptions and calculations made using the cattle enteric fermentation model. Furthermore, as a verification procedure in accordance with paragraph 41 of the UNFCC Annex I inventory reporting guidelines, the Party has provided in its NIR (table A-175) an assessment of the EFs used for this subcategory in comparison with those of other reporting Parties.
A.4	3.B Manure management – CH_4 and N_2O (A.2, 2016) (A.2, 2015) (72, 2013) Transparency	Investigate the reasons for the differences between the trends in volatile solid daily excretion and nitrogen excretion rates per animal type for sheep and swine.	Resolved. The United States has provided additional text and information on trends in annex 3.11 to the NIR (p.A-272).
A.5	3.B Manure management – CH_4 and N_2O (A.14, 2016) (A.14, 2015) Accuracy	Obtain updated MMS data and estimate emissions using the updated MMS usage data; if this is not possible, report on progress in the effort to update the MMS data.	Addressing. The United States has reported in its NIR (annex 3.11, p.A-275) more up-to-date MMS data for cattle and swine (e.g. using information from 2012). Furthermore, during the review the Party explained that it had held an internal workshop on MMS data in 2018 and aims to include further updated information in future submissions as it becomes available. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not underestimated.
A.6	3.B.1 Cattle – CH_4 and N_2O (A.3, 2016) (A.3, 2015) (71, 2013) Transparency	Include explanations for the trends in volatile solid daily excretion and nitrogen excretion rates per animal for dairy cattle.	Resolved. The United States has provided explanatory information in text and tabular format on trends in volatile solid daily excretion and nitrogen excretion rates per animal for dairy cattle in annex 3.11 to the NIR (p.A-274).
A.7	3.B.1 Cattle – CH_4 (A.15, 2016) (A.15, 2015) Transparency	If not using a more disaggregated livestock categorization in estimating emissions, use option A in reporting data and emissions for cattle in the CRF tables; if applying option C, report the values for population size, allocation by climate region to cool and temperate regions, typical animal mass, volatile solid daily excretion and CH_4 producing potential for all other cattle	Addressing. The United States has estimated emissions using option C and has reported in CRF table 3.B(a)s1 disaggregated livestock categorization data. The ERT notes that for certain individual non-dairy cattle, the allocation by climate is reported as "IE".

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		subcategories of option C in CRF tables 3.B(a)s1 and 3.B(a)s2.	
A.8	3.D.a.3 Urine and dung deposited by grazing animals – N_2O (A.8, 2016) (A.8, 2015) (77, 2013) (92, 2012) Consistency	Resolve the inconsistency in the total nitrogen excretion on pasture, range and paddock reported between CRF table 4.B(b), N_2O emissions from manure management, and CRF table 4.D, agricultural soils.	Addressing. The reporting of the total nitrogen excretion on pasture, range and paddock is consistent across CRF tables 3.B(b) and 3.D for only part of the time series. For example, the reporting is consistent for 1990 (4,097,049,827.25 kg nitrogen/year reported in table 3.B(b) (sum for all livestock types) and the same amount is reported in table 3.D), but not for 2015 or 2016 (for both 2015 and 2016, under pasture, range and paddock, precise values in kg nitrogen/year are reported in CRF table 3.B(b), while "NE" is reported in table 3.D). During the review, the Party explained that there was an issue with the transcription of data in the CRF tables, and that the information used in the tier 3 DAYCENT model for estimating N_2O emissions from soils is consistent with that derived from the manure management estimates in CRF table 3.B(b).
A.9	3.D.a.3 Urine and dung deposited by grazing animals – N_2O (A.9, 2016) (A.9, 2015) (77, 2013) (92, 2012) Adherence to the UNFCCC Annex I inventory reporting guidelines	Improve QC procedures to avoid inconsistencies in the total nitrogen excretion on pasture, range and paddock reported between CRF tables 4.B(b) and 4.D and provide information on this improvement.	Addressing. The reporting of the total nitrogen excretion on pasture, range and paddock is consistent across CRF tables 3.B(b) and 3.D for only part of the time series (see ID# A.8 above).
A.10	3.D.a.3 Urine and dung deposited by grazing animals – N_2O (A.17, 2016) (A.17, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Ensure consistency between the data provided in CRF table 3.D and the data provided in the NIR regarding the nitrogen input from manure applied to soils and nitrogen input from sewage sludge applied to soils.	Resolved. The United States has resolved the inconsistencies between its NIR (tables A-202 and A-206) and CRF table 3.D for this subcategory.
A.11	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O (A.4, 2016) (A.4, 2015) (74, 2013) Consistency	Revise the AD and emission estimates for cultivation of histosols in agricultural soils, revise the QC process in order to ensure consistency in the inventory and provide information on these improvements.	Resolved. The United States has addressed the issue of consistency between CRF table 3.D and table A-199 of the NIR, indicating improved QC for the category.
A.12	3.D.b Indirect N_2O emissions from managed soils – N_2O	Provide an explanation of how the methodology and the DAYCENT model used to estimate nitrogen volatilized and nitrogen	Addressing. In the NIR (pp.A-331 and A-350), the United States has included a detailed explanation of how the DAYCENT model is used to estimate indirect N_2O

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	(A.18, 2016) (A.18, 2015) Transparency	loss are both compatible with the 2006 IPCC Guidelines and based on science.	emissions from managed soils. During the review, the Party explained that it aims to further enhance transparency in its next submission by providing additional information in the NIR, including its compatibility with the 2006 IPCC Guidelines.
A.13	3.J Other (CO_2 emissions from liming, urea application and other carbon-containing fertilizers) – CO_2 (A.19, 2016) (A.19, 2015) Comparability	Report CO_2 emissions from liming and urea fertilization under the agriculture sector.	Resolved. The United States has reported in CRF table 3.G-I emissions of CO_2 from 3.G (liming) and from 3.H (urea application).
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.1, 2016) (L.1, 2015) (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).	Resolved. The United States has reported SOC changes in mineral soils under forest land (CRF table 4.A) and land converted to settlements (CRF table 4.E), biomass changes in cropland (CRF table 4.B) and grassland (CRF table 4.C), DOM changes in land converted to cropland (CRF table 4.B) and grassland (CRF table 4.C), and CH_4 and N_2O emissions from biomass burning on grassland (CRF table 4.C). The issue concerning GHG emissions from biomass burning is addressed in ID# L.35 below. The ERT identified additional incompleteness issues during the review, which are individually listed under ID#s L.46, L.51, L.53, L.54, L.56, L.57, L.61 and L.62 in table 5.
L.2	4. General (LULUCF) – CO_2 (L.2, 2016) (L.2, 2015) (81, 2013) Completeness	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 category from forest land to any other land use for each year based on a reliable land-use change matrix, and report on the achievements made.	Addressing. The United States has reported biomass and DOM changes in forest land converted to cropland (CRF table 4.B), grassland (CRF table 4.C) and settlements (CRF table 4.E). The ERT identified additional incompleteness issues during the review, which are individually listed under ID#s L.46, L.51, L.53, L.54, L.56, L.57, L.61 and L.62 in table 5.
L.3	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.3, 2016) (L.3, 2015) (82, 2013) Completeness	Include all managed United States lands in the inventory; improve the consistency of the time series of national areas; and report on the achievements made.	Not resolved. The Party has reported that its estimates do not include the United States territories, the State of Hawaii and a large portion of the interior of the State of Alaska (19.7 million ha) for forest land (CRF table 4.A); the State of Alaska and some minor management types (e.g. aquaculture) for cropland (NIR, p.6.48); the State of Alaska for grassland (NIR, p.6.63); almost 50 per cent of the managed area of wetlands (as compared to areas reported in CRF table 4.1 and 4.D); and the area of settlements not

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			urbanized (CRF table 4.E). In addition, no estimates are reported for any areas under other land (CRF table 4.F). The ERT recalls that it is good practice to report anthropogenic emissions and removals from the entire national managed land area.
L.4	4. General (LULUCF) – CO_2 (L.24, 2016) (L.24, 2015) Transparency	Include information on the use of the model for regional analysis in the QA/QC and verification section of chapter 6.1 of the NIR.	Resolved. In the NIR (pp.A-379 to A-382), the United States has reported the methodology used to extrapolate the forest inventory data backwards and forwards for those years for which data are not available or interpolation is not possible. During the review, the Party explained that the model assigns land changes to the middle year of the time period in which the change was observed. The ERT notes that that assumption does not appear to bias the estimates and that assigning the year of conversion randomly is an alternative unbiased approach.
L.5	4. General (LULUCF) – CO_2 (L.25, 2016) (L.25, 2015) Accuracy	Ensure consistency in the reporting of land area between the NIR and CRF tables 4.B and 4.C.	Resolved. The United States has reported that the differences between the land area reported in the NIR and the land area reported in CRF tables 4.B and 4.C occur because the carbon stock change estimates reported in CRF tables 4.B and 4.C do not include the State of Alaska and some minor management types (e.g. aquaculture) for cropland (NIR, p.6-48), and the State of Alaska for grassland (NIR, p.6-63). The ERT notes that the same issue is addressed in ID# L.3 above.
L.6	Land representation – CO_2, CH_4 and N_2O (L.5, 2016) (L.5, 2015) (84, 2013) (97 and 98, 2012) Adherence to the UNFCCC Annex I inventory reporting guidelines	Check the coherence of reported data on land-use areas reported in the NIR with those reported in the CRF tables, applying the appropriate QC checks.	Resolved. The United States has reported consistent data in its NIR (table 6-6) and in CRF table 4.1.
L.7	Land representation – CO_2, CH_4 and N_2O (L.21, 2016) (L.21, 2015) Consistency	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 notation keys “NE” or “NA” can be used for the latter subcategory.	Addressing. Similar issues are addressed in ID#s L.3 (discrepancy between NIR and CRF table 4.1) and L.6 (discrepancy between CRF table 4.1 and CRF tables 4.A, 4.B, 4.C, 4.D, 4.E and 4.F) above, but this issue also includes the inconsistency of the time series. That aspect has not been completely resolved, because there are still inconsistencies between the area reported as final in a year for a given land category and the initial area reported in the subsequent year for the same land category. For example, the final area reported for forest

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			land in CRF table 4.1 for 2010 is 291,659.25 kha, while the total initial area reported in CRF table 4.1 for 2011 is 295,650.23 kha. This should be classified as an issue of consistency in the time series of land representation.
L.8	Land representation – CO_2, CH_4 and N_2O (L.22, 2016) (L.22, 2015) Transparency	Improve the transparency of the NIR and CRF table 4.A by reporting the territories not included separately as "NA", or, if this is not possible, provide additional documentation to explain why there is a discrepancy between the areas shown in CRF table 4.A and NIR table 6-12.	Resolved. This is the same issue as in ID# L.3 above.
L.9	Land representation – CO_2, CH_4 and N_2O (L.23, 2016) (L.23, 2015) Transparency	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.	Addressing. The United States has reported in its NIR (p.A-515) that it is in the process of updating the land representation analysis to incorporate new data sets, which will be included in the next submission. The Party will also provide an explanation in the next NIR of how the different databases are combined to create the United States land-representation matrix. During the review, the Party explained that the description of the land representation will be enhanced and moved to a dedicated annex to the NIR, and that all references in each land-use category section of the NIR will be streamlined for the 2020 inventory submission.
L.10	4. Land representation (LULUCF) – CO_2 (L.25, 2016) (L.25, 2015) Accuracy	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.	Not resolved. The United States does not estimate emissions and removals in land-use change categories over a 20-year timespan for the entire inventory time series 1990–2016. Indeed, the United States has reported that for land converted to cropland, grassland and settlements, the historical areas cumulate as from 1979, so that for 1999 onward a 20-year cumulated area is reported (NIR, pp.6-51, 6-66 and 6-99), while for land converted to forest land the historical areas cumulate as from 1982, so that for 2002 onward a 20-year cumulated area is reported (NIR, p.6-43). The ERT notes that the gap in historical data from 1971 to 1978 for land converted to cropland, grassland and settlements, and from 1971 to 1981 for land converted to forest land, has an impact on the level of and trend in carbon stock changes and associated emissions and removals reported in all land-conversion and land-remaining categories. During the review, the United States explained that the use of Landsat data to gap-fill area data up to 1971 is planned and will be prioritized, as appropriate, in line with the 2006 IPCC Guidelines.

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L.11	4.A.1 Forest land remaining forest land – CO_2 (L.10, 2016) (L.10, 2015) (90, 2013) Transparency	Make every effort to report the carbon stock changes in the mineral soils and organic soils pools separately.	Resolved. The United States has reported SOC changes separately for mineral and organic soils in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E, as required.
L.12	4.A.1 Forest land remaining forest land – CO_2 (L.26, 2016) (L.26, 2015) Transparency	Include in the NIR background information 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 to verify the accuracy of the estimations of carbon stocks and CO_2 fluxes.	Resolved. In the NIR (p.A-368), the Party has reported information on the FIA survey methods for land classification as well as on age classes, classification and age-class dynamics.
L.13	4.A.1 Forest land remaining forest land – CO_2 (L.26, 2016) (L.26, 2015) Transparency	Provide in an 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) and used for estimating downed deadwood and understorey, which might better reflect the diversity of forest types and age classes).	Not resolved. The United States has not provided tables with carbon stock changes disaggregated by region, state or forest type. During the review, the United States explained that it would report such information in the forest land annex to the NIR in its 2020 submission.
L.14	4.A.1 Forest land remaining forest land – CO_2 (L.26, 2016) (L.26, 2015) Transparency	Disaggregate the carbon fluxes by region and type in the CRF tables, which will ensure transparency and repeatability of the methods.	Resolved. The ERT notes that the disaggregation of carbon fluxes is addressed in ID# L.13 above.
L.15	4.A.2 Land converted to forest land – CO_2 (L.27, 2016) (L.27, 2015) Completeness	Complete the emission estimates for living biomass for land converted to forest land in accordance with the 2006 IPCC Guidelines.	Resolved. The United States has reported complete estimates of carbon stock changes for land converted to forest land in CRF table 4.A.
L.16	4.A.2 Land converted to forest land – CO_2 (L.28, 2016) (L.28, 2015) Completeness	Estimate carbon stock change for deadwood and litter for land converted to forest land in accordance with the 2006 IPCC Guidelines.	Resolved. The United States has estimated and reported carbon stock changes for litter and deadwood for land converted to forest land in CRF table 4.A.
L.17	4.B Cropland – CO_2 (L.29, 2016) (L.29, 2015) Accuracy	Apply the most recent information and data obtained since 2010 for the emission estimates.	Resolved. The United States has reported AD for up to 2012 in CRF table 4.B. However, the ERT notes that the underlying issue relates to institutional arrangements: although NRI collects the relevant data annually, it does not release that information for the preparation of the GHG inventory. This has an impact on estimates for 2013 onward. Thus, carbon stock changes reported in CRF table 4.B have been estimated using surrogate data for 2013 onward; consequently, AD, as well as the IEFs, are reported as "NE". This general issue with inventory arrangements affects all land-use categories except for forest land and is described in ID# L.37 in table 5.

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L.18	4.B Cropland – CO_2 (L.14, 2016) (L.14, 2015) (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. The United States has not reported biomass stock changes in perennial cropland (for either cropland remaining cropland or land converted to cropland). The ERT considers that, if no information is available other than the time series of areas covered by perennial crops reported in the national statistics on agriculture, the Party should consider using such area information and the IPCC tier 1 methodology to prepare a time series of estimates of biomass changes in perennial crops. The carbon stock dynamic of the perennial cropland area in 1989 can be assumed to be at equilibrium and can be modelled for 1990 onward on the basis of the ageing of trees and changes in the area planted. The issue applies to both cropland remaining cropland and land converted to cropland.
L.19	4.B.1 Cropland remaining cropland – CO_2 (L.12, 2016) (L.12, 2015) (83, 2013) (108, 2012) Accuracy	Use more recent data to estimate carbon stocks (except living biomass) as soon as possible.	Resolved. The United States has reported estimates for carbon stock changes using available data for up to 2012 and extrapolating the time series of carbon stock changes for 2013–2016 (CRF table 4.B). The ERT notes that extrapolation with surrogate data is among the splicing techniques listed in the 2006 IPCC Guidelines (volume 1, chapter 5) and that the techniques applied do not seem to create any inconsistencies in the time series. The ERT notes that, although this issue has been resolved, access to up-to-date data remains a challenge within the current institutional arrangements for the United States inventory (see ID# L.37 in table 5).
L.20	4.B.1 Cropland remaining cropland – CO_2 (L.30, 2016) (L.30, 2015) Accuracy	Progress efforts to obtain data on land use since 1971 or earlier for input to the land-use change matrices for cropland, and apply those data for the emission estimates.	Resolved. The United States has reported that the time series of data used to build the land representation of cropland remaining cropland begins in 1979, and consequently the classifications are based on fewer than 20 years, from 1990 to 1998 (NIR, p.6-72). The ERT notes that this issue is the same as in ID# L.10 above.
L.21	4.B.1 Cropland remaining cropland – CO_2 (L.31, 2016) (L.31, 2015) Adherence to UNFCCC Annex I inventory reporting guidelines	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.	Resolved. The United States has reported the same values in its NIR (table A-196, pp.A-314 to A315) as in CRF table 4.B, demonstrating that it applied the appropriate QC checks.
L.22	4.B.2.1 Forest land converted to cropland – CO_2 (L.32, 2016)	Include a transparent explanation of how losses (–3,129 kt carbon in CRF table 4.B for forest land converted to cropland) have been calculated on the basis of carbon densities for	Resolved. In the NIR (p.A-519), the United States has reported that the implied carbon stock change factor for living biomass for forest land converted to cropland is

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	(L.32, 2015) Transparency	forest land, and amend the information on biomass carbon stock changes in the NIR (p.6-57).	estimated directly from the FIA plots that were forest land but were subsequently classified as cropland, so that carbon stock losses caused by deforestation are based on actual field observations. The ERT notes that implied carbon stock change factors of biomass in deforested land may not be comparable among Parties because the annual biomass loss, which usually occurs completely in the first year of conversion, is averaged across the area deforested in the past 20 years. The ERT concludes that this issue has been resolved because the calculation implemented at the level of each single plot ensures the accuracy of the estimate.
L.23	4.C.2 Land converted to grassland – CO_2 (L.33, 2016) (L.33, 2015) Accuracy	Revise the estimates of carbon stock change in mineral soils under forest land converted to grassland using the updated data for mineral soils and report the results in the NIR.	Not resolved. The United States has reported the same implied soil carbon stock change factor for all types of afforestation for 1990–2012 in CRF table 4.A (see ID# L.44 in table 5), making it impracticable to assess whether the implied carbon stock change factors applied to forest land converted to grassland are consistent with those applied for conversion of grassland to forest land, as requested in the ARR 2016, table 5, ID# L.33. The ERT notes that the Party has updated the factors in the 2019 submission. Considering that a disaggregated report would allow the ERT to determine the accuracy of the SOC changes estimated for the land under conversion, the ERT reiterates its encouragement to the United States to report in its NIR SOC changes disaggregated by vegetation type, management system, soil type and estimation method (ARR 2016, table 5, ID# L.33).
L.24	4.D.1 Wetlands remaining wetlands – CO_2, CH_4 and N_2O (L.34, 2016) (L.34, 2015) Completeness	Provide consistent information on the calculation of total managed peatland and on how the calculation relates to the extracted area in the CRF tables and in the NIR.	Resolved. In the NIR (pp.6-79 to 6-82), the United States has reported data on methods and factors applied in estimating emissions from peat extraction and justified the differences between conterminous states and Alaska as being due to differences in AD (i.e. weight versus volume).
L.25	4.D.1 Wetlands remaining wetlands – CO_2, CH_4 and N_2O (L.34, 2016) (L.34, 2015) Transparency	Noting the need to determine the quantity of peat harvested per hectare and the total area undergoing peat extraction, provide the respective AD and IEFs for the on-site CH_4 and N_2O emission estimates in CRF table 4(II) for organic soils under peat extraction.	Not resolved. The United States has not reported the relevant AD or IEFs in its NIR (pp.6-79 to 6-82) or CRF table 4(II), although the AD are reported in CRF table 4.D. Consequently, CRF table 4(II) does not contain IEF values for N_2O or CH_4 emissions from peat extraction sites. During the review, the United States explained that this issue will be addressed in its next submission.
L.26	4.D.2.3 Land converted to	Use the AD reported in table 6-7 of the NIR to separate CO_2, CH_4 and N_2O emissions	Resolved. The United States has reported estimates for forest land, cropland,

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	wetlands – CO_2, CH_4 and N_2O (L.35, 2016) (L.35, 2015) Comparability	from land converted to wetlands and wetlands remaining wetlands.	grassland, settlements and other land converted to other wetlands in CRF table 4.D, which indicates that the issue has been resolved. However, land converted to peat extraction is reported as "NE", while, according to the methodology applied, it should be "IE" (for the issues related to flooded land, see ID# L.53 in table 5).
L.27	4.E. Settlements – CO_2 (L.15, 2016) (L.15, 2015) (94, 2013) Accuracy	Eliminate the overlap between the urban forest inventory and the forest inventory.	Addressing. In the NIR (p.6-106), the United States has reported that some plots defined as forest by FIA actually fall within the boundaries of the areas also defined in the census as urban. Therefore, there may be double counting of these land areas in estimates of carbon stock and fluxes. During the review, the Party explained that all FIA plots that qualify as urban forest have been identified and are not used to estimate carbon stock changes in forest land but are still used for settlements. Consequently, the issue is expected to be resolved in the next submission.
L.28	4.E.1 Settlements remaining settlements – CO_2 (L.38, 2016) (L.38, 2015) Consistency	Check the coherence of the reported data, applying the appropriate QC checks, in order to ensure consistency between the CRF tables and the NIR.	Resolved. The United States has reported methods and factors as well as AD in its NIR (pp.6-100 to 6-114) and coherent carbon stock changes in CRF table 4.E, demonstrating that the appropriate QC checks were applied.
L.29	4.E.2 Land converted to settlements – CO_2 (L.39, 2016) (L.39, 2015) Transparency	Estimate carbon stock changes in living biomass and DOM; if this is not possible, 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 land converted to settlements cannot be separated from settlements remaining settlements.	Resolved. The United States reported carbon stock changes for biomass and DOM only for forest land converted to settlements in CRF table 4.E. The ERT notes that the issue has been resolved because the reporting on land converted to settlements is fully transparent (NIR, pp.6-117 to 6-119). However, because living biomass carbon stock changes in cropland and grassland converted to settlements have not been reported, a specific completeness issue has been raised (see ID# L.56 in table 5).
L.30	4.G HWP – CO_2 (L.43, 2016) (L.43, 2015) Accuracy	Provide in the NIR information showing that data on the life cycle of exported HWP for those countries to which most of the Party's products are exported are comparable with country-specific data, or adjust the data accordingly.	Resolved. In the NIR (p.A-386), the United States has reported that exported HWP are assumed to have the same half-life as those consumed within United States borders. The ERT notes that, on the basis of the information available, the issue has been resolved, as the Party's application of half-life values to exported HWP does not lead to a systematic overestimation or underestimation of actual emissions and removals from the HWP pool (see also ID# L.58 in table 5).
L.31	4.H Other (LULUCF) – CO_2 (L.17, 2016) (L.17, 2015) (96,	Reflect the intersectoral linkages and document the differences in the decay values for yard trimmings and food scraps to ensure	Not resolved. In the NIR (p.6-115), the United States has reported that the waste chapter does not distinguish landfill CH_4 emissions from yard trimmings and food scraps separately from landfill CH_4

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	2013) (112, 2012) Accuracy	the consistent use of decay values across the whole inventory.	emissions from total bulk (i.e. municipal solid) waste, which includes yard trimmings and food scraps, and did not provide a complete description of the calculation of decay rates for yard trimmings and food scraps. The ERT notes that CH_4 emissions from yard trimmings and food scraps are not disaggregated as a subdivision of total CH_4 emissions from MSW. The ERT notes that this is also a transparency issue because there is no evidence that the calculation of the net sink of the yard trimmings and food scraps carbon pool is not biased or that uncertainties have been reduced so far as is practicable.
L.32	4(I) Direct N_2O emissions from nitrogen inputs to managed soils – N_2O (L.40, 2016) (L.40, 2015) Completeness	Use the notation key "NE" 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.	Resolved. The Party has reported emissions from land converted to forest land and land converted to settlements as "IE" and emissions from land converted to wetlands as "NA" in CRF table 4(I) consistent with the explanation provided in the NIR.
L.33	4(I) Direct N_2O emissions from nitrogen inputs to managed soils – N_2O (L.40, 2016) (L.40, 2015) Completeness	Provide information showing how double counting is avoided for nitrogen, without omitting nitrogen input to peat.	Resolved. The United States has reported N_2O emissions from the use of nitrogen fertilizers in CRF table 4(I) only. The ERT notes that the issue has been resolved because N_2O emissions from the horticultural use of peat are not included in CRF table 4(II), and N_2O emissions from peat extraction sites reported in CRF table 4(II) only refer to the effect of peatland drainage.
L.34	4(III) Direct N_2O emissions from nitrogen mineralization/ immobilization – N_2O (L.41, 2016) (L.41, 2015) Transparency	Include an explanation in the NIR for the reporting of "NA" for all land categories for direct N_2O emissions from mineralization/immobilization.	Resolved. The United States has reported all N_2O emissions as "NA" in CRF table 4(III). However, the ERT notes that the transparency issue is no longer relevant because, according to the SOC estimates reported in the CRF background tables 4.A and 4.E, SOC losses occur and therefore N_2O emissions occur. As a result, the issue is one of completeness, not of transparency. SOC losses (and the associated N_2O emissions) are also expected to occur in land converted to other land (4.F), currently reported as "NE" (for the issues on the incomplete reporting of N_2O emissions from nitrogen mineralization in forest land, settlements and other land, see ID#s L.61 and L.62 in table 5).
L.35	4(V) Biomass burning – CO_2, CH_4 and N_2O (L.42, 2016) (L.42, 2015) Completeness	Noting that CH_4 and N_2O emissions from forest fires are key categories, estimate CH_4 and N_2O emissions from biomass burning for land converted to forest land, land converted to wetlands, cropland, grassland, and settlements; and populate CRF table 4(V).	Not resolved. The United States has estimated CH_4 and N_2O emissions from controlled burning and wildfires in forest land, although reported altogether under forest land remaining forest land, and from wildfires in grassland, although reported altogether under grassland remaining

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			grassland in CRF table 4(V). The recommendation to disaggregate estimates between 'converted' and 'remaining' categories remains valid.
Waste			
W.1	5. General (waste) – CO_2, CH_4 and N_2O (W.9, 2016) (W.9, 2015) Transparency	Provide background information that is consistent with the data actually used for the emission estimates, including the waste management practices.	Not resolved. The Party is still working to rectify the inconsistencies between the data provided by BioCycle and the Earth Engineering Center of Columbia University in surveys on the state of garbage in the country and the EPA data on MSW in the country (NIR, p.A-525). The United States is also investigating facility-specific waste composition studies and trends and will investigate differences between facility-specific data and the above-mentioned EPA data. The Party indicated that the inconsistencies in the NIR between figure 7-3 and table A-254 will be resolved in its next submission (e.g. for 1990, figure 7-3 indicates 150 Mt landfilled MSW, while table A-254 indicates 205 Mt landfilled MSW; for 2014, figure 7-3 indicates 135 Mt landfilled MSW, while table A-254 indicates 202 Mt landfilled MSW).
W.2	5.A Solid waste disposal on land – CH_4 (W.2, 2016) (W.2, 2015) (103, 2013) (124, 2012) Accuracy	Report on the trend in total waste generated, provide explanations, and revise the data, if necessary.	Resolved. The Party has explained the trends in waste generated and population in its NIR (p.7-4). The ERT notes that the Party has used waste AD for up to 2004 only to estimate emissions. For 2005–2016, the Party has switched methodology to directly report net emissions, for which there is no need for the AD on waste (see ID# W.5 below).
W.3	5.A Solid waste disposal on land – CH_4 (W.3, 2016) (W.3, 2015) (101 and 104, 2013) Accuracy	Revise the estimates of emissions from solid waste disposal on land by incorporating the revised degradable organic carbon values into the emission estimation.	Not resolved. The United States has explained (NIR, p.A-524) that it is still investigating facility-specific degradable organic carbon data reported in subpart TT (industrial waste landfills) of GHGRP to determine whether the pulp and paper and food and beverage waste composition has changed in recent years. With regard to MSW in landfills, the United States has collected all publicly available MSW characterization study data since 1990 and is reviewing them to determine the impact of a changing waste composition. If applicable, EPA may revise the degradable organic carbon value used for 1990–2004. The Party indicated that the issue will be resolved in its 2021 submission or later.
W.4	5.A Solid waste disposal on land – CH_4 (W.4, 2016) (W.4, 2015) (104,	Report the composition of waste landfilled, with the amounts/shares and corresponding coefficients, including degradable organic carbon.	Not resolved. The United States is still investigating variations in the national composition from landfill-specific waste composition studies (NIR, p.A-524). The

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	2013) (125, 2012) Transparency		Party indicated that this issue will be resolved in its 2021 submission or later.
W.5	5.A Solid waste disposal on land – CH_4 (W.10, 2016) (W.10, 2015) Transparency	Include in the NIR a summary of information on the actual trend in 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".	Resolved. The ERT notes that the information on the actual trend in 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" is provided in the NIR (annex 3, table A-254).
W.6	5.A.1.a Anaerobic – CH_4 (W.11, 2016) (W.11, 2015) Transparency	Strengthen the QA/QC procedures related to consistency checks between information reported in CRF table 5.A on AD and the NIR, in order to avoid errors.	Resolved. The ERT notes that the reported quantities of "total MSW landfilled" in the NIR (annex 3, table 254) and the quantities reported under "annual waste at the solid waste disposal sites" in CRF table 5.A are consistent, suggesting that the QA/QC procedures have been strengthened.
W.7	5.A.1.a Anaerobic – CH_4 (W.12, 2016) (W.12, 2015) Accuracy	Obtain up-to-date data on the type and fractions of organic waste placed in industrial waste landfills; and revise the CH_4 estimates for all major industrial waste landfills.	Not resolved. EPA has a plan to document the assumptions regarding the percentage and composition of industrial waste landfilled and to compare this information to that reported to GHGRP in a technical memorandum (NIR, p.A-527). The GHGRP data are the most up-to-date and comprehensive information available on industrial waste. During the review the Party explained that a preliminary version of a report on the pulp and paper industry and food processing is available. The Party indicated that the issue should be resolved in the next submission. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not underestimated.
W.8	5.B.2 Anaerobic digestion at biogas facilities – CH_4 (W.14, 2016) (W.14, 2015) Transparency	Estimate and report CH_4 emissions from unintentional leakages using the default value of 5 per cent provided in the 2006 IPCC Guidelines.	Not resolved. The Party is still investigating the data sources for and practices of anaerobic digestion and will assess the addition of a 5 per cent factor to account for unintentional leakages in a future inventory (NIR, p.A-527). During the review, the Party provided a newly published report containing data on stand-alone food waste digesting facilities for 2015. The Party also explained that no time-series data are available. The Party indicated that this issue may be resolved in its 2020 submission, but will more likely be resolved in its 2021 submission, depending upon time-series data availability.
W.9	5.C.1 Waste incineration – CH_4 and N_2O (W.8, 2016) (W.8, 2015) (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 include these estimates in future inventory submissions, providing all necessary explanations in the NIR.	Resolved. In annex 5 to the NIR (table A-266, category 1.A.5.a) the Party has indicated that it excluded the emissions from the incineration of non-hazardous industrial waste and medical waste from the inventory. The Party estimated the aggregate of those excluded emissions to be approximately 333 kt CO_2 eq for 2016.

ID#	Issue classification[a, b]	Recommendation made in previous review report[b]	ERT assessment and rationale
			However, elsewhere in annex 5 to the NIR (p.A-427, category 1.A.5.a), emissions from medical waste incineration are reported to be 333 kt CO_2 eq. This seems to suggest that the emissions from the incineration of non-hazardous industrial waste may not have been estimated and, therefore, their exclusion from the inventory for reasons of insignificance is not justified: (a) Regarding emissions from medical waste incineration, the ERT notes that the 333 kt CO_2 eq emissions from medical waste incineration are lower than the 500 kt CO_2 eq significance threshold established in the UNFCCC Annex I inventory reporting guidelines; additionally, those emissions comprise 0.0051 per cent of the total GHG emissions, a percentage below the 0.05 per cent threshold and they are therefore insignificant. The ERT thus considers the completeness issue concerning the emissions from incineration of medical waste to have been resolved; (b) Regarding non-hazardous industrial waste, during the review the ERT and the Party came to the conclusion that the non-hazardous waste mentioned in the NIR is in fact hazardous waste (waste oils, tars and related materials) and the emissions from its incineration are already included in the inventory and reported under category 1.A.5.a (stationary (NEU)) in CRF table 1.A(a)s4. The ERT therefore considers the completeness issue concerning emissions from incineration of non-hazardous industrial waste to no longer be relevant, but notes a new issue concerning transparency (see ID# W.18 in table 5).
W.10	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.15, 2016) (W.15, 2015) Transparency	Provide in the NIR consistent information on the data that are used for the estimation of emissions from waste incineration (e.g. on the percentage of waste incinerated in 2013 reported in figure 7-2 and tables 3-26 and A-272).	Addressing. The ERT notes that the inconsistencies between figure 7-2 and tables 3-26 and A-138 of the NIR are not corrected in the 2018 submission. The NIR indicates (p.A-527) that the Party is investigating additional sources of information on waste incineration, including information reported by facilities under the GHGRP, and plans to update the sources of information on waste used. During the review, the Party explained that data on combusted MSW are no longer collected, which is why new data sources are needed. The Party indicated that this issue will be examined further in a future submission.
W.11	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.16, 2016)	Provide in annex 5 to the NIR a specific reference to the report justifying the insignificance of the emissions from the incineration of medical waste in accordance	Resolved. The ERT notes that the NIR (annex 5, p.A-427) provides a specific reference to the report that justifies the insignificance of the emissions from the incineration of medical waste in accordance

ID#	*Issue classification*[a, b]	*Recommendation made in previous review report*[b]	*ERT assessment and rationale*
	(W.16, 2015) Transparency	with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.
W.12	5.D Wastewater treatment and discharge – CH_4 (W.17, 2016) (W.17, 2015) Transparency	Provide information in CRF table 9 to indicate where all emissions reported as "IE" are included.	Resolved. The ERT notes that information on the use of the notation key "IE" for CH_4 flared from domestic wastewater (5.D.1) and emissions and background information for the category other (5.D.3) are included in CRF table 9.
W.13	5.D.1 Domestic wastewater – N_2O (W.18, 2016) (W.18, 2015) Accuracy	Estimate the N_2O emissions using the revised equations and report the emissions with the background information.	Resolved. The Party corrected the formula for $N_2O_{EFFLUENT}$ in the NIR in its 2017 and 2018 submissions. Recalculations were first made in its 2017 submission using the adjusted formula, and the background information is provided in the NIR (pp.7-29 to 7-31).
W.14	5.D.2 Industrial wastewater – CH_4 (W.5, 2016) (W.5, 2015) (105, 2013) Completeness	Include information on the non-estimation of CH_4 emissions from sludge under industrial wastewater.	Not resolved. The ERT notes that the Party's efforts to ensure the completeness of its inventory reporting are ongoing. During the review, the Party indicated that information will be included in CRF table 9 and the NIR (annex 5), and that this issue will be resolved in its next submission.

[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 identified in accordance with paragraphs 80–83 of the UNFCCC review guidelines and classified as per paragraph 81 of the same guidelines.

[b] The review of the 2017 inventory submission of the United States did not take place during 2017. Therefore, the recommendations reflected in table 3 are taken from the 2016 annual review report. The review of the 2014 inventory submission of the United States did not take place. For the same reason, 2014 and 2017 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 2018 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#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
General		
G.1	Improve the completeness of the inventory, in particular for those categories for which there are methodologies in the 2006 IPCC Guidelines	4 (2012–2018)
Energy		
E.3	Provide a more transparent clarification of how the difference in emissions between the reference and the sectoral approach is determined and which fuels are subtracted as NEU and feedstocks	4 (2012–2018)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
E.4	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)	4 (2012–2018)
E.5	Harmonize and reconcile the data between the reference and the sectoral approach or furnish an adequate explanation of inconsistencies, where appropriate	3 (2013–2018)
E.6	Collect the necessary AD and EFs to prepare emission estimates for the combustion of biomass and other fuels for the following categories, including those used in the United States territories, focusing resources, as appropriate, on improvements in line with the 2006 IPCC Guidelines, and report the corresponding emissions	4 (2012–2018)
IPPU	No issues identified	
Agriculture		
A.8	Resolve the inconsistency in the total nitrogen excretion on pasture, range and paddock reported between CRF table 4.B(b), N_2O emissions from manure management, and CRF table 4.D, agricultural soils	4 (2012–2018)
A.9	Improve QC procedures to avoid inconsistencies in the total nitrogen excretion on pasture, range and paddock reported between CRF tables 4.B(b) and 4.D and provide information on this improvement	4 (2012–2018)
LULUCF		
L.2	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 category from forest land to any other land use for each year based on a reliable land-use change matrix, and report on the achievements made	3 (2013–2018)
L.3	Include all managed United States land in the inventory; improve the consistency of the time series of national areas; and report on the achievements made	3 (2013–2018)
L.18	Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series	4 (2012–2018)
L.27	Eliminate the overlap between the urban forest inventory and the forest inventory	3 (2013–2018)
L.31	Reflect the intersectoral linkages and document the differences in the decay values for yard trimmings and food scraps to ensure the consistent use of decay values across the whole inventory	4 (2012–2018)
Waste		
W.3	Revise the estimates of emissions from solid waste disposal on land by incorporating the revised degradable organic carbon values into the emission estimation	3 (2013–2018)
W.4	Report the composition of waste landfilled, with the amounts/shares and corresponding coefficients, including degradable organic carbon	4 (2012–2018)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
W.14	Include information on the non-estimation of CH_4 emissions from sludge under industrial wastewater	3 (2013–2018)

[a] The reviews of the 2014 and 2017 inventory submissions of the United States did not take place. Therefore, the years 2014 and 2017 are not taken into account when counting the number of successive years in table 4. In addition, as the reviews of the 2015 and 2016 inventory submissions were held in conjunction with each other, they are not considered "successive" years and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2018 inventory submission

9. Table 5 contains findings made by the ERT during the individual review of the 2018 inventory submission of the United States that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2018 inventory submission of the United States of America

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
General			
G.5	Further improvements (identified by the Party)	The ERT commends the United States for its ongoing and planned improvement activities for different categories, which are listed in the respective sections of the NIR. The ERT notes that information on the expected time frames for implementation potential on ongoing and planned improvements is provided for some categories in the NIR (e.g. pp.3-74, 4-27, 5-23, 6-19), where feasible. During the review, the Party presented the expected time frames for implementation of other planned improvements. The ERT acknowledges that reporting on the time frame for implementation of planned improvements is not required by the UNFCCC Annex I inventory reporting guidelines. The ERT commends the Party for voluntarily including information on the projected implementation time frame, where feasible, in the description of the planned improvements in the NIR, as it facilitated understanding of national circumstances related to progress on planned improvements.	Not an issue
Energy			
E.18	1. General (energy sector) – gaseous fuels – CO_2 and CH_4	The ERT notes that there appear to be no recent national data on the natural gas CO_2 EF and composition, with a constant EF (50.24 t CO_2/TJ reported in CRF table 1.A(a)s1 on a gross calorific value basis) applied for 2007 onward. The CO_2 EF used for 2007 onward does not appear to be consistent with the methodology outlined in the NIR (annex 2.2, p.A-76, step 4), which indicates using annual national average pipeline-quality gas heat content to determine the CO_2 EF for the inventory, and presents a variable trend in the CO_2 EF from 1990 to 2010. The ERT acknowledges that the range of composition for natural gas is typically narrow, and notes that the reference used for petroleum fuel carbon content (Green and Perry, 2007) in the NIR (table 24-8) presents a natural gas compositional range in United States cities of between 86 and 95 per cent CH_4. However, the ERT considers that an evaluation is warranted of the representativeness across the time series of the CO_2 EF applied for the combustion of natural gas and the CH_4 content of gas used as the EF for fugitive sources. The ERT notes that the quality of fuel gas used in upstream oil and gas installations, predominantly by offshore operators to run power plants, is likely to differ in composition and CO_2 EF to natural gas that has been processed for injection into the national distribution grid. The ERT therefore recommends that the United States implement its stated methodology (2018 NIR, annex 2.2, p.A-76, step 4) across the time series, conduct research and update, where necessary, the time series for 2007 onward of natural gas CO_2 EFs and natural gas composition data to determine CH_4 content, in order either to update the CO_2 EFs and CH_4 content applied in the national inventory, or to clearly show in the NIR that the EFs applied are accurate and representative of emissions across the time series. The ERT also recommends that the United States examine if the uncertainty analysis needs to be updated to reflect the findings of the research on natural gas combustion and document its findings in future submissions.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT further recommends that the United States (a) research CO_2 EF data for fuel gas used by upstream oil and gas producers, and natural gas that has been processed and injected into downstream distribution networks, in order to determine whether a CO_2 EF for fuel gas used in offshore oil and gas production that is different from the CO_2 EF for the processed gas that enters the transmission, storage and distribution networks used in power and industrial plants and by other users is warranted and whether it can be determined and (b) document the findings of the research on the CO_2 EFs in the NIR.	
E.19	Feedstocks, reductants and other NEU of fuels – CO_2	The ERT notes that the Party uses a mass-balance method across petrochemical production to estimate CO_2 emissions from NEU of fuels, as described by the Party during the review, but it also reports separate emissions from feedstock consumption under IPPU, derived from process emissions reported under GHGRP. The ERT considers that this is likely to lead to double counting of emissions. During the review, the Party highlighted that this potential double counting is transparently described in the NIR (planned improvements on p.4-56).	Yes. Accuracy
		The ERT recommends that, in order to improve inventory accuracy, the United States continue to research the data for the emissions from NEU of fuels reported under the energy and IPPU sectors mass-balance method used across petrochemical production to estimate CO_2 emissions from NEU of fuels and the method based on process emissions reported under facility-level reporting used to estimate emissions from feedstock consumption under IPPU, and further clarify the country-specific approach used in the NIR consistent with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	
E.20	1.A Fuel combustion – sectoral approach – biomass – CH_4 and N_2O	The ERT notes that the energy sector inventory does not include estimates of emissions from the combustion of landfill gas, sewage gas and other biogas (e.g. derived from anaerobic digestion) and, as a result, there is a gap in the inventory for CH_4 and N_2O (and in the memo items for CO_2). In that regard, the ERT notes that the NIR (p.3-109) indicates that a planned improvement is to research data on biogas for future inclusion. During the review, the United States confirmed this planned improvement and that an evaluation is needed to determine the completeness of the non-CO_2 emissions reported in the waste sector.	Yes. Completeness
		The ERT recommends that the United States advance its research on CH_4 and N_2O emissions from the combustion of landfill gas, sewage gas and other biogas in order to review data sources for biogas, review the reporting of non-CO_2 emissions in the waste sector and assess the need to add new estimates to improve the completeness of the inventory.	
E.21	1.A.1 Energy industries – solid fuels – CO_2	The ERT notes that the CO_2 EFs are based on country-specific coal analysis data from 2008 or earlier, including state- and coal basin-specific characteristics, and were used to establish the GHGRP rules (published in 2010). The ERT recognizes that the production and use of coal from large domestic reserves dominates the power sector consumption of coal, and that a large data set is used to derive the national factors based on state and basin mixes. Nevertheless, the coal CO_2 EFs for states, basins and the national weighted average may vary over time, depending on coal supply and mine and power plant openings and closures. There is therefore uncertainty regarding the representativeness of the CO_2 EFs for recent years, and there is no justification presented in the NIR regarding their accuracy. During the review, the Party indicated that the national coal CO_2 EFs could be updated using updated regional production data to derive a new national weighted average, using the historic basin-	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		specific CO_2 EFs and reflecting the changes over time in coal production across the United States coal-mining regions. Further, the ERT notes that improved data are available (e.g. for all coal-fired power stations on coal heating values and continuous emission monitoring systems for CO_2 emissions, through the EPA Acid Rain Program), which could be used to evaluate the likely representativeness of the coal CO_2 EFs used in the inventory, to reassess the uncertainty associated with the coal CO_2 EFs and to recalibrate the coal CO_2 EFs used in the national inventory. The ERT therefore recommends that the United States review the time series of coal CO_2 EFs applied to energy industries, using the available annual data on coal heating values and continuous emission monitoring systems for CO_2 emissions from power stations and the regional production of coal that are supplied to power stations. The ERT also recommends that the Party either recalculate emissions using updated CO_2 EFs derived from the available data or present a clear justification in the NIR that the CO_2 EFs applied are accurate and representative of its emissions across the time series, and update the uncertainty analysis for this source accordingly as needed.	
E.22	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O	The ERT notes that the MOVES model is used for estimating emissions from NRMM that are reported in categories 1.A.2.g and 1.A.3.e.ii, and that a new version of the model (MOVES2014b) was developed in 2018 but not made available in time for use for the 2018 inventory. During the review, the United States indicated that the improvement of the model, which integrates updated fleet information, is expected to lead to improvements in the time series of NRMM estimates. The ERT acknowledges that the latest version of the model MOVES2014b will be incorporated for use in its next submission. The ERT recommends that the Party document the impacts of the new model and the validity of the outputs and transparently document the recalculations in the NIR when the latest version of the model (MOVES2014b) is incorporated into the inventory.	Yes. Transparency
E.23	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O	The ERT notes that CO_2 emissions from NRMM are reported under this subcategory, including emissions from fuel use by agricultural mobile machinery (which should be reported under 1.A.4.c.ii) and by fishing vessels (which should be reported under 1.A.4.c.iii). The ERT recommends that the Party research whether data are available to accurately reallocate emissions from fuel use by agricultural mobile machinery from subcategory 1.A.2.g to 1.A.4.c.ii and fuel use for fishing vessels to 1.A.4.c.iii in order to improve the comparability of its submission and ensure that emissions of all gases from a given source are reported under the same IPCC category. If data are not available to accurately reallocate emissions to the different categories, the ERT recommends that the Party clarify, in the NIR, the country-specific approach taken consistent with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines.	Yes. Comparability
E.24	1.A.2.g Other (manufacturing industries and construction) –	The ERT notes that CO_2 emissions from NRMM are reported under this subcategory, including emissions from fuel use by agricultural mobile machinery (which should be reported under 1.A.4.c.ii) and by fishing vessels (which should be reported under 1.A.4.c.iii) (see ID# E.23 above). The ERT notes that CH_4 and N_2O emissions from those sources are estimated using AD from different sources than those used under subcategory 1.A.3.e.ii. During the review, the United States explained that AD from several sources, including the MOVES model and	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
	liquid fuels – CO_2, CH_4 and N_2O	the Federal Highway Administration, are used for different NRMM types, and noted that, in accordance with the 2006 IPCC Guidelines, its method derived vehicle kilometre data by NRMM type to estimate emissions of CH_4 and N_2O that are comparable to the top-down fuel use data used to underpin CO_2 emission estimates. The ERT recommends that the Party research data by NRMM vehicle type across the different data sets, including the Federal Highway Administration and MOVES model outputs, to determine the optimum AD estimate for each subsource under NRMM, and improve inventory accuracy, as necessary, including for CO_2, CH_4 and N_2O emissions from industrial, commercial and agricultural machinery and fishing vessels.	
E.25	1.A.3 Transport – liquid fuels – CO_2, CH_4 and N_2O	The ERT notes that several planned methodological improvements are outlined in the NIR (pp.3-34 and 3-36) for the transport sector. During the review, the United States clarified that the programme of planned improvements for the transport sector will lead to a series of methodological improvements for future submissions, focusing resources, as appropriate, on improvements in line with the 2006 IPCC Guidelines. Further, the United States explained that longer-term improvements are planned, based on ongoing research and documentation of minor emissions sources currently not included in its inventory. The ERT commends the Party's commitment to improving inventory accuracy and completeness for the transport sector and acknowledges that these improvements may not be delivered in time for the next submission. The ERT recommends that, in order to improve the accuracy and completeness of its submission, the United States advance its research in order to implement as soon as practicable the following improvements indicated during the review: (1) updating on-road diesel CH_4 and N_2O EFs; (2) developing improved methodology and data sources to estimate emissions from class II and III (short-line and regional) rail locomotives; (3) applying a consistent methodology over time to estimate VMT for on-road vehicles by vehicle type, defined by wheel base; and (4) including ongoing research and documentation of minor emissions sources currently not included in the inventory, such as urea use in trucks, biojet fuel, and compressed natural gas or liquefied petroleum gas use in shipping). The ERT recognizes that the United States may prioritize or phase these improvements according to data availability and notes the likely greater significance in terms of inventory accuracy of items (1) and (3) above.	Yes. Accuracy
E.26	1.A.3.b Road transportation – liquid fuels – CO_2	The ERT notes that emissions from road transportation are a significant part of the country's emissions (e.g. 1,499,111.28 kt CO_2 eq in 2016, or 28.2 per cent of the country's total CO_2 emissions excluding LULUCF), and therefore a small inaccuracy in the CO_2 EF for this category could lead to a significant accuracy issue in the United States inventory totals. The ERT notes that the CO_2 EFs applied in the inventory for diesel are constant across the time series (70.10 t CO_2/TJ, as reported in CRF table 1.A(a)s3, on a gross calorific value basis), and that the gasoline CO_2 EFs vary for 1990–2008 but are constant for 2008 onward (67.62 t CO_2/TJ, on a gross calorific value basis), reflecting, according to table A-51 of the NIR, that no new data on the density of different grades of gasoline have been gathered since 2009. Further, the ERT notes that the diesel CO_2 EFs are based on densities from samples from a diesel survey carried out in winter 2008, and the application of carbon content data for distillate burner fuel oil grades (table 24-6), which presents a range of carbon content for distillate grades (including low and high sulfur grades) of 84.7 to 87.3 per cent carbon. The ERT also notes and agrees	Yes. Consistency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		with the United States (NIR, p.A-88) that the density, heat content and carbon share of these fuels may vary according to the additives in each seasonal blend and the sulfur content of each subgrade. The country-specific CO_2 EFs may not be representative of emissions from fuel use in recent years, owing to the impact of changes in fuel composition on the fossil component of gasoline and diesel, especially in light of the underlying changes in fuel formulation to accommodate the growth of biofuel blends, as well as changes in fuel formulation to limit emissions of species such as sulfur. The ERT therefore recommends that the United States review and update the time series of diesel and gasoline CO_2 EFs, including, where necessary, the data on fuel densities and carbon share by fuel grade or document in the NIR that the EFs applied are accurate and representative of emissions across the time series, and update the uncertainty analysis as needed to reflect the findings of the research.	
E.27	1.A.3.b Road transportation – liquid fuels – CO_2	The ERT notes that the 2006 IPCC Guidelines (volume 2, chapter 3, p.3.17, footnote) indicate that biodiesel made from fossil methanol has a non-zero fossil fuel fraction ranging from 5 to 10 per cent. The ERT also notes that the 2006 IPCC Guidelines (volume 3, chapter 3, p.3.58) indicate that worldwide almost all methanol is made by steam-reforming natural gas. The ERT notes that the fossil carbon component of biodiesel derived from fatty acid methyl ester is not included in the estimates for this subcategory. During the review, the Party stated that those emissions are covered in the inventory in the NEU calculations under the emissions from the production of methanol, but the ERT notes that a tier 1 method is applied for methanol production, which does not assume stored carbon in the methanol product. Further, the United States may import methanol to use in the manufacture of biofuels; hence domestic production alone may not cover all such carbon inputs to the biofuels sold in the United States. The ERT recommends that the Party either present information in the NIR to justify the omission of any fossil carbon component in the CO_2 EF for biofuel use (e.g. fatty acid methyl ester use) or update the inventory estimates to account for emissions from the fossil carbon component of biofuels and explain the estimations in the NIR.	Yes. Completeness
E.28	1.A.3.b Road transportation – liquid fuels – CH_4 and N_2O	The ERT notes that the United States has improved the country-specific MOVES model, including using new EFs from the 2016 GREET model for alternative fuel vehicles, in order to improve the accuracy of the non-CO_2 EFs. The ERT commends the United States for its evident commitment to the continuous improvement of its method for calculating emissions from the road transportation sector in order to improve accuracy. However, the ERT notes a number of unexplained notable trends in EFs across the time series, which undermines confidence in the accuracy of the model outputs across the time series. For example, the time series of CH_4 EFs for biofuel use in alternative fuel vehicles, derived from the 2016 GREET model, exhibit a large increase beginning in 2011 (see NIR, annex 3.2, table A-111) (see also ID# E.29 below). Further, while the method description in the NIR (pp.3-40 and 3-41, and annex 3.2) does provide many details of the calculation process and AD and EF selection by vehicle type, it does not present evidence of the validation and calibration of the 2016 GREET and MOVES models or the QC of model outputs that justifies the assertion	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		that the models deliver outputs that are representative of national circumstances (e.g. fleet composition, driving conditions, VMT by road type and vehicle type). The ERT notes that the United States has not reported information on verification of the tier 3 models used to derive the emission estimates, which is not in accordance with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, which call for the provision of model verification information in the NIR. During the review, the Party explained the MOVES model data inputs and outputs and the process used to evaluate and improve the model, and confirmed that future submissions will include a description of MOVES and its evaluation and application. The ERT recommends that, in order to improve transparency and adherence to the UNFCCC Annex I inventory reporting guidelines for tier 3 model verification, the United States include descriptions of the MOVES model used to estimate CH_4 and N_2O emissions from road transportation and the 2016 GREET model used to generate EF inputs for alternative fuel vehicles, and information to verify that the models have been tested and calibrated to be representative of the United States fleet, fuels, driving conditions, road types and vehicle types.	
E.29	1.A.3.b Road transportation – liquid fuels – CH_4	The ERT noted an error in the CH_4 EF time series for biodiesel, which shows an implausible increasing trend in the more recent years of the time series (the CH_4 EF ranges from 0.01 to 0.03 kg/TJ for 1990–2010 and from 0.12 to 1.76 kg/TJ for 2011–2016). During the review, the Party noted that the agency responsible for the inventory was aware of the issue and making corrections, and that the issue will be resolved in the next submission. The ERT recommends that, to improve accuracy, the United States correct the error in the CH_4 EFs for 2011–2016.	Yes. Accuracy
E.30	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O	The ERT notes that the method used to derive emission estimates and AD for inland waterways, national navigation, navy ships and international shipping is not clearly described in the NIR. How the total AD for shipping are derived, both for national sales data and bunker fuels, is not fully transparent. In particular, the ERT considers the split of fuel use for international shipping (not included in national totals) from the other shipping categories (included in national totals) to be critical. During the review, the United States explained that the United States Energy Information Administration surveys inform AD estimates for national consumption, including bunker fuels, and that additional data from the Department of Commerce are used to inform the domestic–international split of fuel use, but no further details were provided. The method is still not transparent, with no clear information provided on the scope of surveys or how the AD are collected and allocated between domestic and international shipping categories. The ERT believes that future ERTs should consider this issue further to ensure that emissions in this category are not underestimated. The ERT recommends that the United States enhance the transparency of the descriptions of the scope of the surveys and how the total AD for shipping, both national sales and bunker fuels, are split and allocated to international shipping (not included in national totals) from other domestic shipping (included in national totals).	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
E.31	1.A.5.b Mobile – solid and gaseous fuels, and biomass use – CO_2, CH_4 and N_2O	The Party reported CO_2, CH_4 and N_2O emissions from solid and gaseous fuel and biomass use in 1.A.5.b (other mobile (military)) as "NA". During the review, the Party indicated that these activities do not occur. The ERT recommends that the Party report AD and emissions of activities not occurring as "NO" instead of "NA".	Yes. Transparency
E.32	1.B.2 Oil, natural gas and other emissions from energy production – all fuels – CO_2, CH_4 and N_2O	During the review, the ERT learned that the Party's programme of planned improvements to the upstream oil and gas fugitive emission estimates reported under this subcategory is expected to lead to a series of methodological improvements for the next submission. The ERT commends the United States for its continued efforts to improve inventory accuracy and completeness for oil and gas fugitive emissions and acknowledges that most improvements will be addressed in the next submission. The ERT recommends that the United States implement the planned improvements for this category discussed during the review (including the following: (1) estimating emissions from natural gas gathering systems using component-level annual data instead of whole-facility study data; (2) estimating emissions from hydraulically fractured oil well completions using annually reported facility emissions data instead of production-based estimates; (3) estimating fugitive emissions releases from LNG storage and transfer using GHGRP data rather than data from an older reference; and (4) estimating emissions from natural gas transmission pipeline blowdowns using GHGRP data rather than data from an older reference), ensuring that the recalculations are described transparently and that a consistent time series of estimates is maintained.	Yes. Accuracy
E.33	1.B.2.c Venting and flaring – gaseous fuels – N_2O	The ERT notes that no N_2O emissions are currently reported from flaring in the upstream oil and gas sector (N_2O emissions from flaring are reported as "NE" for oil, gas and combined in CRF table 1.B.2). The United States explained during the review that these estimates will be included in the next submission. The ERT recommends that, in order to improve the completeness of its inventory, the Party estimate and report N_2O emissions from all flaring sources in the upstream oil and gas sector, in CRF table 1.B.2, for the entire time series and explain the estimation methods, AD and EFs in the NIR, applying methodologies in line with the 2006 IPCC Guidelines (the ERT notes that table 4.2.4 in volume 2 of the Guidelines includes an estimation methodology and default N_2O EFs for flaring emissions from upstream oil and gas sources).	Yes. Completeness
IPPU			
I.26	2. General (IPPU) – CO_2	The Party has reported in its NIR (pp.4-52 and 4-66) that for various categories it applies a methodology based on production and then applies a carbon content factor for the respective solid, liquid and gaseous fuels in order to determine emissions or feedstock use in energy units to minimize double counting between the energy and IPPU sectors; the United States derives estimates of AD for NEU of fuels (e.g. fuels used as reductants or chemical feedstocks). However, the carbon content factors of these fuels in some cases are not consistent with those used in the energy chapter, and instead the Party applies IPCC default values or constant country/plant-	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		specific factors. For example, the Party uses different carbon contents for coking coal in iron and steel production than in energy use (NIR, table 4-69). These feedstock uses are then subtracted from the fuel uses in the energy sector in order to avoid double counting. However, the emissions and amounts of subtracted fuel are potentially inaccurate because of the different carbon contents applied for the same energy carrier and may lead to potential under- or overestimated emissions in the energy and IPPU sectors. Furthermore, the estimates of natural gas and petroleum coke used as a feedstock in ammonia production (see NIR, pp.4-25 and 4-26) use constant factors from literature across the time series to estimate the natural gas and petroleum coke consumption for the process feedstock component of NH_3 production, for which annual production data and a comparison of the percentage of natural gas and the percentage of petroleum coke used as feedstock are available. The NIR (planned improvements on p.4-28) indicates that the United States will obtain data on feedstock quantities from ammonia production facilities via GHGRP starting in 2018. During the review, the United States explained that while it will not be able to address this in the 2019 submission, it will have opportunities to collect new data to improve the inventory and incorporate the data when technically feasible (i.e. a few years of reported data may be necessary to fully consider these and any other data). The ERT notes that this practice is not in accordance with the UNFCCC Annex I inventory reporting guidelines because the carbon content of fuels is not consistent between the energy and IPPU sectors, and because the resulting estimated emissions reported in the energy and IPPU categories are not accurate. During the review the Party noted that some of the EFs applied to derive AD are based on consultation with data providers. The ERT recommends that the Party review the basis of EFs applied and, where appropriate, apply consistent carbon content factors to ensure consistency across the energy and IPPU sectors, reflecting any annual variations in the factors. The ERT encourages the Party to report on any relevant research that has been carried out in this regard.	
I.27	2. General (IPPU) – all	The ERT notes that for all reported emission categories under IPPU the Party has provided a complete time series of emissions. The ERT also notes that not all entries in the time series are consistently based on the same methodology in accordance with documentation in the NIR. The ERT further notes that, given the national circumstances, with the recent availability of facility-level data for some categories, applying different methodologies for different periods in the time series is the best option, as no alternative methodologies could provide better estimates.	Not an issue
I.28	2.A.1 Cement production – CO_2	The Party has reported in its NIR (pp.4-9 and 4-10) that it applies a cement kiln dust factor of 1.02 (IPCC default). During the discussion on uncertainty, the Party also reported that the cement kiln dust factor can range between 1.5 and 8 per cent depending on plant specifications. The Party explained during the review that it does not currently have sufficient data to use IPCC equation 2.5 (correction factor for cement kiln dust not recycled to the kiln for a tier 2 method; 2006 IPCC Guidelines, volume 3, chapter 2, p.2.13), as data on plant-specific cement kiln dust generation is not always available and	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		thus used the default value from the 2006 IPCC Guidelines (2 per cent) for tier 1. The ERT notes that this category has been identified as key, and therefore the 2006 IPCC Guidelines (volume 3, chapter 2, decision tree in figure 2.1) indicate that the Party should use a tier (2 or 3) that corrects for cement kiln dust when estimating emissions. The ERT also takes note that the 2006 IPCC Guidelines state that, under the tier 2 method, estimating emissions from lost cement kiln dust based on a default value can be considered good practice, as data on the amount of cement kiln dust produced may be scarce (except possibly for plant-level reporting) (p.2.12). The ERT recommends that the Party justify the applicability of the 2 per cent value of the cement kiln dust factor to its national circumstances or investigate further the availability of the data required to derive a country-specific cement kiln dust factor for cement production and report on the outcome of this investigation.	
I.29	2.B.1 Ammonia production – CO_2	The Party has reported in its NIR (p.4-25) and CRF table 2(i).A-Hs1 that it subtracts CO_2 used for urea production from its estimated CO_2 emissions from ammonia production and that it thus reports "net" emissions from ammonia production. The Party does not explicitly report CO_2 removals for urea production, but reports separately (NIR, section 4.6) on the CO_2 emissions related to non-agricultural use of urea under IPPU. Emissions from agricultural use of urea are reported under category 3.H (urea application) in the agriculture sector. The ERT notes that the Party's reporting is transparent and complete but not in accordance with the UNFCCC Annex I inventory reporting guidelines because it does not report CO_2 removals for urea production separately, leading to non-comparable CO_2 emissions from ammonia production. The ERT also notes that CRF table 2(I).A-Hs1 includes a column for CO_2 emissions recovered, where the Party has reported them as "IE". The ERT recommends that the Party report separately the removals from CO_2 recovered for urea production in CRF table 2(I).A-Hs1 and the NIR.	Yes. Comparability
I.30	2.B.3 Adipic acid production – CO_2, CH_4, N_2O and PFCs	The ERT noted that the N_2O IEF for adipic acid production (calculated by the ERT using adipic acid production data from NIR table 4-31 and N_2O emissions from CRF table 2(I).A-Hs1) increased by 101.6 per cent between 2015 and 2016, from 0.014 kt/kt to 0.027 kt/kt. There is no analysis of the trends in the IEFs included in the NIR. However, the analysis of the trends in AD and emissions is generally included for each category under IPPU and has been included for adipic acid in previous submissions. During the review, the Party explained that it has not been able to perform such analysis on IEFs as a part of this inventory submission owing to other priority improvements but that it intends to include it in future submissions. The ERT recommends that the Party include a trend analysis of the IEF in order to explain observed inter-annual changes and irregularities in these trends for adipic acid production (2.B.3).	Yes. Transparency
I.31	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O	The Party has reported AD and emissions as "NE" in CRF table 2(I).A-Hs1. In its NIR the Party has not reported emissions from glyoxal and glyoxylic acid. The ERT notes that the 2006 IPCC Guidelines (volume 3, chapter 3, section 3.5.3) provide a methodology and EF for estimating N_2O emissions from glyoxal and glyoxylic acid production. During the review, it explained that lack of data and lack of publicly available information prevent it from estimating those emissions consistent with tier 1 methods.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		The ERT recommends that the Party gather the necessary data and report N_2O emissions from glyoxal and glyoxylic acid production.	
I.32	2.B.5 Carbide production – CO_2	The ERT notes that the Party's allocation of CO_2 emissions from calcium carbide is not in line with the 2006 IPCC Guidelines, as those emissions are reported under the energy sector rather than under IPPU (see ID# I.9 in table 3). The NIR (chapter 4.10) describes the estimation of CO_2 emissions from production of calcium carbide, indicating that CO_2 emissions are implicitly accounted for in the storage factor calculation for NEU of petroleum coke in the energy sector. During the review, the Party explained that assessing availability of data on calcium carbide production is part of its improvement plan.	Yes. Comparability
		The ERT recommends that the Party allocate CO_2 emissions from production of calcium carbide to the IPPU sector in line with the 2006 IPCC Guidelines or provide clarity in the NIR as to the country-specific approach taken.	
I.33	2.B.8 Petrochemical and carbon black production – CO_2	The Party has reported in its NIR (pp.4-50 to 4-56) that it applies a CO_2 EF for prior to 2010 that is based on the average CO_2 EF for 2010–2016, obtained from the annual EFs from GHGRP, to estimate CO_2 emissions from subcategories 2.B.8.b (ethylene), 2.B.8.c (ethylene dichloride and vinyl chloride monomer), 2.B.8.d (ethylene oxide) and 2.B.8.f (carbon black). This average EF is used to backcast emissions using AD for the period 1990–2009. During the review, the Party confirmed that, for its next submission, it intends to review methods, such as the use of a moving average for 2010 to year X – 1 to estimate an average EF to backcast emissions for year X prior to 2010. The ERT notes that the EF for ethylene, ethylene dichloride and ethylene oxide shows a decreasing trend for the period 2010–2016, and concludes that continuing the use of an average of a decreasing EF may lead to less accurate emission estimates for the period 1990–2009 in future submissions. The Party responded that it plans to reassess this method for its next submission in order to have a more accurate EF for backcasting emissions from carbon black, ethylene, ethylene dichloride and ethylene oxide. The Party also indicated that it will have further discussions with experts, which could result in trend extrapolation as one possible technique for backcasting.	Yes. Accuracy
		The ERT recommends that the Party review the backcasting methods to estimate the CO_2 EF for the period 1990–2009 for subcategories 2.B.8.b (ethylene), 2.B.8.c (ethylene dichloride and vinyl chloride monomer), 2.B.8.d (ethylene oxide) and 2.B.8.f (carbon black) with improved accuracy, and report transparently on the backcasting methodology for the CO_2 EF that it chooses to apply.	
I.34	2.B.10 Other (chemical industry) – phosphoric acid production – CO_2	The ERT notes that the Party reports CO_2 emissions from phosphoric acid production under category 2.B.10. In the NIR (p.4-65), the Party reports that a single producer also produces elementary phosphor using coal coke as the reductant, but that data for this producer were not available. The ERT notes that this facility would account for about 7 per cent of the phosphoric rock consumption in the United States, which raises questions about the completeness of the reporting if this facility is omitted. During the review, the Party explained that it assumes that all phosphoric acid in the country is produced from the wet process, where the calcium phosphate of the phosphate rock is treated with sulfuric acid, and that any current consumption of coke for non-fuel use (e.g.	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		reducing agent) would be captured in the energy chapter owing to the limited availability of accurate consumption data within the facility. The ERT encourages the Party to explore the data available from the United States Geological Survey, as well as other potential sources, including whether data on elemental phosphor production, or a more specific breakdown (percentage) of phosphate rock going to this end use, are available.	
I.35	2.C.4 Magnesium production – SF_6	The Party has reported AD as confidential in CRF tables 2(I).A-Hs2 and 2(II)B-Hs1. During the review, the Party presented information on SF_6 emissions and EF trends for SF_6 emissions from magnesium production, which showed an unexplained increase in the IEF for 2009–2011. The Party acknowledged that this increase may be artificial and incorrect because it may be the result of non-accurate AD and emissions for those years. The Party added that, from 2010 to 2011, emissions were thoroughly tracked by GHGRP, while the United States Geological Survey may have gathered less complete AD (surface of magnesium manufactured products). The ERT recommends that the Party further investigate the reasons for the SF_6 IEF increase between 2009 and 2011 and report in the NIR on the outcome of its investigation and on any recalculations of AD, IEF or emissions resulting from those investigations.	Yes. Accuracy
I.36	2.D Non-energy products from fuels and solvent use – CO_2	The ERT noted that the Party reported CO_2 emissions from lubricants and paraffin wax uses as "IE" in CRF table 2(I)s2. In CRF table 9 the Party reported that emissions from feedstocks and NEU of fuels (thus including emissions from lubricants and paraffin wax uses) are reported under category 1.A.5.a (other). The ERT noted that this practice is not in accordance with the 2006 IPCC Guidelines, which stipulate that CO_2 emissions from lubricants and paraffin wax use should be reported under IPPU category 2.D. The ERT notes that the Party currently reports information regarding its country-specific methodology for emissions from lubricants, waxes, asphalt and solvents consistent with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines in box 3.6 (NIR, p.3-50) and in text on page 4-5 of its NIR. While the ERT acknowledges that reallocating the emissions to IPPU may not improve the overall accuracy of the United States inventory, the ERT maintains that it would improve the comparability against other reporting Parties. Therefore, the ERT recommends that the Party estimate separately CO_2 emissions from lubricants and paraffin wax use and report them under category 2.D.	Yes. Comparability
I.37	2.G.2 SF_6 and PFCs from other product use – SF_6	The Party has not reported any SF_6 emissions from military applications and accelerators (both should be reported under this subcategory) in CRF table 2(II).B-Hs1. The ERT noted that the 2006 IPCC Guidelines (volume 2, chapter 8) include methods for estimating SF_6 emissions from the operation of airborne warning and control systems (pp.8.23–8.25) and particle accelerators (pp.8.26–8.30). During the review, the Party indicated that there may have been SF_6 emissions since 1990 from use in military (radar) and research (linear accelerators) use in the country, but that thus far they have not been estimated. The ERT believes that future ERTs should consider this issue further to ensure that emissions from this category are not underestimated.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		The ERT recommends that, in accordance with the 2006 IPCC Guidelines (volume 2, chapter 8, pp.8.23–8.25 and 8.26–8.30), the Party investigate possible SF_6 emissions from airborne warning and control systems, particle accelerators and radars and include them in its next submission, providing a description of the identified sources, the SF_6 emissions from them for the entire time series, a methodology description and an uncertainty analysis.	
I.38	2.H Other (IPPU) – N_2O	The Party has reported N_2O emissions from semiconductor manufacturing (category 2.E.1) in CRF table 2(I).A-Hs2 under category 2.H.3. However, the AD and IEF are reported as "NE". The ERT also notes that the NIR does not contain a description of category 2.H.3. During the review, the Party explained that the reporting was not transparent because the CRF tables do not allow for reporting of N_2O emissions under category 2.E.1 (CRF table 2(I).A-H does not include category 2.E for CO_2, CH_4 and N_2O emissions from IPPU). Therefore, the Party chose to report those N_2O emissions under category 2.H.3. The Party also explained that, for this category, only emission data were available from GHGRP; no relevant AD or EFs were available. The ERT notes that reporting N_2O emissions for category 2.E.1 is not mandatory and commends the Party for including these emissions in its inventory.	Yes. Transparency
		The ERT recommends that the Party increase the transparency of the reporting of N_2O emissions from semiconductor manufacturing by including in both the NIR and the CRF tables a clear indication of where the emissions are reported and explaining that it reports this way because CRF table 2(I).A-H does not allow for reporting N_2O emissions under category 2.E.1.	
		The ERT notes that, during the next revision of the reporting guidelines for GHG inventories, Parties may wish to revise the CRF tables to allow the reporting of N_2O emissions from semiconductor manufacturing.	
Agriculture			
A.14	3. General (agriculture) – CH_4 and N_2O	The United States has used various approaches to estimate emissions for the later years of the time series in several subcategories using surrogate data, trend analysis and statistical approaches in order to make the best use of available resources, as outlined in the NIR (box 5-2), resulting in a biennial update cycle to tier 2 emission estimates for CH_4 from enteric fermentation and tier 3 estimates for N_2O emissions from agricultural soils. However, the ERT notes that, for the years that emissions are estimated using surrogate data, trend analysis and statistical approaches, the United States has only reported emission values and no AD or other related information in the CRF tables. During the review, the Party stated that it will improve transparency and comparability in future submissions by including AD and other related information in all CRF tables both as part of the biennial update cycle and for the years that surrogate data, trend analysis and statistical approaches are used to estimate emissions.	Yes. Comparability
		The ERT recommends that the United States report AD and other related information for all years of the time series in all CRF tables regardless of whether emissions are estimated from surrogate data, trend analysis or statistical sources.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
A.15	3. General (agriculture) – CH_4 and N_2O	The ERT commends the United States for developing tier 2 estimates of CH_4 emissions from enteric fermentation and manure management and tier 3 estimates of N_2O emissions from agricultural soils. It notes, however, that there are opportunities to further enhance the accuracy of those emission estimates by using consistent data sets (e.g. daily or monthly temperature values). During the review, the Party stated that it will improve the accuracy of the estimates of CH_4 from enteric fermentation and manure management and N_2O emissions from agricultural soils by using consistent model parameter data sets where common parameters (e.g. temperature) exist and will make reference to the use of common data sets in the NIR.	Not an issue
A.16	3.A Enteric fermentation – CH_4	The ERT notes that a quantitative uncertainty analysis for CH_4 emissions from enteric fermentation has not been undertaken since the 2003 annual submission (1990–2001 inventory). During the review, the Party explained that an up-to-date quantitative uncertainty assessment has not been undertaken owing to other priority improvements and that it will undertake such an assessment with future planned methodological updates. The ERT recommends that the United States undertake a quantitative uncertainty assessment in conjunction with future planned methodological updates.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
A.17	3.A.1 Cattle – CH_4	In CRF table 3.As1, under this category, the Party has left blank cells for options A and B on animal representation. The ERT notes that the United States has reported emissions using option C. The ERT recommends that the Party use the notation key "NA" to report cattle population size, AD and other related information under options A and B for this subcategory in CRF table 3.As1.	Yes. Transparency
A.18	3.A.1 Cattle – CH_4	The Party applies a constant milk fat percentage of 4 per cent throughout the time series to estimate CH_4 emissions from enteric fermentation for dairy cattle. The ERT notes that milk fat percentage is a function of diet, production practices and other factors, and that it varies throughout a given year and between years. During the review, the United States explained that current data sources do not include specific information on milk fat percentage, and it thus applies the default value of 4 per cent set out in the 2006 IPCC Guidelines (volume 4, chapter 10, p.10.60). The ERT acknowledges the lack of specific information on milk fat percentage values in the United States' current data sources. However, it recommends that the Party improve the accuracy of the milk fat percentage, for example by investigating the possibility of using additional data sources, such as creameries and agricultural extension services. During the review, the Party explained that it will source country-specific milk fat percentage values and use that information for calculating emission estimates for future submissions but is not likely to be feasible prior to the 2021 submission.	Yes. Accuracy
A.19	3.A.1 Cattle – CH_4	The Party uses an even distribution of dairy calf births throughout the year in the estimation of CH_4 emissions from enteric fermentation from dairy cattle. The ERT notes that this may not reflect production practices and lactation curves on farms. During the review, the Party stated that current data sources do not include specific information on the distribution of calf births from dairy cows, and it thus evenly distributes births throughout the year.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		The ERT acknowledges the lack of country-specific information on calf births from dairy cows. However, it recommends that the Party investigate the possibility of using additional data sources (e.g. farm extension services) to derive country-specific information on calf births from dairy cows throughout the year and report on the results of this investigation in its NIR. During the review, the Party explained that it will endeavour to source information on the distribution of dairy calf births throughout the year and use it in the calculation of emission estimates for future submissions, but the Party indicated that this improvement is not likely to be feasible prior to the 2021 submission.	
A.20	3.A.1 Cattle – CH_4	The United States uses regional diet data for all animals except feedlots in the estimation of CH_4 emissions from enteric fermentation. The ERT notes that there are differences in cattle diets across different farms and states, and that this may influence the accuracy of the emission estimates. During the review, the Party explained that it aims to update these data as part of inventory improvements for the next submission.	Yes. Accuracy
		The ERT recommends that the United States update regional diet characterization data used in the estimation of CH_4 emissions from cattle in order to more accurately reflect the differences in diets across farms and states.	
A.21	3.A.2 Sheep – CH_4	The Party estimated CH_4 emissions from enteric fermentation from sheep using population distribution data from 1993, which is assumed to be constant thereafter. The ERT notes that this assumption may not reflect the current sheep population distribution. During the review, the Party explained that it will update the sheep population distribution as resources and data availability allow.	Yes. Accuracy
		The ERT recommends that the United States update the sheep population distribution as data availability allows, focusing resources as appropriate, in line with the 2006 IPCC Guidelines.	
A.22	3.A.2 Sheep – CH_4	The United States has not reported in CRF table 3.As1 average gross energy intake and Ym for this category. The ERT notes that the Party utilizes the default EFs from the 2006 IPCC Guidelines and that average gross energy intake and Ym are provided in the 2006 IPCC Guidelines (volume 4, chapter 10, table 10.13).	Yes. Transparency
		The ERT recommends that the United States include the average gross energy intake and Ym associated with the use of the default EF.	
A.23	3.A.2 Sheep 3.A.3 Swine – CH_4	The United States has reported AD and emissions from sheep at an aggregated level only in CRF table 3.As1, although the estimates were calculated at a disaggregated level. The same issue occurs for swine. Furthermore, AD and emissions from sheep and swine are reported under the subcategory other of categories 3.A.2 and 3.A.3, respectively. During the review, the Party explained that it will address the level of aggregation at which emissions are reported in CRF tables 3.As1 and 3.B(a)s1 in its next inventory submission.	Yes. Comparability
		The ERT recommends that the United States remove the subcategory other from under categories 3.A.2 and 3.A.3 and report the associated emissions, AD and other related information either directly at the most aggregated level or else report emissions disaggregated by subspecies, and include an appropriate description of the estimation methodologies in the NIR.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
A.24	3.A.3 Swine – CH_4	The United States has not reported in CRF table 3.As1 average gross energy intake and Ym for this category.	Yes. Transparency
		The ERT recommends that the United States include values for average gross energy intake and Ym.	
A.25	3.B Manure management – CH_4	The ERT notes that a quantitative uncertainty analysis for CH_4 emissions from manure management has not been undertaken since the 2003 annual submission (1990–2001 inventory). During the review, the Party explained that an up-to-date quantitative uncertainty assessment has not been prioritized due to other improvements. The Party has initiated efforts to update data (started in Spring 2018) and uncertainty will be addressed through updates with these multi-year methodological improvements.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
		The ERT recommends that the United States update the quantitative uncertainty assessment.	
A.26	3.B Manure management – N_2O	The ERT notes that the animal MMS data utilized by the United States is based largely on information that may not be representative of current national circumstances (e.g. category 3.B.3 (sheep) inputs are based on data from 2001). During the review, the Party explained that it is currently discussing new animal MMS data requirements with the United States Department of Agriculture, and that it will utilize updated animal MMS data for estimating emissions as they become available.	Yes. Accuracy
		The ERT recommends that the United States use the updated animal MMS data for estimating emissions as soon as they become available and provide an update on developments in its improvement plan. The ERT also recommends that the United States investigate other potential sources of animal MMS data, such as extension services (i.e. agricultural advisory services).	
A.27	3.B.1 Cattle – CH_4	The United States has reported in CRF table 3.B(a)s2 the notation key "NE" for some MMS that are not used (e.g. other animal waste management systems for heifer stocker). The ERT notes that the most appropriate notation key to report when an animal waste management system is not used is "NO".	Yes. Transparency
		The ERT recommends that the United States report MMS that are not used as "NO" instead of "NE" in CRF table 3.B(a)s2 or, if they occur but are not estimated, replace "NE" with the appropriate estimate.	
A.28	3.B.2 Sheep 3.B.3 Swine – CH_4	The ERT takes note of the aggregation issue for sheep and swine under category 3.A described in ID# A.23 above.	Yes. Comparability
		The ERT recommends that the United States remove the subcategory other under categories 3.B.2 and 3.B.3 in CRF table 3.B(a)s1 and report the associated emissions, AD and other related information either directly at the most aggregated level or report emissions disaggregated by subspecies, and include an appropriate description of the estimation methodology in the NIR.	
A.29	3.B.4 Other livestock – CH_4	The United States has not reported in CRF table 3.As1 average gross energy intake and Ym for this category.	Yes. Transparency
		The ERT recommends that the United States include values for gross energy intake and Ym.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
A.30	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The Party states in its NIR (p.5-41) that not all N_2O emissions from the States of Alaska and Hawaii are included in the national inventory estimates (e.g. emissions from crop residues and manure applied to agricultural soils). During the review, the Party explained that the impact of nitrogen inputs on N_2O emissions has not been estimated in either state, and those emissions are likely to be less than 0.05 per cent of the total United States GHG emissions, but may exceed the 500 kt CO_2 eq threshold defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The Party also explained that it was in the process of determining the missing N_2O emissions, to the extent resources allowed, and will include them in future submissions. The ERT recommends that the United States include all N_2O emissions from the States of Alaska and Hawaii in the emissions reported under this category or clearly outline in its improvement plan steps for including those emissions in the inventory.	Yes. Completeness
A.31	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The ERT commends the United States for developing tier 3 estimates of N_2O emissions from agricultural soils, and recognizes the level of effort required to continually update and maintain tier 3 methodologies. The ERT notes, however, that the United States has not evaluated the parametrization of the DAYCENT model since it was first used for the 2005 inventory submission (1990–2003 inventory). The ERT also notes that the United States has insufficient data for both the parameterization and evaluation of emission estimates and that the Party uses available research data for model evaluation and verification. The ERT further notes that there are several global and national research initiatives (e.g. the Global Research Alliance (see https://globalresearchalliance.org) and the Agricultural Greenhouse Gas Research Initiative for Ireland (see http://agri-i.ie)) under way that could facilitate the inclusion of further additional data sets in the Party's model parameterization and evaluation and verification activities. The ERT encourages the United States to update the parametrization, evaluation and verification of the DAYCENT model using results from research studies completed by other Parties whose soil and environmental variables are similar.	Not an issue
A.32	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The Party includes the application of non-commercial organic amendments in the estimation of nitrogen application to agricultural soils. These organic amendments include biosolids, dried blood, compost and other materials (NIR, table 5-18). The ERT notes that the identification of these materials and their individual nitrogen contents is not transparently described in the NIR. The ERT recommends that the United States provide additional information in the NIR on the quantities and nitrogen content of non-commercial organic amendments (e.g. biosolids, dried blood and compost) applied to agricultural soils.	Yes. Transparency
A.33	3.D.a.3 Urine and dung deposited by grazing animals – N_2O	The Party states in its NIR (p.5-39) that it divides evenly the amount of nitrogen deposited in dung and urine by grazing animals between all counties in each individual state. The ERT notes that this may affect the accuracy of the N_2O emissions reported in this category owing to differing soil types and environmental characteristics. During the review, the Party agreed that this general assumption may result in the underestimation of N_2O emissions in this category. However, to date, the information required to refine estimates to take into account	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		different soil types has not been available. The ERT believes that future ERTs should consider this issue further to ensure that emissions in this category are not underestimated. The ERT recommends that the Party refine the emission estimates with available data on nitrogen deposited by soil type and document this in its planned improvements.	
LULUCF			
L.36	4. General (LULUCF) – CO_2, CH_4 and N_2O	The ERT noted issue ID# L.3 in table 3. Until the Party is able to report anthropogenic emissions and removals from the entire national managed land area, the ERT recommends that the Party report non-estimated managed land as a subdivision in the relevant CRF tables (i.e. tables 4.A, 4.B, 4.C, 4.D and 4.E), so that the managed land area for each land category reported in CRF table 4.1 corresponds with that reported for the same category in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.37	Land representation – CO_2, CH_4 and N_2O	In the NIR (pp.6-15 to 6-20) and CRF tables 4.B and 4.C, the United States has reported that data from NRI used to build the land representation were not available for 2013 onward for the inventory, although NRI collects data each year from a fraction (20 per cent) of the total grid of sampling points. The ERT notes that, although data are collected by United States agencies, the data are not made available in a timely manner for the preparation of the inventory often due to QC processes (the NRI only releases updated data sets every few years given the scope of their effort). This also implies that uncertainties of estimates are not reduced as far as practicable, since additional errors are caused by the structure of the models used (i.e. imputation methods) to extrapolate the time series of estimates for the years for which data are not available. During the review, the United States explained that coordination needs have been identified in order to facilitate the timely collection and sharing of data among relevant federal agencies. The ERT recommends that the United States update its land representation with the latest available data from NRI, and proceed with plans to improve the coordination and timing of sharing data between federal agencies if necessary.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.38	Land representation – CO_2, CH_4 and N_2O	The Party has reported the area of unmanaged land aggregated as a single total for each year in the land transition matrix (the value is reported in cell K17 in CRF table 4.1). The Party has reported all transitions to and from unmanaged land as “IE”, “NA” and “NO”. However, the ERT notes that data on unmanaged land disaggregated by land category are available in the NIR (p.6-9, table 6-6), and therefore the current reporting in CRF table 4.1 is not in accordance with paragraph 4(a) of the UNFCCC Annex I inventory reporting guidelines, and also not consistent with the reporting in the NIR. The ERT noted that United States plans to provide disaggregated information in the 2020 submission. The ERT recommends that the United States report disaggregated areas and changes in areas for every type of unmanaged land in CRF table 4.1.	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
L.39	4.A Forest land – CO_2	In the NIR (pp.A-377 to A-379), the United States has reported that a tier 3 model was applied to estimate SOC changes in mineral forest soils. The ERT notes that no information on the verification of the estimates has been reported and that this is not in accordance with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines, which requires Parties to provide verification information in the NIR when estimates are calculated using higher-tier (tier 3) methods and models consistent with the 2006 IPCC Guidelines. The ERT recommends that the United States report up-to-date information on the verification of the outputs of the model used to estimate SOC changes in mineral soils, for example, at the level of annual fluxes in single specific sites representative of the variability of the population or, as done for the DAYCENT model for agricultural soils (NIR figure A-12), at the level of the total cumulated (across the time series and the entire territory modelled) net flux.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.40	4.A Forest land – CO_2	The Party has reported that the carbon conversion factor applied to forest biomass is the IPCC default value of 0.5. The ERT notes that this is not the default value provided in the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.3), which is 0.47 t carbon/t dry matter for all domains. The ERT recommends that the United States apply as the carbon conversion factor for forest biomass either a country-specific value or the default value provided in the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.3), and, for mangrove forests, either a country-specific value or the default value provided in the Wetlands Supplement.	Yes. Accuracy
L.41	4.A Forest land 4(II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – CO_2, CH_4 and N_2O	The United States has reported in CRF table 4.A a decreasing sink of CO_2 emissions from organic soils (from a net sink of 23.44 kt carbon/year in 1990 to a net source of 25.62 kt carbon/year in 2016) and constant N_2O and CH_4 emissions in CRF table 4(II), although the area of organic soils continuously increases across the entire time series 1990–2016 (from 6,609.99 to 6,938.70 kha). The ERT noted that NIR tables 6-21 and 6-22 report different values with a different trend in the CO_2 emissions than those reported in the corresponding CRF tables (for example, CO_2 direct emissions are reported in NIR table 6-21 as 0.7 Mt constant across the entire time series, while in CRF table 4.A a net sink of 0.09 Mt CO_2 is reported for 1990 and a net source of 0.09 Mt CO_2 for 2016). During the review, the Party explained that there was an error in the CRF table compilation and that the values in the NIR are correct. The ERT recommends that the United States review the AD and estimates of CO_2, CH_4 and N_2O emissions from organic soils reported in CRF tables 4.A and 4(II), confirming that the values are consistent, and explain any recalculation in the NIR. The ERT also recommends that the United States ensure the accuracy of the information reported in the CRF tables, in particular whether there is consistency between reported CO_2 and N_2O fluxes in organic soils and between GHG fluxes and the area of organic soils in which such fluxes originate.	Yes. Accuracy
L.42	4.A Forest land – CO_2 and N_2O	In the NIR (pp.A-368 to A-382) the United States has reported that the stock difference used to estimate net carbon stock changes in each of the carbon pools is applied at the state level, although carbon stocks are estimated at the level of each single plot. Further, the Party has reported in the NIR (pp.A-380 and A-381) that,	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		when interpolating and extrapolating carbon stocks, it calculated the carbon stock changes in net area changes instead of calculating the carbon stock impact in both gross changes (i.e. afforestation and deforestation) separately. The ERT notes that applying the stock difference at the level of aggregated quantities (i.e. at state level) instead of at plot level results in double counting of biomass and DOM losses associated with deforestation as well as overestimation of the soil organic matter, and possibly of biomass and DOM, associated with afforestation. During the review, the Party explained that estimates of carbon stock change for each carbon pool of forest land for the next submission will be prepared at the level of every single plot, and that, consequently, carbon stock changes should neither be double counted with deforestation nor overestimated with afforestation. The ERT acknowledges the planned improvement and recommends that the United States calculate the carbon stock change in each carbon pool at the level of each single plot and then aggregate the results at the state and national level, and explain any recalculations in the NIR.	
L.43	4.A Forest land – CO_2	The United States applies the stock-difference approach to estimate carbon stock changes for all pools, including the biomass carbon pool (see ID# L.42 above). Considering that data are available (e.g. in the forest inventory) and the verification of emission estimates against independent data sets is a good practice as per the 2006 IPCC Guidelines (volume 1, chapter 6), the ERT encourages the United States to also apply suggested verification techniques, such as the application of IPCC default methods (i.e. the gain and loss approach in estimating biomass carbon stock changes).	Not an issue
L.44	4.A.2 Land converted to forest land – CO_2	The United States has erroneously reported the same implied mineral soil SOC change factor for all types of afforestation for 1990–2012 in CRF table 4.A (see ID# L.23 in table 3). The ERT recommends that the United States recalculate SOC changes in mineral soils for all areas converted to forest land in the CRF tables and explain the recalculations in the NIR. The ERT notes that the Party plans to correct these factors in CRF table 4.A in its next submission.	Yes. Accuracy
L.45	4.B Cropland – CO_2	The ERT notes a significant sudden and temporary decrease of about 80 kha in the area of organic soils for cropland remaining cropland between 1999 and 2000 reported in CRF table 4.B. The area decreased from 622.63 to 537.37 kha between 1998 and 1999, remained at about that level in 2000 (538.95 kha) and increased to the 1998 level in 2001 (624.38 kha). During the review, the Party explained that area data are provided by NRI and the compilers of the inventory do not conduct QC for potential biases. The ERT noted that this practice is not in accordance with the 2006 IPCC Guidelines (volume 1, chapter 6), which state that it is good practice to ensure the quality of AD when using national AD from a secondary data source. The ERT recommends that the United States check the quality of the data from which the land representation is derived, investigate the reasons for the sudden and temporary decrease in the area of organic soils by about 80 kha between 1999 and 2000 for cropland remaining cropland reported in CRF table 4.B, explain the result of this investigation in the NIR, correct any identified inconsistencies and explain any recalculations in the NIR.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
L.46	4.B.2.2 Grassland converted to cropland – CO_2	The Party has reported biomass carbon stock changes for grassland converted to cropland as "NE" in CRF table 4.B. The ERT noted that the 2006 IPCC Guidelines (chapter 5, volume 4) provide methods for estimating carbon stock change and associated emissions and removals for land converted to cropland. The ERT recommends that the United States estimate biomass carbon stock changes using the IPCC default method and factors or, where available, country-specific methods and factors, and report the estimations in the NIR.	Yes. Completeness
L.47	4.B Cropland 4.C Grassland – CO_2 and N_2O	In the NIR (pp.A-305 to A-312) the United States has reported that the tier 3 DAYCENT model was applied to estimate SOC changes and associated CO_2 and N_2O emissions for mineral soils. The ERT notes that the Party has complied with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines by reporting on the verification of the model's outputs for the category cropland remaining cropland for the period 1982–1997 in the NIR (table A-12) consistent with the 2006 IPCC Guidelines. However, the ERT considers that verification of the model's output should be performed regularly across the entire time series and all land categories should be estimated by the model. The ERT recommends that the United States verify the model's output for the entire time series from 1990 onward and for all applicable land categories (e.g. by verifying the model's output for each land-use category, or for the total of the land-use categories, or for any subaggregation, as long as the total estimate of all land-use categories modelled is verified) and report on the verification and the results in the NIR.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.48	4.B Cropland 4.C Grassland – CO_2 and N_2O	The ERT notes that the DAYCENT model for mineral soils was used to estimate SOC changes and associated CO_2 and N_2O fluxes originating from a depth increment of 20 cm, while the 2006 IPCC Guidelines (volume 4, chapter 2) establish a minimum depth increment of 30 cm. The ERT understands that the United States anticipates addressing this update in its 2020 submission. The ERT recommends that the United States report SOC changes and associated CO_2 and N_2O emissions from cropland and grassland mineral soils using a depth increment of at least 30 cm in line with the 2006 IPCC Guidelines (volume 4, chapter 2).	Yes. Comparability
L.49	4.C Grassland – CO_2	The Party has not reported estimates for area and carbon stock change for all pools for woody grassland separately from other grassland types. During the review, the United States explained that data on the area and carbon stock of woody grassland are available within the FIA data set. Considering that it is good practice to reduce uncertainties as far as practicable, and that data on woody grassland are available, the ERT recommends that the United States report woody grassland as a subdivision of the grassland category, estimate accordingly the area and carbon stock change for all carbon pools of woody grassland within the category grassland remaining grassland and within all land-use categories of conversion from and to grassland, and report the estimations in the NIR.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
L.50	4.C.1 Grassland remaining grassland	In the NIR (p.6-9, table 6-6) the United States has reported that the area of unmanaged grassland increased from 25,953 to 27,043 kha between 1990 and 2005. The ERT notes that this is not in accordance with the 2006 IPCC Guidelines (volume 4, chapter 1) because, according to the definition provided therein, land that was once managed is not expected to subsequently return to unmanaged status. The ERT recommends that the United States revise the time series of the area of unmanaged grassland, ensuring that once a land area is classified as managed it is thereafter tracked as managed land within the inventory.	Yes. Consistency
L.51	4.C.2.2 Cropland converted to grassland – CO_2	The Party has reported biomass carbon stock change in cropland converted to grassland as "NE" in CRF table 4.C. The ERT notes that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 6) for estimating carbon stock change and associated emissions and removals for land converted to grassland. The ERT recommends that the United States estimate biomass carbon stock change using the IPCC default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Yes. Completeness
L.52	4.D Wetlands – CO_2, CH_4 and N_2O	The United States has reported in its NIR (pp.6-84 to 6-95) and CRF tables 4.B and 4(II) emissions and removals from coastal wetlands estimated using methods provided in the Wetlands Supplement. The ERT commends the United States for reporting on this category and notes that this enhances the completeness of the inventory beyond the categories listed in the 2006 IPCC Guidelines. The ERT notes that the conversion of unvegetated open water coastal wetlands to vegetated coastal wetlands likely causes a perturbation in the stream of organic matter from land to ocean and a consequent lateral transfer and accumulation of organic matter in the vegetated land. It also notes that a fraction of such organic matter may otherwise be sequestered in the ocean sediment as per natural processes. Subject to improvement priorities and the availability of resources, the ERT encourages the United States to assess the magnitude of lateral transfers of organic matter into the converted vegetated coastal wetlands and the natural accumulation of organic matter into marine sediments.	Not an issue
L.53	4.D.2.2 Land converted to flooded land – CO_2	The Party has reported carbon stock change in all carbon pools for land converted to flooded land as "NE" in CRF table 4.D. The ERT notes that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 7) for estimating carbon stock change and associated emissions and removals for land converted to flooded land. The ERT recommends that the United States estimate carbon stock change in flooded land using the 2006 IPCC Guidelines (volume 4, chapter 7) default method and factors or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Yes. Completeness
L.54	4.D.2.3 Land converted to other wetlands – CO_2	The Party has reported carbon stock change in the biomass and DOM carbon pools for forest land converted to other wetlands, as well as stock change in the biomass carbon pool for the conversion of cropland and grassland to other wetlands, as "NE" in CRF table 4.D. The ERT notes that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 7) for estimating carbon stock change and associated emissions and removals for land converted to other wetlands. During the review, the Party explained that estimating carbon stock change for	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue?[a] If yes, classify by type
		forest land converted to other wetlands is among its planned improvements, and that the estimates are expected to be included in the 2020 inventory submission. The ERT recommends that the United States estimate biomass and DOM carbon stock changes for forest land converted to other wetlands as planned for its 2020 submission, and explain the estimations in the NIR. The ERT also recommends that the Party estimate carbon stock change in biomass for the conversion of cropland and grassland to other wetlands using IPCC default methods and factors (2006 IPCC Guidelines, volume 4, chapter 7) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	
L.55	4.E.1 Settlements remaining settlements – CO_2	The United States has reported a net carbon stock gain in solid waste disposal sites of yard trimmings and food scraps in the living biomass carbon pool in CRF table 4.E (e.g. 12,146.68 kt CO_2 for 2016). The ERT notes that this is not in accordance with the 2006 IPCC Guidelines (volume 4, chapters 1, 2 and 8) because yard trimmings and food scraps are neither part of the living biomass pool (yard trimmings and food scraps are composed of DOM), nor do they pertain to any of the other carbon pools for which IPCC guidance is provided. Furthermore, although, like any other human infrastructure (e.g. power plants), solid waste disposal sites are physically located in settlements, they are not part of the carbon pools of any of the land-use categories for which carbon stock gains and losses are reported, including settlements. The ERT also notes that solid waste disposal sites constitute a category of the waste sector for which CH_4 emissions from biogenic waste are reported in CRF table 5.A, and that information on the long-term stored carbon stock, including its annual changes, should be reported in CRF table 5 (as a memo item). During the review, the United States explained that the net sink reported does not pertain to the waste sector because it is a carbon stock change not a GHG flux. Further, the Party noted that, similar to the carbon stock change in HWP displaced in solid waste disposal sites, the carbon stock change from yard trimmings and food scraps is a category to be reported under the LULUCF sector instead of the waste sector. The ERT took note of the rationale provided by the Party and notes that the Party could consider reporting under category other (4.H) as a way to accommodate the reporting of country-specific categories for which the IPCC does not yet provide methods. The ERT therefore recommends that the United States remove the reporting of the carbon stock change associated with yard trimmings and food scraps from under the settlements category and allocate it to the category other under the relevant sector. The ERT also recommends that the United States report information on the long-term stored carbon stock of yard trimmings and food scraps, as well as on its annual changes, in the memo item in CRF table 5.A.	Yes. Comparability
L.56	4.E.2.2 Cropland converted to settlements 4.E.2.3 Grassland	The Party has reported carbon stock change in biomass for the conversion of cropland and grassland to settlements as “NE” in CRF table 4.E. The ERT notes that methods and default values are provided in the 2006	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
	converted to settlements – CO_2	IPCC Guidelines (volume 4, chapter 8) for estimating carbon stock change and associated emissions and removals for land converted to settlements. The ERT recommends that the United States estimate biomass carbon stock change for cropland converted to settlements (category 4.E.2.2) and grassland converted to settlements (category 4.E.2.3) using the IPCC default method and factors (2006 IPCC Guidelines, volume 4, chapter 8) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	
L.57	4.F.2 Land converted to other land – CO_2	The United States has reported all carbon stock changes in all carbon pools as "NE" in CRF table 4.F. The ERT noted that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 9) for estimating carbon stock change and associated emissions and removals for land converted to other land. During the review, the Party explained that estimating carbon stock change for land converted to other land is among its planned improvements, and that the estimates are expected to be included in its 2020 inventory submission. The ERT recommends that the United States report estimates of carbon stock change for land converted to other land using the IPCC default method and factors (2006 IPCC Guidelines, volume 4, chapter 9) or, where available, country-specific methods or factors, and explain the estimations in the NIR.	Yes. Completeness
L.58	4.G HWP – CO_2	The United States has reported background data on HWP (i.e. quantities produced, imported and exported as well as factors used to convert product units to carbon) as "NA" in CRF table 4.Gs2. The ERT notes that these data are available and their omission is not in accordance with the transparency requirements set out in paragraph 4(a) of the UNFCCC Annex I inventory reporting guidelines. However, the ERT also notes that the model applied (WOODCARB II) uses as input a number of subcategories from each HWP category, and each of the subcategories has a specific conversion factor to carbon weight, which makes it impossible for the Party to complete CRF table 4.Gs2 in its current format. The ERT further notes that the United States' reported removals from HWP (e.g. 99,618.46 kt CO_2 removals in 2016) are the highest among Parties included in Annex I to the Convention and significantly higher than the second largest level of removals (European Union, 38,234.90 kt CO_2 removals in 2016). The ERT recommends that the United States complete CRF table 4.Gs2 with aggregated values in t carbon for each of the three HWP subcategories (solid wood, paper and paperboard, and other) and report in the NIR a table with all subcategories used by the model to calculate the HWP contribution as well as the conversion factors to carbon weight applied for each subcategory. The ERT believes that this issue should be considered further in future reviews when background data on HWP are available for assessing the consistency of the HWP removals with the time series of harvested wood in forest land and domestic production of HWP.	Yes. Transparency
L.59	4.G HWP – CH_4 and N_2O	Although the assumption that the half-life of HWP exported to other countries is the same as the half-life of HWP consumed in the United States is consistent with IPCC tier 1 and is therefore not considered to be biased (see ID# L.30 in table 3 above), the ERT notes that HWP are a significant sink (e.g. 99,618.46 kt CO_2 eq reported for 2016 in CRF table 4.Gs1).	Not an issue

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		Therefore, the ERT encourages the United States to compile available information, from literature as well as from national GHG inventories, on the half-life values of HWP in the countries to which its HWP are exported, and, until such information is compiled, to use for the exported HWP the IPCC default half-life values.	
L.60	4.H Other (LULUCF) – CH_4	In the NIR (p.6-115) the United States has reported that in the waste chapter landfill CH_4 emissions from yard trimmings and food scraps are not distinguished from landfill CH_4 emissions from total bulk (i.e. municipal solid) waste, which includes yard trimmings and food scraps, and did not provide a complete description of the calculation of decay rates for yard trimmings and food scraps. The ERT notes that the disaggregation of yard trimmings and food scraps from MSW necessitates the recalculation of the decay rates applied to the MSW in disposal sites to exclude their contribution to CH_4 emissions. To ensure transparency, the ERT recommends that the United States report the complete calculation of the decay rates applied to yard trimmings and food scraps as well as information on the impact that the calculation has on the CH_4 emission rates applied to other MSW.	Yes. Transparency
L.61	4(III) Direct N_2O emissions from nitrogen mineralization/ immobilization – N_2O	The United States has reported all direct N_2O emissions for all land-use categories as "NE" in CRF table 4(III). The ERT notes that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 11) for estimating N_2O emissions associated with the mineralization of nitrogen contained in SOC losses of mineral soils under any land-use category. The ERT also notes that the United States has reported, under the agriculture sector, N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for cropland remaining cropland, grassland remaining grassland, cropland converted to grassland and grassland converted to cropland, meaning that those N_2O emissions should be reported as "IE" in CRF table 4(III) for the LULUCF sector. The ERT recommends that the United States estimate N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for their conversion to and from cropland and grassland, using the IPCC default method and factors (2006 IPCC Guidelines, volume 4, chapter 11) or, where available, country-specific methods or factors, and report the estimations in CRF table 4(III) and the NIR.	Yes. Completeness
L.62	4(IV) Indirect N_2O emissions from managed soils – N_2O	The United States has neither estimated nor reported in CRF table 4(IV) indirect N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for forest land, wetlands, settlements and other land. The ERT notes that methods are provided in the 2006 IPCC Guidelines (volume 4, chapter 11) for estimating indirect N_2O emissions associated with the mineralization of nitrogen contained in SOC losses of mineral soils for any land-use category. The ERT recommends that the United States estimate indirect N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for forest land, wetlands, settlements and other land and report them in CRF table 4(IV), and explain the estimations in the NIR.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
L.63	4(V) Biomass burning – CH_4 and N_2O	The ERT notes that CH_4 and N_2O emissions from biomass burning is a key category for the Party, and the Party used default factors from the 2006 IPCC Guidelines in the estimations. However, the decision tree in the 2006 IPCC Guidelines (volume 4, chapter 2) indicates using country-specific fuel data and combustion factors as a good practice. The ERT encourages the United States to use country-specific fuel data and combustion factors to prepare estimates of GHG emissions from biomass burning or, if that is not possible, the ERT recommends that the Party explain in the NIR the reasons for not using an estimation method in accordance with the decision tree in the 2006 IPCC Guidelines (volume 4, chapter 2, figure 2.6).	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
Waste			
W.15	5.A.1 Managed waste disposal sites – CH_4	The Party used the top-down tier 2 first-order decay method from the 2006 IPCC Guidelines (volume 5, chapter 3, section 3.2.1) for estimating CH_4 emissions for 1990–2004. To estimate CH_4 emissions for 2005 onward, the Party used a country-specific bottom-up method using directly reported net CH_4 emissions (i.e. the difference between the CH_4 generated and the CH_4 recovered) from GHGRP in combination with a scale-up factor to account for facilities that do not need to report to GHGRP. The ERT notes that (1) the methodologies that the facilities are using to produce estimates of net CH_4 emissions reported in GHGRP are not described in detail in the NIR, which makes it difficult to assess the accuracy of those estimates; (2) the rationale for choosing 2005 as the start of the bottom-up estimation method is not provided in the NIR; and (3) the assumption of a 9 per cent scale-up factor for estimating emissions from non-reporting facilities for 2005 onward is not described in the NIR. As a result, the ERT finds it impossible to assess both the accuracy of the bottom-up method and the consistency of the time series 1990–2016. During the review, the Party provided information on the methods and parameters that the facilities use to produce the estimates of net CH_4 emissions. The Party also explained that facilities that recover CH_4 also produce alternative estimates of net CH_4 emissions using a back-calculation method, and clarified how it selects which of the two estimates provided by the facilities to use in the national inventory. The Party also provided information on the analysis that was done in order to select a suitable year to start using the new bottom-up method. In that regard, it provided and discussed a relevant technical report (RTI International, 2017). Another technical report (RTI International, 2018) was provided by the Party and discussed, which covers the methodologies used and analysis conducted in order to produce a scale-up factor for non-reporting facilities. The ERT recommends that the Party include detailed information on the methods and parameters used by the facilities to estimate net CH_4 emissions and how the estimates are chosen for the national inventory when alternative estimates of net CH_4 emissions (e.g. from facilities that recover CH_4) are also produced. The ERT also recommends that the Party include in the NIR a summary of its process to select the year to start using the new bottom-up method.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue?[a] If yes, classify by type*
		The ERT further recommends that the Party include in the NIR a summary of the methodologies used and analysis conducted in order to produce a scale-up factor for non-reporting facilities.	
W.16	5.A.1 Managed waste disposal sites	The Party has reported the amounts of CH_4 flared and CH_4 for energy recovery under category 5.A.1.a (anaerobic) for 2005–2016 as "IE" in CRF table 5.A. During the review, the Party explained that the correct notation key is "NE" for 2005–2016.	Yes. Comparability
		The ERT recommends that the Party estimate and report the amounts of CH_4 flared and CH_4 for energy recovery for anaerobic waste disposal sites, but, until that is possible, report them as "NE" instead of "IE" in CRF table 5.A.	
W.17	5.B.2 Anaerobic digestion at biogas facilities	The ERT notes that the information on 5.B.2.b (other (CH_4 and N_2O)) in CRF table 9 is incomplete: the entry states that anaerobic digestion and biogas recovery of wastewater treatment sludge are reported under category 5.D, but an additional explanation should be added (e.g. that basic research was initiated that indicates that some activity for this category occurs in the United States, but EPA needs to conduct further research on available AD for estimating emissions).	Yes. Transparency
		The ERT recommends that the Party review and complete the explanation in CRF table 9 for category 5.B.2.b for CH_4 and N_2O.	
W.18	5.C.1 Waste incineration	The Party has indicated in the NIR (annex 5, table A-266, category 1.A.5.a) that emissions from incineration of non-hazardous industrial waste are not included in the inventory. However, during the review, the Party and the ERT concluded that that type of waste in fact qualifies as hazardous waste and the emissions from its incineration are already included in the inventory (see ID# W.9 in table 3).	Yes. Transparency
		The ERT recommends that the Party ensure that the 2019 NIR indicates that the emissions from the incineration of non-hazardous industrial waste referred to in the 2018 NIR are in fact emissions from the incineration of hazardous industrial waste and are already included in the inventory by (1) correcting the entry in annex 5 to the NIR, page A-427, section on category 1.A.5.a (CO_2 emissions from non-hazardous industrial waste incineration and medical waste incineration); (2) correcting the entry in annex 5 to the NIR, table A-266, row on category 1.A.5.a; and (3) changing the notation key reported for CO_2, CH_4 and N_2O emissions for category 5.C.1 (non-biogenic (other)) from "NA" to "IE" in CRF table 5.C and explaining in CRF table 9 where the emissions are included.	

[a] Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines. Encouragements are made to the Party to address all findings not related to such issues.

Annex I

Overview of greenhouse gas emissions and removals for the United States of America for submission year 2018, as submitted by the United States of America in its 2018 inventory submission

1. Table 6 shows total GHG emissions, including and excluding LULUCF and, for Parties that have decided to report indirect CO_2 emissions, with and without indirect CO_2. Tables 7 and 8 show GHG emissions reported under the Convention by the United States by gas and by sector, respectively.

Table 6
Total greenhouse gas emissions for the United States of America, 1990–2016
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions*[a]	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*
1990	5 536 014.23	6 355 634.21	NA	NA
1995	5 909 731.77	6 695 591.66	NA	NA
2000	6 463 882.37	7 216 645.32	NA	NA
2010	6 206 013.80	6 922 945.80	NA	NA
2011	6 022 170.73	6 771 119.19	NA	NA
2012	5 775 307.96	6 528 790.27	NA	NA
2013	5 973 343.67	6 709 106.69	NA	NA
2014	6 022 765.07	6 763 141.33	NA	NA
2015	5 942 941.27	6 638 132.74	NA	NA
2016	5 794 521.57	6 511 302.42	NA	NA

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.
[a] The Party did not report indirect CO_2 emissions in CRF table 6.

Table 7
Greenhouse gas emissions by gas for the United States of America, excluding land use, land-use change and forestry, 1990–2016
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	5 121 264.46	779 942.24	354 754.17	46 288.81	24 255.67	285.99	28 794.95	47.92
1995	5 439 213.31	767 225.64	372 087.88	71 741.38	18 640.47	1 774.06	24 825.68	83.24
2000	6 000 606.07	709 233.60	358 504.90	110 970.32	15 929.66	4 653.92	16 547.05	199.81

	CO_2[a]	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
2010	5 701 075.81	693 630.83	366 756.04	139 368.47	4 654.24	8 632.83	8 329.74	497.85
2011	5 570 706.56	672 405.17	359 811.47	142 412.47	6 906.73	9 093.50	9 139.90	643.40
2012	5 366 730.28	662 501.26	335 763.09	141 002.66	5 935.52	9 540.24	6 674.12	643.10
2013	5 519 612.56	662 552.60	363 229.48	141 111.34	5 771.01	9 987.87	6 283.26	558.57
2014	5 568 759.26	663 961.12	361 152.47	146 241.48	5 635.24	10 477.38	6 397.81	516.57
2015	5 420 804.13	665 381.40	379 574.69	149 029.52	5 112.08	11 729.92	5 929.25	571.75
2016	5 310 861.41	657 439.82	369 542.15	149 449.64	4 346.90	12 881.01	6 201.55	579.94
Per cent change 1990–2016	**3.7**	**–15.7**	**4.2**	**222.9**	**–82.1**	**4 404.1**	**–78.5**	**1 110.2**

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.

[a] The United States did not report indirect CO_2 emissions in CRF table 6.

Table 8

Greenhouse gas emissions by sector for the United States of America, 1990–2016

(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1990	5 325 072.68	342 049.77	489 169.88	–819 619.98	199 341.88	NA
1995	5 617 634.06	370 766.54	511 441.61	–785 859.89	195 749.45	NA
2000	6 153 110.02	388 964.45	509 885.02	–752 762.95	164 685.83	NA
2010	5 871 098.82	353 942.03	549 631.80	–716 932.00	148 273.14	NA
2011	5 725 904.05	370 303.01	535 702.42	–748 948.46	139 209.72	NA
2012	5 511 180.26	357 446.19	519 772.39	–753 482.31	140 391.43	NA
2013	5 671 360.11	357 918.68	543 123.91	–735 763.01	136 703.99	NA
2014	5 715 417.23	371 429.41	539 822.01	–740 376.26	136 472.67	NA
2015	5 567 824.95	367 831.93	566 873.26	–695 191.46	135 602.60	NA
2016	5 455 195.03	362 063.43	562 590.93	–716 780.85	131 453.03	NA
Per cent change 1990–2016	**2.4**	**5.9**	**15.0**	**–12.5**	**–34.1**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions. (2) The United States did not report indirect CO_2 emissions in CRF table 6.

Annex II

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which methods are included in the 2006 IPCC Guidelines that were reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of reporting in the Party's inventory are the following:

(a) 1.A fuel combustion (CO_2, CH_4 and N_2O emissions from combustion of gaseous fuel use in domestic navigation and other transportation (pipeline transport), biomass in category other (stationary fuel combustion) in the United States territories and N_2O emissions from flaring) (see ID# E.6 in table 3);

(b) 1.A fuel combustion (CH_4 and N_2O emissions from combustion of landfill gas, sewage gas and other biogas) (see ID# E.20 in table 5);

(c) 1.A.3.b road transportation (CO_2 emissions from the fossil carbon component of biofuels) (see ID# E.27 in table 5);

(d) 1.B.2.c venting and flaring (N_2O emissions from all flaring sources in the upstream oil and gas sector) (see ID# E.33 in table 5);

(e) 2.A.4 other process uses of carbonates (CO_2 emissions from ceramics and non-metallurgical magnesium production) (see ID# I.5 in table 3);

(f) 2.B.8 petrochemical and carbon black production (CH_4 and N_2O emissions from combustion and flaring) (see ID# I.10 in table 3);

(g) 2.C.1 iron and steel production (CO_2 emissions from natural gas consumption and coke oven gas production at merchant coke plants) (see ID# I.16 in table 3);

(h) 2.B.4 caprolactam, glyoxal and glyoxylic acid production (N_2O emissions from glyoxal and glyoxylic acid production) (see ID# I.31 in table 5);

(i) 2.G.2 SF_6 and PFCs from other product use (SF_6 emissions from airborne warning and control systems, particle accelerators and radars) (see ID# I.37 in table 5);

(j) 3.D direct and indirect N_2O emissions from agricultural soils for the States of Alaska and Hawaii (see ID# A.30 in table 5);

(k) 4 LULUCF sector (carbon stock changes in the living biomass and DOM pools for each conversion category from forest land to any other land use for each year) (see ID# L.2 in table 3);

(l) 4 LULUCF sector (CO_2, CH_4 and N_2O emissions from the LULUCF sector for some land uses in the United States territories, the State of Hawaii and a large portion of the State of Alaska) (see ID# L.3 in table 3);

(m) 4.B cropland (carbon stock changes in living biomass in perennial crops for all years) (see ID# L.18 in table 3);

(n) 4.B.2.2 grassland converted to cropland (carbon stock changes in biomass) (see ID# L.46 in table 5);

(o) 4.C.2.2 cropland converted to grassland (carbon stock changes in biomass) (see ID# L.51 in table 5);

(p) 4.D.2.2 land converted to flooded land (carbon stock changes in biomass) (see ID# L.53 in table 5);

(q) 4.D.2.3 land converted to other wetlands (carbon stock change in biomass) (see ID# L.54 in table 5);

(r) 4.E.2.2 cropland converted to settlements and 4.E.2.3 grassland converted to settlements (carbon stock changes) (see ID# L.56 in table 5);

(s) 4.F.2 land converted to other land (carbon stock changes) (see ID# L.57 in table 5);

(t) 4(III) direct N_2O emissions from nitrogen mineralization/immobilization (N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for conversions of those land uses to and from cropland and grassland) (see ID# L.61 in table 5);

(u) 4(IV) indirect N_2O emissions from managed soils (indirect N_2O emissions associated with the mineralization of the nitrogen content of SOC losses in mineral soils for forest land, wetlands, settlements and other land) (see ID# L.62 in table 5);

(v) 4(V) biomass burning (CH_4 and N_2O emissions from biomass burning for land converted to forest land and land converted to wetlands, cropland, grassland and settlements) (see ID# L.35 in table 3);

(w) 5.D.2 industrial wastewater (CH_4 emissions from sludge) (see ID# W.14 in table 3).

Annex III

Documents and information used during the review

A. Reference documents

Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva, Switzerland: IPCC. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

Annual review reports

Reports on the individual reviews of the 2012, 2013, 2015 and 2016 inventory submissions of the United States, contained in documents FCCC/ARR/2012/USA, FCCC/ARR/2013/USA, FCCC/ARR/2015/USA and FCCC/ARR/2016/USA, respectively.

Other

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 https://unfccc.int/sites/default/files/resource/AGI%20report_2018.pdf.

EPA. 2004. *The U.S. solvent cleaning industry and the transition to non ozone depleting substances. Prepared for U.S. Environmental Protection Agency Significant New Alternatives Policy (SNAP) Program Office of Air and Radiation Stratospheric Protection Division*. Available at https://www.epa.gov/snap/us-solvent-cleaning-industry-and-transition-non-ozone-depleting-alternatives.

Green DW and Perry RH. 2008. *Perry's Chemical Engineers' Handbook*. New York: McGraw-Hill. Available at https://www.accessengineeringlibrary.com/content/book/9780071422949.

Fertilizers Europe. 2000. *Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry*. Available at http://fertilizerseurope.com/fileadmin/user_upload/publications/tecnical_publications/BATs/Booklet_1_final.pdf.

RTI International. 2017. Methodological changes to the methane emissions from municipal solid waste landfills as reflected in the public review draft of the 1990–2015 GHG Inventory. Memorandum prepared by K Bronstein and M McGrath for R Schmeltz (EPA). 31 March 2017.

RTI International. 2018. Methodological refinements as applied in the 1990-2016 estimates of U.S. greenhouse gas emissions from MSW landfills to account for emissions from facilities not reporting to the Greenhouse Gas Reporting Program. Memorandum prepared by K Bronstein and M McGrath for R Schmeltz (EPA). 4 April 2018.

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.* General Technical Report NE-343. Newtown Square, Pennsylvania: United States Department of Agriculture Forest Service. Available at https://www.fs.fed.us/ecosystemservices/pdf/estimates-forest-types.pdf.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Mausami Desai (EPA), including additional material on the methodology and assumptions used. The following documents[1] were also provided by the United States:

Status report on the annual inventory of the United States of America for 2018. Available at https://unfccc.int/sites/default/files/resource/asr2018_USA.pdf.

The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model. Available at https://greet.es.anl.gov/.

[1] Reproduced as received from the Party.