ANNEX 8 QA/QC Procedures

8.1. Background

The purpose of this annex is to describe the Quality Assurance/Quality Control (QA/QC) procedures and information quality considerations that are used throughout the process of creating and compiling the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. This includes the evaluation of the quality and relevance of data and models used as inputs into the Inventory; proper management, incorporation, and aggregation of data; and review of the numbers and estimates to ensure that they are as accurate and transparent as possible. Quality control—in the form of both good practices (such as documentation procedures) and checks on whether good practices and procedures are being followed—is applied at every stage of inventory development and document preparation. In addition, quality assurance occurs at three stages—an expert review and a public review in the process of developing the report, followed by an international peer review of the final published report coordinated by the UN. While all phases contribute to improving the quality of the Inventory, the public review phase is also essential for promoting the openness of the Inventory development process and the transparency of the inventory data and methods. As described in respective source and sink category text, comments received from these reviews may also result in updates or changes to continue to improve inventory quality.

8.2. Purpose

The *Quality Assurance/Quality Control and Uncertainty Management Plan for the U.S. Greenhouse Gas Inventory* (QA/QC Management Plan) guides the process of ensuring the quality of the Inventory. The QA/QC Management Plan describes data and methodology checks, develops processes governing peer review and public comments, and provides guidance on conducting an analysis of the uncertainty surrounding the emission estimates. The QA/QC Management Plan procedures also stress continual improvement, providing for corrective actions that are designed to improve the inventory estimates over time.

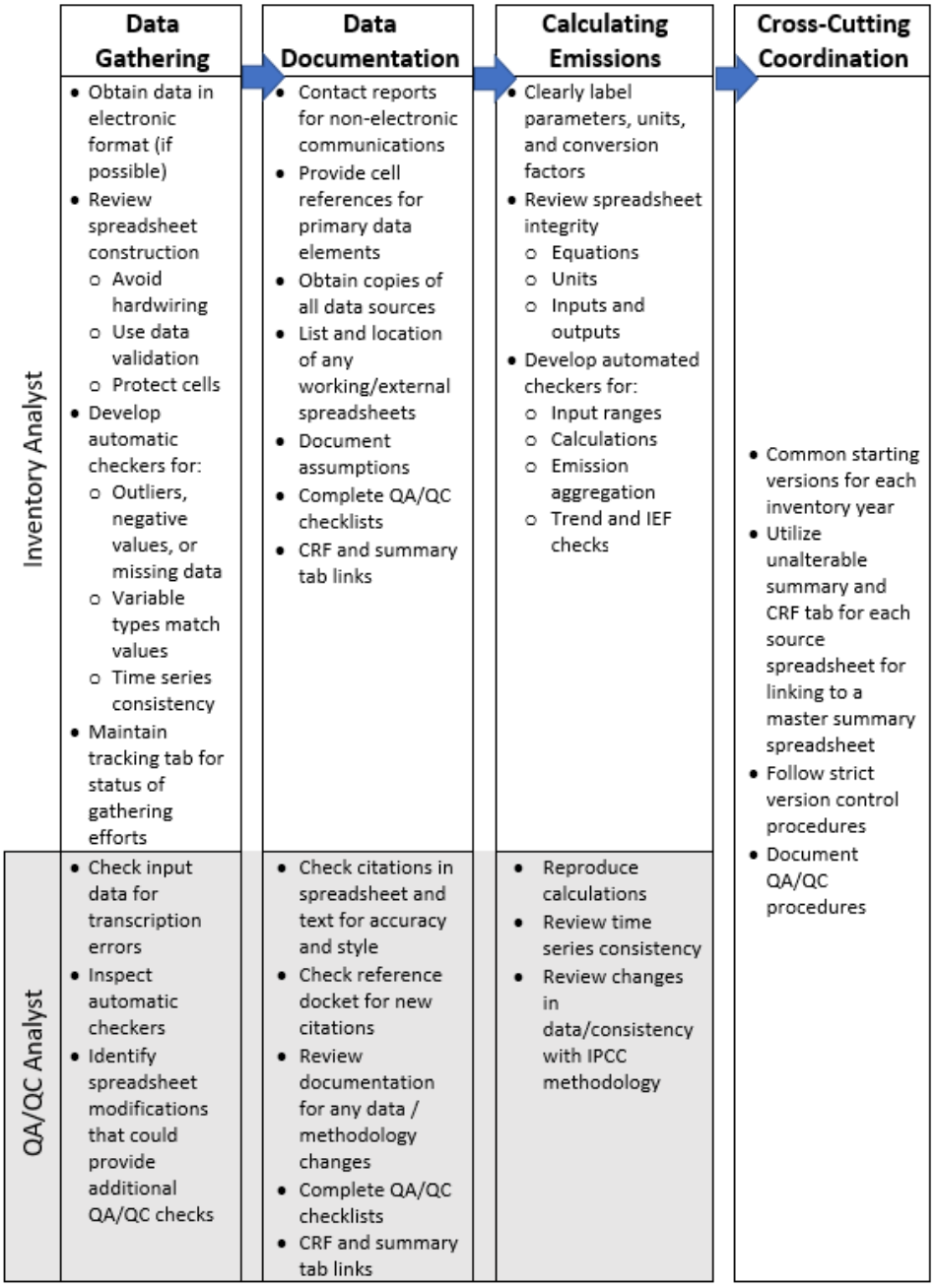
Key attributes of the QA/QC Management Plan are summarized in Figure A-20. These attributes include:

- *Procedures and Forms:* detailed and specific systems that serve to standardize the process of documenting and archiving information, as well as to guide the implementation of QA/QC and the analysis of uncertainty.
- *Implementation of Procedures:* application of QA/QC procedures throughout the whole Inventory development process from initial data collection, through preparation of the emission estimates, to publication of the Inventory.
- *Quality Assurance:* expert and public reviews for both the Inventory estimates and the report (which is the primary vehicle for disseminating the results of the Inventory development process). The expert technical review conducted by the UNFCCC supplements these QA processes, consistent with the QA good practice recommended in the *2006 IPCC Guidelines* (IPCC 2006).
- *Quality Control*: application of *General (Tier 1) and Category-specific (Tier 2)* quality controls and checks, as recommended by *2006 IPCC Guidelines* (IPCC 2006), along with consideration of secondary data and category-specific checks (additional Tier 2 QC) in parallel, and coordination with the uncertainty assessment; the development of protocols and templates, which provide for more structured communication and integration with the suppliers of secondary information.
- *Record Keeping:* provisions to track which procedures have been followed, the results of the QA/QC process, uncertainty analysis, and feedback mechanisms for corrective action based on the results of the investigations, which provide for continual data quality improvement and guided research efforts.
- *Multi-Year Implementation*: a schedule for coordinating the application of QA/QC procedures across multiple years, especially for category-specific QC, focusing on key categories.
- *Interaction and Coordination:* promoting communication within the EPA, across Federal agencies and departments, state government programs, and research institutions and consulting firms involved in supplying data or preparing estimates for the Inventory. The QA/QC Management Plan itself is intended to be revised to reflect new information that becomes available as the program develops, methods are improved, or additional

supporting documents become necessary. Further information on verification will be included in future submissions.

In addition, based on the national QA/QC Management Plan for the Inventory, source and sink-specific QA/QC plans have been developed for a number of sources and sinks. These plans follow the procedures outlined in the national QA/QC plan, but tailor the procedures to the specific text and spreadsheets of the individual sources. For each greenhouse gas emissions source or sink included in this Inventory, minimum general QA/QC analysis consistent with Vol. 1, Chapter 6 of the *2006 IPCC Guidelines* has been undertaken. Where QA/QC activities for a particular source or sink category go beyond the general level, and include category-specific checks, further explanation is provided within the respective category text. Similarly, responses or updates based on comments from the expert, public and the international technical expert reviews (e.g., UNFCCC) are also addressed within the respective source or sink category text. For transparency, responses to public and expert review comments are also posted on the EPA website with the final report.

Figure A-20: Summary of Key QC Processes from U.S. QA/QC Plan



8.3. Assessment Factors

The *Inventory of U.S. Greenhouse Gas Emissions and Sinks* development process follows guidance outlined in EPA's *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency*[146] and *A Summary of General Assessment Factors for Evaluating the Quality of Scientific*

[146] EPA report #260R-02-008, October 2002, Available online at http://www.epa.gov/quality/guidelines-ensuring-and-maximizing-quality-objectivity-utility-and-integrity-information.

and Technical Information.[147] This includes evaluating the data and models used as inputs into the Inventory against the five general assessment factors: soundness, applicability and utility, clarity and completeness, uncertainty and variability, evaluation and review. Table A-255 defines each factor and explains how it was considered during the process of creating the current Inventory.

Table A-255: Assessment Factors and Definitions

General Assessment Factor	Definition	How the Factor was Considered
Soundness (AF1)	The extent to which the scientific and technical procedures, measures, methods or models employed to generate the information are reasonable for, and consistent with their intended application.	The underlying data, methodologies, and models used to generate the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* are reasonable for and consistent with their intended application, to provide information regarding all sources and sinks of greenhouse gases in the United States for the Inventory year, as required per UNFCCC Annex I country reporting requirements. The U.S. emissions calculations follow the *2006 IPCC Guidelines* developed specifically for UNFCCC inventory reporting. They are based on the best available, peer-reviewed scientific information, and have been used by the international community for over 25 years. When possible, Tier 2 and Tier 3 methodologies from the *2006 IPCC Guidelines* are applied to calculate U.S. emissions more accurately.
Applicability and Utility (AF2)	The extent to which the information is relevant for the Agency's intended use.	The Inventory's underlying data, methodology, and models are relevant for their intended application because they generate the sector-specific greenhouse gas emissions trends necessary for assessing and understanding all sources and sinks of greenhouse gases in the United States for the Inventory year. They are relevant for communicating U.S. emissions information to domestic audiences, and they are consistent with the *2006 IPCC Guidelines* developed specifically for UNFCCC reporting purposes of international greenhouse gas inventories.
Clarity and Completeness (AF3)	The degree of clarity and completeness with which the data, assumptions, methods, quality assurance, sponsoring organizations and analyzes employed to generate the information are documented.	The methodological and calculation approaches applied to generate the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* are extensively documented in the *2006 IPCC Guidelines*. The Inventory report describes its adherence to the *2006 IPCC Guidelines*, and the U.S. Government agencies provide data to implement the *2006 IPCC Guidelines* approaches. Any changes made to calculations, due to updated data and methods, are explained and documented in the report consistent with UNFCCC reporting guidelines.
Uncertainty and Variability (AF4)	The extent to which the variability and uncertainty (quantitative and qualitative) in the information or in the	The evaluation of uncertainties for underlying data is documented in the Annex 7 Uncertainty to the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. In accordance with the *2006 IPCC Guidelines*, the uncertainty associated with the

[147] EPA report #100/B-03/001, June 2003, Available online at http://www.epa.gov/risk/guidance-evaluating-and-documenting-quality-existing-scientific-and-technical-information, and Addendum to: A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information, December 2012, Available online at http://www.epa.gov/risk/summary-general-assessment-factors-evaluating-quality-scientific-and-technical-information.

	procedures, measures, methods or models are evaluated and characterized.	Inventory's underlying input data was evaluated by running a Monte Carlo uncertainty analysis on most source and/or category emissions data to produce a 95 percent confidence interval for the annual greenhouse gas emissions for that source and/or sink. The error propagation approach is used to quantify uncertainties for some categories that are not significant contributors to emissions across the time series. To develop overall uncertainty estimates, the Monte Carlo simulation output data for each emission source and/or sink category uncertainty analysis were combined by type of gas, and the probability distributions were fitted to the combined simulation output data where such simulated output data were available.
Evaluation and Review (AF5)	The extent of independent verification, validation and peer review of the information or of the procedures, measures, methods or models.	The majority of the underlying methodology, calculations, and models used to generate the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* have been independently verified and peer reviewed as part of their publication in the *2006 IPCC Guidelines* and the *2019 Refinement*. In cases where the methodology differs slightly from the *2006 IPCC Guidelines*, these were independently verified and validated by technical experts during the annual expert review phase of the Inventory development process. For the data used in calculating greenhouse gas emissions for each source, multiple levels of evaluation and review occur. Data are compared to results from previous years, and calculations and equations are continually evaluated and updated as appropriate. Throughout the process, inventory data and methodological improvements are planned and incorporated. The Inventory undergoes annual cycles of expert and public review before publication. This process ensures that both experts and the general public can review each category of emissions and sinks and have an extended opportunity to provide feedback on the methodologies used, calculations, data sources, and presentation of information.

8.4. Responses to Review Processes

EPA is continually working to improve transparency, accuracy, completeness, comparability, and consistency of emission estimates in the Inventory in response to the feedback received during the Expert, Public, and UNFCCC Review periods, as well as supplemental stakeholder outreach efforts. For instance, as mentioned in the Planned Improvements section of the petroleum and natural gas systems source categories (Section 3.6 and 3.7), EPA has engaged in stakeholder outreach to increase the transparency in the Inventory methodology and to identify supplemental data sources that can lead to methodological improvements. During the annual preparation of the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, in considering and prioritizing improvements, EPA reviews the significance of the source and sink category (i.e., key categories), along with QC, QA, and uncertainty assessments. Identified planned improvements to methods (including data, emissions factors, and other key parameters), along with QA/QC and uncertainty assessments are documented within each source and sink category to complement the Recalculations and Improvements chapter. Additionally, the Executive Summary also highlights key changes in methodologies from previous *Inventory* reports.

As noted in the previous section, for transparency, responses to comments received while developing the annual estimates from Public Review and Expert Review are posted on the EPA website with the final *Inventory*.[148]

As noted above in Section 8.2, the expert technical review conducted by the UNFCCC supplements these QA processes. This review by an international expert review team (ERT) occurs after submission of the final report to the UNFCCC and assesses consistency with UNFCCC reporting guidelines. More information on the UNFCCC reporting guidelines and the review process can be found here:

- UNFCCC Reporting Guidelines for annual national greenhouse gas inventories[149]
- UNFCCC Review Process and Guidelines for annual national greenhouse gas inventories[150]
- Inventory Review reports of annual submissions (latest reviews).[151]

Table A- 251 includes responses to findings from the previous UNFCCC expert review consistent with review guidelines under 24/CP.19. The most recent review was conducted the week of September 12-17, 2022, and focused on the annual Inventory submitted in April 2022. Note future reviews will follow technical review guidelines under the Paris Agreement, consistent with Annex to 18/CMA.1 and so some issues and responses captured here may not be applicable to reviews under future guidelines.

[148] See https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.
[149] Available online at: https://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2.
[150] Available online at: https://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=3.
[151] Available online at: https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/inventory-review-reports-2019.

Table A- 251: Response to UN Review of the 2022 Inventory Submission

ID#	*Issue Classification*	*Recommendation Made in Previous Review Report Including ERT Assessment and Rationale*	*Response on Status of Issue*
General			
G.1	Annual submission (G.1, 2021) (G.1, 2020) (G.1, 2019) (G.1, 2018) (G.1, 2016) (G.1, 2015) (9, 2013) (8,2012) Completeness	Addressing. *Improve the completeness of the inventory, in particular by including those categories for which there are methodologies in the 2006 IPCC Guidelines*. The Party's inventory improvement plan includes the estimation of emissions for the missing categories as soon as the necessary data become available. The Party provided an estimate of the significance of some categories reported as "NE" in annex 5 to the NIR, however, a number of sources (categories, subcategories and carbon pools) (e.g. net carbon stock change in living biomass and DOM for the cropland and grassland categories) are not included. The ERT, while noting the continuous improvements made, considers that the recommendation has not yet been fully addressed because the Party has not yet estimated emissions for a number of categories, subcategories and carbon pools for which there are methodologies in the 2006 IPCC Guidelines (see annex II).	The United States is still addressing this issue and notes planned improvements include incorporating these categories into future submissions and/or providing additional information on the likely level of emissions and removals in Annex 5 to the National Inventory Document (NID). This report has includes some categories previously not estimated (e.g., ceramics, non-metallurgical magnesium, and SF_6 and PFs from other product use.). Remaining improvements will be made over time as data becomes available and prioritized with other improvements to make best use of available resources.
G.2	Annual submission (G.2, 2021) (G.2, 2020) (G.2, 2019) Completeness	Addressing. *Provide a justification in the NIR, based on the likely level of emissions as per paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, for all sources and sinks that occur but are considered insignificant and excluded from the inventory and for which there are methodologies provided in the 2006 IPCC Guidelines, and provide in the NIR evidence that the total national aggregate of estimated emissions for all mandatory gases and categories considered insignificant remains below 0.1 per cent of national total GHG emissions*. The Party reported in its improvement plan that NIR table A-235, which contains the reason for exclusion and estimated 2020 emissions for sources and sinks not included in the inventory, will be updated as data become available. However, the justification and evidence referred to in the recommendation are currently missing for some categories (e.g. 1.A.3.d (CO_2 emissions from domestic navigation – gaseous fuels), 2.A.4.c (CO_2 emissions from other process uses of carbonates: non-metallurgical magnesium production), 2.B.4.c (CO_2 and N_2O emissions from glyoxylic acid production), 2.B.8.d (CO_2 recovery from petrochemical and carbon black production), 2.E.2 (HFCs, PFCs, SF_6 and NF_3 emissions from electronics industry: thin-film transistor flat panel display), 4.A.1 (N_2O emissions from N mineralization/immobilization) and 4.B and 4.C (net carbon stock change in living biomass and DOM for the cropland and grassland categories)). The ERT, while noting the continuous improvements made, considers that the recommendation has not yet been	The United States is still addressing this issue and notes that planned improvements include incorporating these categories into future submissions and/or providing additional information on the likely level of emissions and removals in Annex 5 to the NIR. These improvements will be made over time as data becomes available and prioritized with other improvements to make best use of available resources. Annex 5 of the current (i.e., 2024) submission does include updates for some categories.

		fully addressed because the Party has not yet provided in the NIR the justification, based on the likely level of emissions as per paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, for a number of categories, subcategories and carbon pools for which there are methodologies in the 2006 IPCC Guidelines (see annex II).	
G.3	Further improvements (identified by the Party) (G.3, 2021) Not an issue/problem	The Party described in its NIR planned improvements for most categories. The ERT commends the United States for its ambition to continue to improve the inventory. However, the ERT noted that the NIR does not include information on or an overview of the improvement planning process and considerations for prioritizing improvements. During the review, the Party explained that it maintains a GHGI Improvement Tracker, which is updated annually with all planned improvements. A priority is assigned to each planned improvement in the Tracker. The ERT encourages the Party to include in the NIR a description of the process for prioritizing the planned improvements to its inventory.	While not an issue, this information is included in Chapter 1.3 of the current national inventory document.
G.4	QA/QC and verification (G.4, 2021) Not an issue/problem	The Party described in its NIR (p.1-16) the process for independent expert review. However, the ERT noted that it is not clear from the information provided how many experts are involved, whether there is a rotation of experts or the pool of experts remains fixed, and what instructions are provided to the experts. During the review, the Party clarified the number of experts involved in independent expert review, described the turnover in the expert pool and explained that experts receive a guidance memo, which includes a request to flag any available information that could be used to estimate emissions for categories currently not included in the inventory. The experts are free to provide feedback on areas other than those related to the guiding questions provided to them. The ERT also noted the good approach to the independent expert review implemented by the Party. The ERT encourages the Party to expand the description of the process for independent expert review in the NIR, including by reporting information on the pool of experts and the guidance provided to them, as provided to the ERT during the review.	While not an issue, the United States has included information on review phases and process in Section 1.3 of the 2024 national inventory document submission notes that there are no specific reporting requirements related to describing the number of independent experts involved in review of the annual inventory. The United States also publishes responses to expert review comments, including the guidance provided to reviewers to ensure transparency in the review processes on EPA's website following submission and publication of the national inventory report.
G.5	Methods (G.5, 2021) Transparency	The Party reported the key category analysis in the NIR (section 1.5, pp.1-17 and 1-22) and additional information on the analysis in annex 1 to the NIR. The Party provides methodological tier information within the category- specific methodological discussions across the NIR. CRF table summary 3 includes information on the methodological tier used but the ERT noted that it is not possible to link this information to specific key categories owing to the high level of aggregation automated in CRF table summary 3 for all Parties. It is therefore not clear which methodological tier was used and whether the recommended methods from the appropriate decision tree in the 2006 IPCC Guidelines are used for the key categories. During the review, the Party provided the ERT with a spreadsheet mapping	Resolved. The United States notes that methods applied are described throughout the report for all categories under the Methodology and Time-Series Consistency discussions for each source/sink category. EPA has included a summary table on methodological tiers applied in Annex 1 of the current national inventory document.

		the results of the key category analysis to the methodological tier(s) used for each category and including additional information on the methodological choice, where relevant. The ERT recommends that the Party provide an overview of the methodological tiers used for estimating emissions and sinks for the key categories, which, for example, may be in a spreadsheet similar to the one provided to the ERT during the review, either for the inventory as a whole or for each sector.	
G.6	Uncertainty analysis (G.6, 2021) Transparency	The Party reported in its NIR (pp.1-26–1-27) overall uncertainties for the GHG inventory for 1990 and 2020. The uncertainties reported are very similar (–5 to +6 per cent for 1990 and –6 to +6 per cent for 2020). The NIR (p.A- 524) also describes improvements (recent and ongoing, as well as planned) to the inventory, for example the use of more detailed data from the GHGRP, which are expected to reduce uncertainties over time. During the review, the Party explained that some improvements have already been made to significant sources, which has offset the trend within the relevant category (e.g. improvements to oil and gas system estimates have resulted in a slight decrease in the uncertainty for 2020 compared with that for 1990 for CO_2 and a slight increase compared with that for 1990 for CH_4). The United States noted that some categories for which GHGRP data have been used to improve the inventory are insignificant categories. The ERT agrees with the explanations provided and notes that changes in emission levels arising from the improvements, for example a decrease in emissions for categories with reduced uncertainty, could mean that uncertainties will increase over the time series. The ERT recommends that the Party include more information on the trend in the uncertainties for its GHG inventory in future inventory submissions, such as that provided to the ERT during the review concerning why improvements did not result in a decrease in the uncertainty.	Resolved. Additional information has been included in the introduction section 1.7 and Annex 7 of the 2024 submission.
G.7	Uncertainty analysis (G.7, 2021) Not an issue/problem	The Party reported in its NIR (p.A-516) that for most sources, one of six probability density functions was used for the uncertainty analysis: normal, log-normal, uniform, triangular, pert or beta. While extensive information on uncertainty is provided in both the general and the sectoral chapters of the NIR, the ERT noted that it is not always specified which probability density function was used for individual categories. During the review, the Party provided the ERT with additional information and examples of the probability density functions used for different categories. The ERT encourages the Party to include in the NIR information on the probability density function used for the uncertainty analysis for each category in those cases where this information is not already included.	Resolved. The United States has included more information on probability density functions used for the uncertainty assessment where Approach 2 is applied to enhance transparency of the uncertainty assumptions in the 2024 submission.
G.8	AD	The Party reported in annex 5 to the NIR information on the sources and	See response to G.2. This issue appears to be identical,

	(G.8, 2021) Completeness	sinks not estimated in the inventory, which the ERT found very useful. The ERT noted that for some of the sources (e.g. CO_2 emissions from ceramics production and SF_6 and PFCs used in various applications), the likely level of emissions exceeds the significance threshold provided in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines; therefore, these sources cannot be considered insignificant. During the review, the Party clarified that estimating emissions from these sources is a priority and that work on collecting the necessary AD is ongoing. The Party indicated that there is a possibility that the results will be reflected in the 2024 submission. The ERT recommends that the Party continue with the planned improvements with the aim of including the categories not estimated and for which the likely level of emissions exceeds the significance threshold in future submissions and provide an update on progress on the planned improvements concerning the estimation of these categories in the 2023 submission.	or redundant with issue G.2. The reporting guidelines do not include requirements to provide information on prioritization of planned improvements. The categories noted here as examples in this issue were included in this year's national inventory report and are no longer listed in Annex 5.
Energy			
E.2	1. General (energy sector) – gaseous fuels – CO_2 and CH_4 (E.2, 2021) (E.2, 2020) (E.3, 2019) (E.18, 2018) Transparency	(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 different CO_2 EF for fuel gas used in offshore oil and gas production than 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. Addressing. The Party reported in its NIR (p.A-73) that the use of different CO_2 EFs for offshore gas use and onshore marketable gas is not warranted given that EIA reports the same calorific value for both types of natural gas. However, as indicated in the NIR (pp.A-70 and A-73), there is no reliable correlation between calorific value and the carbon content of the natural gas. Therefore, the ERT noted that the fact that the same calorific value is reported for the different types of natural gas cannot be used as the basis of an assumption that there are no differences in the carbon content. During the review, the Party reiterated that there are no data to indicate a different EF is needed for natural gas energy use in upstream oil and gas operations and provided a link to a document that explains how EIA estimates heating values (https://www.eia.gov/totalenergy/data/monthly/pdf/mer_a_doc.pdf). The document indicates that for "natural gas production, dry", the heat content has been assumed to be equal to that for natural gas consumption. The Party clarified that while there is variation in the carbon content of natural gas for any given heat content (as shown in NIR figure A-1 (p.A-72)), it is relatively small (± approximately 2 per cent) and within the range of	Resolved. The United States conducted research on upstream oil and gas emissions from combustion of natural gas. The data was based on facility level reporting to the EPA Greenhouse Gas Reporting Program (GHGRP). The data did not indicate that different emission factors were needed for upstream natural gas combustion compared to the factors used currently in the Inventory for downstream natural gas combustion. The information is summarized in Annex 2.2 of the 2024 submission.

		uncertainty for this source. Furthermore, the heat content–carbon content correlation is used in determining the carbon content of natural gas used in the inventory for all natural gas combustion. Another reason that the Party deems the approach to be appropriate is that the amount of natural gas used in upstream oil and gas operations is not known (this gas is included as part of aggregated industrial sector natural gas use) but is likely to be a small portion of all natural gas use and the variation in natural gas carbon content is not considered to be large for a given heating value. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided in the NIR any research or other information substantiating its assumption that there is no difference between the carbon content of the natural gas used upstream by oil and gas producers and the processed marketable gas used downstream.	
E.4	Fuel combustion – reference approach – gaseous and liquid fuels – CO_2 (E.4, 2021) (E.21, 2020) Convention reporting adherence	Not resolved. *Consistently treat still gas as liquid fuel under the sectoral and reference approaches to improve consistency between CRF tables 1.A(a), 1.A(b), 1.A(c) and the NIR table that compares fuel consumption under the two approaches*. . The Party reported still gas under petroleum in the NIR (e.g. table A-4) but under gaseous fuels in CRF tables 1.A(a), 1.A(b) and 1.A(c). See also ID# E.9 in table 3 below. According to EIA (https://www.eia.gov/tools/glossary/index.php?id=still%20gas), the definition of still gas is "any form or mixture of gases produced in refineries by distillation, cracking, reforming, and other processes. The principal constituents are methane and ethane. May contain hydrogen and small/trace amounts of other gases. Still gas is typically consumed as refinery fuel or used as petrochemical feedstock. Still gas burned for refinery fuel may differ in composition from marketed still gas sold to other users". By this definition, the ERT considers it clear that it should be categorized as a liquid fuel in the emissions inventory. During the review, the Party explained that because still gas is physically a gas, it will continue to report it as a gaseous fuel in the CRF tables. The ERT noted that these fuel definitions are different from those in the 2006 IPCC Guidelines (vol. 2, chap. 1, table 1.1), where refinery gas is defined as "non-condensable gas obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries. It consists mainly of hydrogen, methane, ethane and olefins". The ERT notes that the transparency of reporting would be greatly improved if the United States were to include in the NIR a table of all fuels used in the sectoral and reference approaches and the fuel category under which the individual fuels have been reported in the CRF tables.	Resolved. For fossil fuel combustion, the United States improved CRT reporting consistency by treating still gas as liquid fuel under the sectoral and reference approaches to improve consistency between CRT table 1.A(a), 1.A(b), 1A(c) and the NIR table that compares fuel consumption under the two approaches.
E.6	Fuel combustion – reference approach – other fossil fuels – CO_2, CH_4 and N_2O	Not resolved. *Take into account other fossil fuels under the reference approach when completing CRF table 1.A(b) or document that waste fuels are not used in the comparison between the sectoral and reference approaches in order to improve consistency between the reference and*	Resolved. This issue has been addressed in the current 2024 NIR submission. Language was added to Annex 4 of the NIR to indicate that "waste fuels (e.g., MSW combustion) is not captured as part of the reference

	(E.6, 2021) (E.25, 2020) Convention reporting adherence	*sectoral approaches in terms of estimation coverage, and amend the reference approach column in CRF table 1.A(c), as needed*. . The Party did not include data for other fossil fuels in CRF table 1.A(b). The comparison between the sectoral and reference approaches in this CRF table automatically includes other fossil fuels from the sectoral approach. The ERT noted that if it is not possible to obtain data on the production, import and export of waste, then the consumption reported in the sectoral approach could be assumed to be equal to production, with import and export reported as "IE" (unless the Party knows that import and export do not occur). During the review, the Party stated that it will look into options for ensuring that the two approaches have the same coverage. The ERT considers that the recommendation has not yet been addressed because the Party has not yet improved the consistency between the reference and sectoral approaches.	approach energy statistics. Therefore, waste fuels are not used in the comparison between the sectoral and reference approaches energy use in order to improve consistency between the reference and sectoral approaches in terms of estimation coverage. However, sectoral estimates for MSW combustion emissions are added to the reference approach in order to align CO_2 emissions comparisons across the two different approaches." MSW has also been added to reference approach in CRF table 1.A(b). It was not added to 1.A(c) because energy consumption from the combustion of waste is not calculated anywhere in the analysis.
E.7	Fuel combustion – reference approach –LPG – CO_2 (E.7, 2021) (E.26, 2020) Comparability	Estimate natural gas liquid and LPG consistently between the reference and sectoral approaches or explain in the NIR why covering different fuels under the reference approach applying a different list of fuels than that used for the sectoral approach is the most accurate way to estimate emissions under both approaches, and change the notation key reported for LPG in CRF table 1.A(b) from "NA" to "IE". Addressing. The Party included in its NIR (p.A-465) the explanation called for by the recommendation and changed the notation key reported in CRF table 1.A(b) from "NA" to "IE". However, the ERT noted that EIA provides import/export data for propane, propylene and total hydrocarbon gas liquids on its website (https://www.eia.gov/totalenergy/data/annual) that would allow the Party to report the reference approach in line with the UNFCCC Annex I inventory reporting guidelines. During the review, the Party stated that it is looking into ways to disaggregate the data on hydrocarbon gas liquids for reporting AD and EFs used for both the sectoral and the reference approach. The Party also clarified that currently it uses EIA data on imports and exports of LPG to report LPG data in the tables in annex 4 to the NIR (A-458). These LPG data are then reported under natural gas liquids in CRF table 1.A(b), with LPG being reported as "IE". The Party also confirmed that it could report the same data as LPG in CRF table 1.A(b) and report natural gas liquids in table 1.A(b) as "IE" in order to be more consistent with the sectoral approach (which does not have a natural gas liquids category) in future submissions. The ERT considers that the recommendation has not yet been fully addressed because import/export data are available that would allow the Party to estimate natural gas liquid and LPG consistently between the reference and sectoral approaches and report the reference approach in line with the UNFCCC Annex I inventory reporting guidelines.	Resolved. This issue has been addressed in the current 2024 NIR submission. NGLs were switched to LPGs in CRT table 1.A(b) and natural gas liquids in table 1.A(b) were reported as "IE" in order to be more consistent with the sectoral approach.

E.8	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2 (E.8, 2021) (E.4, 2020) (E.5, 2019) (E.4, 2018) (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). Not resolved. The Party has made no changes to the reporting since the previous (2020) inventory submission and continued to report emissions from NEU under fuel combustion (category 1.A.5.a). The ERT notes that the current reporting of the United States hinders comparability with the reporting of other Parties. Furthermore, the ERT agrees with the previous ERT that some emissions (e.g. from the use of lubricants) could be estimated using the data currently available and reported under the IPPU sector. If this is not feasible, the ERT notes that the Party could include in the NIR the rationale for not disaggregating these emissions and allocating them to the IPPU sector.	The United States reiterates that it uses a country-specific methodology for non-energy use of fuels in line with para. 10, Decision 24/CP.19 to most accurately portray U.S. emissions from NEU. The United States has improved the explanation of its country-specific approach to the allocation of NEU of fuels in the introduction of the IPPU Chapter 4 and Annex 2 of the 2024 NIR.
E.9	Feedstocks, reductants and other NEU of fuels all fuels – CO_2 (E.9, 2021) (E.5, 2020) (E.6, 2019) (E.19, 2018) Accuracy	Continue to research the data for the emissions from the NEU of fuels reported under the energy and IPPU sectors mass- balance method used across petrochemical production to estimate CO_2 emissions from the 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. Addressing. The Party reported in its NIR (p.3-55) that double counting of CO_2 emissions from the NEU of fuels under the energy sector and CO_2 process emissions from petrochemical production under the IPPU sector is not considered to be a significant issue and that further data integration is not feasible because the feedstock data from EIA used to estimate emissions from the NEU of fuels are aggregated by fuel type rather than being disaggregated by both fuel type and industry/IPPU category. The ERT considers that the Party has not yet fully addressed the recommendation, in particular the potential issue related to possible double counting, by describing how the country-specific approach is better able to reflect the national situation and how the methodologies used for estimating emissions are compatible with the 2006 IPCC Guidelines (see ID# E.4 above).	Resolved. This issue was addressed in the current (i.e., 2024) submission. See, for example, the 2024 NID Chapter 3.2 for the following discussion: "This country specific approach taken is better able to reflect the national situation because it is accounting for secondary product imports and exports that are not included directly in the national energy statistics. Furthermore, it is compatible with the *2006 IPCC Guidelines* as discussed in Box 1.1 above, but also as the NEU emissions here represent different emissions from those covered in the IPPU petrochemical production category."
E.12	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.12, 2021) (E.6, 2020) (E.7, 2019) (E.5, 2018) (E.6, 2016) (E.6, 2015) (35, 2013) Transparency	Harmonize and reconcile the data between the reference and the sectoral approach for the reporting of jet kerosene consumption between CRF tables 1.A(b) and 1.D or furnish an adequate explanation of inconsistencies, where appropriate. Inconsistencies remain in the reporting of consumption of jet kerosene as an international bunker fuel between the two CRF tables; for example, for 2020, the Party reported 99.22 Mbbl (approximately 595,134 TJ) in CRF table 1.A(b) and 594,699 TJ in CRF table 1.D. In footnote (a) to NIR table A-228 (annex 4, p.A-468), the Party explained that jet	Addressing. The United States plans to address this in a future submission by looking into aligning heat contents used in Reference Approach with those in the Sectoral Approach.

		kerosene used in international aviation has a different calorific value, based on data specific to that source, from other jet kerosene. During the review, the Party clarified that the conversion factor shown in CRF table 1.A(b) for jet fuel (5,998.02 TJ/unit) corresponds to the apparent consumption data in the table in 106 bbl and TJ. The apparent consumption includes imports, exports and stock change, as well as bunkers. The heating value for each use is different, as shown in NIR table A-228. To compare bunker fuel data in CRF table 1.A(b) and CRF table 1.D, the Party applied the heat equivalent for bunker fuels shown in NIR table A-228, that is, 5.68 million Btu/bbl, which results in a value of 5,993.64 TJ/106 bbl. The ERT noted that it should be possible for the Party to derive a weighted average calorific value for jet kerosene on the basis of the detailed methodology used for the sectoral approach and apply this value to the reference approach to achieve the highest level of comparability between the two approaches. See also ID# E.34 in table 5. The ERT considers that the recommendation has not yet been fully addressed because the NIR does not justify the reason why different heating values are applied to jet kerosene in CRF tables 1.A(b) and 1.D.	
E.13	1.A Fuel combustion – sectoral approach – biomass – CH_4 and N_2O (E.13, 2021) (E.7, 2020) (E.9, 2019) (E.20, 2018) Completeness	Not resolved. Advance the 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. The Party did not report CH_4 and N_2O emissions from the combustion of biogas under the energy sector. The ERT noted that N_2O emissions from the combustion of biogas are not included as a missing source in annex 5 to the NIR; furthermore, some information on the amount of landfill gas combusted and the electricity generated from landfill gas, wastewater treatment gas and manure-based biogas is available from EIA (https://www.eia.gov/energyexplained/biomass/landfill-gas-and-biogas.php). During the review, the Party clarified that while EIA does have some data on landfill gas used for energy and electricity production, these data do not cover all the possible uses of biogas (e.g. to supplement the natural gas supply, in other mobile or stationary sources). Furthermore, the United States stated that non-CO_2 emissions from biogas use for energy are already captured under the waste sector and provided a reference to the NIR (p.A-447) where this is reported. While the ERT understands that CH_4 emissions from the combustion of biogas are included in the estimate for landfills and potentially wastewater handling and manure biogas, N_2O emissions should not be included under the waste sector at all. The ERT considers that the recommendation has not yet been addressed because the Party has not yet included in the energy chapter of the NIR information on emissions from biogas and whether some of the emissions are currently	Addressing. The United States is still investigating sources of data on biogas use and combustion for energy and confirming whether these emissions are not reported elsewhere. Updates will be implemented as needed and described in future submissions.

		reported under the waste sector.	
E.15	1.A.2.g Other (manufacturing industries and construction) – liquid fuels – CO_2, CH_4 and N_2O (E.15, 2021) (E.9, 2020) (E.13, 2019) (E.23, 2018) Comparability	Not resolved. *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 the 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, clarify, in the NIR, the country-specific approach taken consistently with paragraph 10 of the UNFCCC Annex I inventory reporting guidelines. The Party reported AD for subcategories 1.A.4.c.ii (off-road vehicles and other machinery) and 1.A.4.c.iii (fishing) as "IE" and "NO" respectively for the whole time series, as it had done in the previous inventory submissions. The ERT noted that the majority of Parties included in Annex I to the Convention are able to report emissions from machinery used in agriculture, forestry and fishing in the appropriate CRF tables.* During the review, the Party explained that disaggregated data are not available and that the EIA data on the "industrial sector" used for estimating CO_2 emissions include manufacturing (NAICS codes 31–33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). Data are received as a sum of these categories. The ERT noted that in some statistical products from EIA, fishing is included under "vessel bunkering" and there is a separate category "farm". If EIA can include fishing under one category ("vessel bunkering") in some statistical products and under another category ("industrial sector") in other products, then it should be possible for the Party to isolate the contributions of the relevant IPCC subcategories to the overall emissions. Also, the ERT noted that the International Energy Agency publishes data for the United States for "agriculture/forestry". The ERT considers that the recommendation has not yet been addressed because the Party has not yet provided a clarification on 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 by fishing vessels from subcategory 1.A.2.g to 1.A.4.c.iii in order to improve the comparability of the inventory submission with those of other Parties and ensure that emissions of all gases from a given source are reported under the same IPCC category.	Addressing. The United States is researching the availability of data for addressing the allocation of emissions from fuel use by agricultural mobile machinery from subcategory 1.A.2.g (other) to 1.A.4.c.ii (off-road vehicles and other machinery). The United States has researched data on allocating emissions and fuel use for fishing vessels to category 1.A.4.c.iii (fishing) and determined that the information is not available. The activity data (AD) on marine fuel use is not specified in terms of type of vessel and includes recreational vessels as well as cargo and passenger carrying, military (i.e., U.S. Navy), fishing, and miscellaneous support ships (e.g., tugboats). More information stating the data is not available is found in the latest submission. See Annex 3.2 of the 2024 NID.
E.18	1.A.3 Transport – liquid fuels – CO_2, CH_4 and N_2O (E.18, 2021) (E.11, 2020) (E.15,2019) (E.25, 2018) Accuracy	Addressing. *Advance the research in order to implement as soon as practicable the following improvements indicated during previous reviews: (c) Apply a consistent methodology over time to estimate vehicle miles travelled for on-road vehicles by vehicle type, defined by wheelbase; (d) Include ongoing research and documentation of minor emissions sources*	Item (c) was resolved in the 2023 submission NIR. See for example Annex 3 and the Recalculations Discussion under the "CH_4 and N_2O from Mobile Combustion" section of Chapter 3. For item (d), the United States has updated the estimate

		currently not included in the inventory, such as urea use in trucks, bio jet fuel, and compressed natural gas or LPG use in shipping.. (c) Not resolved. The Party reported in its NIR that improvements regarding methodology application will be undertaken in stages, pending data availability, and included in future inventory submissions. (d) Addressing. The Party included urea use in trucks in the inventory and described this source in the NIR (pp.4-35–4-38). Emissions for the remaining missing sources have not yet been estimated, but the sources have been included in annex 5 to the NIR in the table of sources and sinks not included in the inventory. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet applied a consistent methodology over time to estimate vehicle miles travelled for on-road vehicles by vehicle type, defined by wheelbase.	for non-CO_2 emissions from bio-jet fuel and found them to be insignificant. See Annex 5 of the 2022 NID.
E.21	1.A.3.b Road transportation – liquid fuels – CO_2 (E.21, 2021) (E.13, 2020) (E.17,2019) (E.27, 2018) Completeness	Addressing. *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, explaining the estimations in the NIR*. The inventory was not updated to account for possible emissions from the fossil carbon component of biofuels. The Party explained in footnote 91 of the NIR (p.3- 120) that CO_2 emissions from biodiesel do not include emissions associated with the carbon contained in methanol used in the process of combustion, as emissions from methanol use in combustion are assumed to be accounted for under NEU. It also explained in footnote 85 of annex 2 to the NIR (p.A-104) that natural gas used as a petrochemical feedstock includes use in production of methanol and that, as a result, the carbon storage factor developed for natural gas as petrochemical feedstocks takes into consideration the emissions from the use of the resulting products, including methanol. Therefore, it is assumed that emissions from the combustion of methanol used in biodiesel are captured here and not reported as part of biodiesel combustion emissions. During the review, the Party clarified that it will continue to examine ways to incorporate more information into NIR table A-45 to further clarify the use of methanol as a petrochemical feedstock. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet incorporated more information into NIR table A-45 to further clarify the use of methanol as a petrochemical feedstock.	Addressing. In addition to the existing documentation described in the NID (footnote 97 and footnote in Annex 2.3), the United States will continue to examine ways to incorporate information into Table A-67 of NID Annex 2.3 to further clarify uses of methanol as part of petrochemical feedstocks.
E.29	1. General (energy sector) – CO_2, CH_4 and N_2O (E.29, 2021)	The Party reported in NIR table A-235 12 sources of emissions under the energy sector not currently estimated in the inventory. Two of the identified sources have no estimation methodology in the 2006 IPCC Guidelines, but the others do have a methodology. These sources are N_2O	Addressing. See responses to G.1 and G.2 which also cover this issue. This issue appears to duplicate the scope of those issues. The United Stated will continue researching and, if possible, quantifying, CH_4 and N_2O

	Completeness	emissions from biomass combustion for domestic aviation; CH_4 and N_2O emissions from biomass combustion for motorcycles, railways, domestic navigation and non- transportation mobile; CO_2, CH_4 and N_2O emissions from gaseous fuel combustion for navigation; CO_2, CH_4 and N_2O emissions from liquid and gaseous fuels used in pipeline transport; and CO_2, CH_4 and N_2O emissions from medical waste incineration included under category 1.A.5.a. The likely level of emissions is provided for all sources except for CH_4 and N_2O emissions from the combustion of biogas (see ID# E.13 in table 3) and CO_2 emissions from gaseous fuels used in domestic navigation and ranges in amount from miniscule (0.0015 kt CO_2 eq) to close to the threshold of significance (342.6 kt CO_2 eq; the threshold for significance for the United States was 500.00 kt CO_2 eq in 2020). During the review, the Party provided the ERT with information on the priorities assigned to the sources currently not estimated in the inventory. The ERT noted that, in general, the sources with a high likely level of emissions have been assigned a high priority, but one of the sources with the highest likely level of emissions (medical waste incineration) is classified as low priority. The ERT recommends that the Party (1) continue its efforts to estimate and report emissions for sources not currently included in the inventory, especially those sources for which methodologies are available in the 2006 IPCC Guidelines (1.A.3.a domestic aviation (N_2O emissions from biomass), 1.A.3.b.iv motorcycles (CH_4 and N_2O emissions from biomass), 1.A.3.c railways (CH_4 and N_2O emissions from biomass), 1.A.3.d domestic navigation (CH_4 and N_2O emissions from biomass), 1.A.3.d domestic navigation (CO_2 emissions from gaseous fuels), 1.A.3.e.i pipeline transport (CO_2, CH_4 and N_2O emissions from liquid fuels), 1.A.3.e.i pipeline transport (CO_2, CH_4 and N_2O emissions from gaseous fuels), 1.A.3.e.ii non-transportation (CH_4 and N_2O emissions from mobile-biomass), 1.A.5.a incineration of waste (CO_2 emissions from medical waste incineration), 1.A.5.a stationary fuel combustion (CH_4 and N_2O emissions from biomass in United States territories), 1.B.1.a.2.ii fugitive emissions (CO_2 emissions from coal mining related to post-mining activities), 1.B.1.a.1.iii fugitive emissions (CO_2 emissions from abandoned underground coal mines)); and (2) add information to NIR table A-235 on the prioritized efforts relating to the planned improvements for all these sources, noting in particular that the likely level of CH_4 and N_2O emissions from the combustion of biogas is currently missing (see ID# E.13 in table 3).	emissions from the noted sources and will note any such updates in subsequent submissions.
E.30	1.A Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – CO_2 (E.30, 2021)	The Party described in annex 2.2 to the NIR the methodology and data used to estimate the carbon content of various fuels. The Party noted that the carbon content of different types of coal is based on 8,672 samples, 6,588 of which are samples measured by the United States Geological Survey in 1998. The United States does not use GHGRP data either directly for	Resolved. In the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021* (April 2023) NIR, the United States added a discussion in the QA/QC and Verification section of the Energy chapter (see pg. 3-38). The new language has a discussion of emission factors

	Convention reporting adherence	reporting or indirectly for verification purposes. During the review, the Party clarified that the GHGRP covers only a portion of the total national fossil fuel combustion emissions and that about a third of total emissions are estimated using the tier 3 approach. Furthermore, for data providers using the tier 3 approach, it is not always possible to calculate an EF because emissions and fuel use are reported separately. The United States stated its intention to continue to evaluate the use of GHGRP data for verifying data from other sources. The ERT noted that the GHGRP has been running for many years and hence there is a substantial amount of data available that could provide valuable verification of the currently used EFs. The ERT recommends that the Party utilize data reported under the GHGRP to verify the country-specific CO_2 EFs currently in use for estimating emissions from the combustion of solid, liquid and gaseous fuels, many of which were derived a considerable number of years ago.	reported as part of the GHGRP and a comparison on emission factors used in the Inventory and those calculated based on electricity sector reporting programs.
E.31	1.A Fuel combustion – sectoral approach – gaseous fuels – CO_2, CH_4 and N_2O (E.31, 2021) Accuracy	The Party reported in CRF tables 1.A(a)s1–1.A(a)s4 two CO_2 IEFs for gaseous fuels: 50.14 t/TJ and 51.72 t/TJ. The ERT noted that it is not clear from the NIR why there are two IEFs and how the United States determined that the higher value would be applied for all subcategories of category 1.A.2 (manufacturing industries and construction) and for subcategory 1.A.4.c.i (stationary (other sectors)) plants in agriculture. During the review, the Party clarified that the different IEFs arose as a result of the inclusion of still gas as a gaseous fuel, and that still gas consumption was assumed to be evenly distributed among the above-mentioned categories. The ERT noted that this categorization of fuels does not follow the definitions provided in the 2006 IPCC Guidelines (see also ID# E.4 in table 3). Furthermore, the ERT noted that still gas is likely to primarily be used in chemical industries close to the place of production and that it seems unlikely that it would be introduced into general natural gas transmission and distribution networks. The ERT recommends that the Party examine the use of still gas with the aim of reporting emissions from the consumption of still gas under the relevant subcategory(ies) rather than assuming that its consumption is evenly distributed across all subcategories of category 1.A.2 (manufacturing industries and construction) and subcategory 1.A.4.c.i (stationary (other sectors)).	Resolved. This issue was addressed with the change in CRT reporting of still gas as a liquid. (See Issue E.4).
E.32	1.A.1.a Public electricity and heat production – biomass – CO_2, CH_4 and N_2O (E.32, 2021) Accuracy	The Party reported in its NIR (p.A-136) that only two EFs were considered for biomass, that is, one for wood/wood waste boilers and one for wood recovery boilers. The lowest of the EFs (1 kg/TJ for both CH_4 and N_2O) was used for estimating emissions from wood recovery boilers. The CH_4 and N_2O IEFs reported in CRF table 1.A(a)s1 are both 0.3 kg/TJ. The ERT noted that wood recovery boilers are typically used in the pulp and paper industry rather than in public electricity and heat production. During the review, the	Resolved. The United States addressed the discrepancy by using EIA data instead of Acid Rain Program fuel use data for electricity production from biomass.

		Party clarified that woody biomass is used in boilers associated with solid fuel use, such as stokers and fluidized beds, and that an EF of 1.0 kg/TJ was used for wood combustion for estimating both CH_4 and N_2O emissions. However, the emissions were based on fuel use data from the Acid Rain Program data set, while the AD reported in CRF table 1.A(a)s1 were based on EIA data – this leads to the observed difference in IEFs and EFs used. The ERT noted that, except under special circumstances, it is not good practice to base emission estimates on AD that are different from those reported in the CRF tables and that the biomass amount reported by EIA is significantly higher than the data used from the Acid Rain Program. The ERT recommends that the Party investigate the collection of AD to ensure that all biomass is accounted for in the emission estimates for this category.	
E.33	1.A.2 Manufacturing industries and construction – biomass – CO_2, CH_4 and N_2O (E.33, 2021) Comparability	The Party reported in CRF table 1.A(a)s2 all biomass consumption under category 1.A.2.g.vii (other), while biomass consumption for all other 1.A.2 subcategories was reported as "IE". During the review, the Party clarified that GHGRP data are determined by fuel type by industry, and then the fuel types are mapped to EIA fuel types and compared with data from the EIA Manufacturing Energy Consumption Survey to develop a time series of fuel use. The United States stated that better matching of GHGRP and Manufacturing Energy Consumption Survey reporting across industries is an ongoing area of work and the focus has been on fossil fuels. The ERT noted that the Manufacturing Energy Consumption Survey includes a category "Other", which includes biomass and other fuels, and that significant consumption is reported for industries such as "Food", "Wood products" and "Paper", which normally are significant consumers of biomass. The ERT recommends that the Party explore the available energy data with the aim of reporting biomass consumption under the correct subcategory(ies) of 1.A.2 rather than following the current practice of reporting all consumption under 1.A.2.g.vii (other) and reporting consumption for all other subcategories as "IE".	Resolved. This issue was addressed in the current (i.e., 2024) submission. Biomass is now reported under 1.A.2 subcategories in Table 1.A(a)s2 where data is available, similar to what is done with fossil fuel reporting for those subcategories.
E.34	1.A.3.a Domestic aviation – jet kerosene – CO_2, CH_4 and N_2O (E.34, 2021) Accuracy	The ERT noted that the carbon EF used under the reference approach (18.67 t C per TJ, corresponding to about 68.5 t CO_2 per TJ) is quite different from the IEF reported under the sectoral approach for international bunkers (66.89 t CO_2 per TJ) but matches the IEF for domestic aviation. During the review, the Party clarified that bunker fuel emissions from commercial aircraft were estimated using the tier 3 methodology while bunker fuel emissions from domestic aviation were estimated using the tier 2 methodology with the same EF as that used for the reference approach. The rationale provided for using the tier 2 methodology for domestic aviation when data for implementing a tier 3 methodology are available was to be consistent with the tier used for other energy combustion emissions. The ERT noted that data on the origin and	Resolved. The United States notes that Tier 3 data on aviation CO_2 emissions is known for commercial domestic and international (bunker fuel) flights. As noted, the Tier 3 data is used directly for IBF emissions. Domestic aviation, however, includes both commercial and general aviation. Domestic commercial aviation emissions are estimated based on the Tier 3 data available. See Table 3-13 in the current 2024 NIR and also Table A-93. Domestic general aviation emissions are calculated based on the Tier 2 approach.

		destination of flights and on air traffic movements are available and the emissions could be estimated using the tier 3 methodology. The ERT recommends that the Party make use of the available data, which are already applied to international aviation, for estimating emissions from domestic aviation, thereby improving the accuracy of the emission estimates.	
E.35	1.A.5.a Stationary – other fossil fuels – CO_2, CH_4 and N_2O (E.35, 2021) Transparency	The Party described in its NIR (section 3.3, p.3-57, and annex 3.7, p.A-225) the methodology and data used for estimating emissions from waste incineration. However, the ERT could not identify the Party's rationale for using CH_4 and N_2O EFs to back estimate waste amounts. Furthermore, the ERT was unable to reproduce the calculations for CH_4 and N_2O emissions. During the review, the Party clarified that data on the amount of waste do not come directly from the GHGRP; non- CO_2 emissions from waste incineration were calculated using default EFs from the 2006 IPCC Guidelines in order to back estimate these data. The United States also clarified that the unit indicated in NIR tables 3-27 and A-110 ("metric tons") is incorrect; the correct unit is short tons. The ERT recommends that the Party (1) expand in the NIR the explanation of how data on waste amounts have been derived and why using CH_4 and N_2O emissions as a proxy for these data is suitable and (2) correct the unit in NIR tables 3-27 and A-110 from "metric tons" to "short tons".	Resolved. Annex 3.7 has been updated to include a discussion around how MSW amounts are calculated using the GHGRP data and why use of back calculating with the CH_4 and N_2O emission factors are appropriate. Table A-110 has also been updated to reflect the correct units "short tons."
E.36	1.C CO_2 transport and storage – CO_2 (E.36, 2021) Transparency	The Party presented AD for EOR and geological sequestration of CO_2 in NIR box 3-6 (p.3-87) but reported AD and CO_2 emissions as "IE" in CRF table 1.C. The Party explained in CRF table 9 that emissions for EOR are included in CRF table 1.B.2, but geologic sequestration is not mentioned. Furthermore, the ERT noted that no recovery is reported from oil and gas in CRF table 1.B.2 and the amount of CO_2 recovered from the fuel combustion sector is very small (0.005 kt in 2020) and significantly less than what is reported in the NIR. During the review, the Party indicated that work on evaluating the use of GHGRP data for reporting CO_2 capture and sequestration, including discussion with stakeholders, is under way and that it plans to include the results of this work in the 2023 or 2024 submission. The ERT recommends that the Party (1) complete the work on evaluating the suitability of GHGRP data for reporting on CO_2 capture and geological sequestration and (2) report relevant AD and emissions in CRF table 1.C, report the amount of CO_2 recovered, by sector, in the relevant CRF tables, and document the estimation in the NIR.	Addressing. The United States continues to evaluate the use of GHGRP data for reporting of CO_2 sequestration and will provide updates on the proposed approach when available.
IPPU			
I.1	2.A.1 Cement production – CO_2 (I.1, 2021) (I.26, 2020) Accuracy	Addressing. *Identify the amount of non-carbonate sources of CaO used in cement production (category 2.A.1) by fully implementing the planned improvement related to the use of non- carbonate raw materials in clinker production, and revise estimates of CO_2 emissions in accordance with the*	The United States continues to review data from GHGRP and other sources on CaO content of clinker and inputs of non-carbonate CaO for consideration in order to estimate a country-specific CO_2 emission factor for

		tier 2 methodology from the 2006 IPCC Guidelines by correcting the amount of CaO from non-carbonate sources if data on non-carbonate CaO sources are available. The Party reported in its NIR (p.4-14) the planned improvements for this category (cement production), including the review of methods and data used in estimating CO_2 emissions from cement production to account for organic material contained in the raw material and to investigate the carbonation that occurs across the lifetime of the cement product. During the review, the Party clarified that it continues to review data from GHGRP and other sources on CaO content of clinker and inputs of non-carbonate CaO in order to estimate a country-specific CO_2 EF for clinker. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet identified the amount of non-carbonate sources of CaO used in cement production.	clinker. An update will be provided, as appropriate, in future submissions.
I.3	2.A.4 Other process uses of carbonates – CO_2 (I.3, 2021) (I.3, 2020) (I.3, 2019) (I.5, 2018) (I.17, 2016) (I.17, 2015) Completeness	Addressing. *Conduct further research and consultation with industry, state-level regulators and/or statistical agencies to access additional AD and EFs and/or to seek verification of the current method and assumptions for estimating emissions from ceramics and non- metallurgical magnesium production and report on progress in the NIR*. The Party described in the NIR (p.4-30) its ongoing efforts to collect data on the production of ceramics and non-metallurgical magnesium. The Party reported in the NIR (annex 5) that the emissions from ceramics production, which are currently reported as "NE", amount to 1,160 kt CO_2 eq for 2019. These emissions were calculated using clay data as a proxy as an initial estimate to assess the significance of the ceramics subcategory. The ERT noted that, according to annex 5 (p.A-479), which also lists the raw materials not included in the proxy data, this represents an underestimation of the emissions from carbonates use in ceramics and non-metallurgical magnesium production. During the review, the Party informed the ERT that it is working on developing arrangements for regular, long-term data collection. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported emissions from ceramics and non-metallurgical magnesium production.	Resolved. Emissions estimates from ceramics and non-metallurgical magnesium production are included in the 2024 submission. See Chapter 4.4 of this report.
I.4	2.B.1 Ammonia production – CO_2 I.4, 2020) (I.4, 2021) (I.4, 2019) (I.7, 2018) (I.19, 2016) (I.19, 2015) Comparability	Addressing. *Allocate emissions from all fossil fuel uses (i.e. fuel and feedstock) for NH_3 production under subcategory 2.B.1 of the IPPU sector in accordance with the 2006 IPCC Guidelines.* The Party continued to report emissions from NH_3 production under the energy and IPPU sectors, as described in the NIR (p.4-32). During the review, the Party indicated that NH_3 production facilities have recently started reporting information that will facilitate the Party's refining of its emission estimation method for consistency with the tier 3 methodology of the 2006 IPCC Guidelines and that the EPA GHGRP regulation has been updated to provide for the	The United States has included information on its country-specific approach in the report. The UNFCCC reporting guidelines (para. 10) explicitly allow use of country-specific approaches. The approach applied builds from the methodological guidance and accounting framework of the IPCC guidelines and explicitly documents why this approach has been applied (i.e., to avoid double-counting emissions) which is a guiding principle of the reporting guidelines.

		collection of additional data, although it will take some years to be implemented. In the meantime, data on fuel use for NH_3 production are not available in the country, and data providers do not provide data on fuel consumption broken down by industry. The ERT noted that information on NH_3 production is available and that the default EFs provided in the 2006 IPCC Guidelines could be used to estimate the emissions for category 2.B.1 (i.e. under the IPPU sector). Using the parameters provided in the 2006 IPCC Guidelines (vol. 3, chap. 3, table 3.1), the fuel requirements for NH_3 production could be estimated and then subtracted from the aggregated consumption currently reported under the energy sector. The Party highlighted that the parameters provided in table 3.1 of the 2006 IPCC Guidelines do not represent operations specific to the United States. The ERT noted that the parameters are based on the European IPPU sector, similarly to the EF used by the Party (which is from the European Fertilizer Manufacturers Association). The ERT also noted that it is not clear how the approach currently followed by the Party better represents its operations, given that it is based on European operations. During the review, the Party noted that it is not appropriate to compare the EF used with default factors that include both fuel and feedstock emissions. It also noted in the NIR (p.4-7) that the country-specific method of accounting for emissions from feedstocks and reducing agents in the IPPU chapter and emissions from energy use in the energy chapter is compatible with the 2006 IPCC Guidelines, and is well documented and based on the science, and the allocation is undertaken to avoid double counting of emissions. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported all emissions from NH_3 production under the IPPU sector or documented how the methodologies used better reflect national circumstances and are compatible with the 2006 IPCC Guidelines.	As noted in Introduction to Chapter 4 and in the Methodology and Time-Series Consistency discussion of Chapter 4.5 of the 2024 submission, "Emissions from fuel used for energy at ammonia plants are accounted for in the Energy chapter. This approach differs slightly from the *2006 IPCC Guidelines* which indicates that "in the case of ammonia production no distinction is made between fuel and feedstock emissions with all emissions accounted for in the IPPU sector." Disaggregated data on fuel used for ammonia feedstock and fuel used for energy for ammonia production are not available in the United States. The Energy Information Administration (EIA), where energy use data are obtained for the Inventory (see the Energy chapter), does not provide data broken out by industrial category. EIA data are only available at the broad industry sector level. Furthermore, the GHGRP data used to estimate emissions are based on feedstock use and not fuel use."
I.6	2.B.4 Caprolactam, glyoxal and glyoxylic acid production – N_2O (I.6, 2021) (I.8, 2020) (I.7, 2019) (I.31, 2018) Transparency	Addressing. *Gather the necessary data and report N_2O emissions from glyoxal and glyoxylic acid production.* The Party reported in its NIR that data on glyoxal and glyoxylic acid production are not available. The Party described its activities aimed at obtaining information on these two emissions sources from potential data providers. During the review, the Party informed the ERT that it estimated emissions from glyoxal production using limited data gathered on domestic production and import of glyoxal and found that they do not exceed the category-level threshold for significance (500 kt) in recent years as reported in the NIR (annex 5). Furthermore, ongoing research suggests that glyoxylic acid may not be produced in the United States at a level that would exceed the category-level threshold for significance (500 kt). The ERT noted that evidence supporting these emissions sources not exceeding the significance	Addressing. See Annex 5 of the current 2024 NID and Annex 5 of the previous submission. EPA has identified potential data sources for glyoxal, and glyoxylic acid based on ongoing research efforts. Using limited data on the range of domestic production and import of glyoxal, EPA estimates that emissions from glyoxal production do not exceed the category-level threshold for significance of 500 kt in recent years. Research suggests that glyoxylic acid may not be produced in the United States at levels that would exceed the category-level threshold for significance of 500 kt. EPA hopes to report more progress in the next (i.e., April 2025) submission, but anticipates the earliest reflection of this data, if useful,

		threshold was reported in the NIR (annex 5, p.A-480). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported N_2O emissions from glyoxylic acid production or demonstrated that these emissions are insignificant.	would be the April 2026 submission as additional historical data to develop the time series has not been identified.
I.7	2.B.5 Carbide production – CO_2 (I.7, 2021) (I.9, 2020) (I.8, 2019) (I.32, 2018) Comparability	Addressing. *Allocate CO_2 emissions from the 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*. The Party reported CO_2 emissions from calcium carbide production as "IE" in CRF table 2(I).A-Hs1. The Party reported in CRF table 9 that the CO_2 emissions are included under category 1.A.5, explaining in the NIR (p.4-52) that they are implicitly accounted for in the storage factor calculation for the NEU of petroleum coke under the energy sector. During the review, the Party highlighted that there is no way to disaggregate and report emissions specifically associated with petroleum coke used in calcium carbide production because production data are not available for calcium carbide. The ERT noted that an estimation of calcium carbide production was reported by the Party in annex 5 to the NIR, and that this information could be used to estimate the emissions for the category and allocate them to the IPPU sector in line with 2006 IPCC Guidelines. Furthermore, as there is only one producer of calcium carbide in the country, this plant could be approached for information. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet estimated and allocated CO_2 emissions from the production of calcium carbide to the IPPU sector in line with the 2006 IPCC Guidelines.	The United States reiterates that a country-specific approach was taken for CO_2 emissions from production of calcium carbide. Footnote 15 in the 2023 NIR (pp. 4-18) indicates calcium carbide is produced from quicklime and petroleum coke. Any emissions from quicklime production are included in lime production emissions (Section 4.2). Furthermore, Section 4.10 (pp. 4-51) in the 2023 NIR indicates that CO_2 (from petroleum coke used in calcium carbide production) is implicitly accounted for in the storage factor calculation for the non-energy use of petroleum coke in the Energy chapter. Table A-40 on pp. A-101 of the 2023 NIR Annexes indicates a storage factor of 30 percent for petroleum coke used in non-energy uses. This indicates effectively that 70 percent of any CO_2 emissions associated with petroleum coke used in calcium carbide production is released and accounted for under NEU emissions in the *Inventory*. There is no way to disaggregate and report emissions specifically associated with petroleum coke used in calcium carbide production (as is done for silicon carbide) since production data are not available for calcium carbide to estimate emissions directly.
I.9	2.B.8 Petrochemical and carbon black production – CH_4 and N_2O (I.9, 2021) (I.11, 2020) (I.9, 2019) (I.10, 2018) (I.22, 2016) (I.22, 2015) Completeness	Not resolved. *Progress with plans to analyse new data reported by facilities (i.e. GHGRP data) and include emissions from the combustion and flaring from installations not currently included in the inventory.* The Party reported in its NIR that CH_4 emissions for category 2.B.8 are currently included in the CO_2 estimates and reported as "IE" in the corresponding CRF tables. In the planned improvements section for this category, the Party reported that it plans to adjust CO_2 emissions for the GHGRP downward by subtracting the carbon that is also included in the reported CH_4 emissions. Regarding N_2O emissions, the Party reported in the NIR (p.4-68) that ethylene production facilities are required to report N_2O emissions from the combustion of ethylene process off-gas in both stationary combustion units and flares. Further, the Party reported that a preliminary analysis of the aggregated reported CH_4 and N_2O emissions from facilities suggests that these emissions are less than 500 kt CO_2 eq/year. The Party noted in the NIR that the inclusion of these emissions in the inventory has	Addressing. The United States also points to Section 4.13 of the 2024 NID in the Methodology and Time-Series Consistency discussion, that "Analysis of aggregated annual reports from those facilities shows that flared CH_4 and N_2O emissions are less than 300 kt CO_2 Eq./year. Since data is only available from a subset of facilities and not consistently reported over time and since CH_4 and N_2O emissions are shown to be insignificant, they are excluded from this analysis. Analysis is also included in Annex 5. The United States continues to assess its GHGRP data for ways to better disaggregate the data and incorporate it into the *Inventory* and any information will be included as appropriate in future submissions.

		not been prioritized owing to their limited impact on national total emissions. During the review, the Party informed the ERT that it continues to assess GHGRP data for ways to better disaggregate the data and incorporate them into the inventory, and disaggregated data will be included, as appropriate, in future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated CH_4 and N_2O emissions from ethylene production.	
I.10	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.10, 2021) (I.12, 2020) (I.10, 2019) (I.12, 2018) (I.25, 2016) (I.25, 2015) Accuracy	Addressing. *Develop a methodology that is consistent with the 2006 IPCC Guidelines as soon as is practicable, allocating relevant fuel and feedstock emissions within the IPPU sector.* The Party described in its NIR (p.4-61) the overall allocation approach followed, wherein all emissions are reported under category 2.B (chemical industry) except fuels and feedstocks transferred out of the system for energy purposes. The ERT noted that this is in line with the allocation approach set out in the 2006 IPCC Guidelines (vol. 3, chap. 3, p.3.57), which state that "fuels which are not used within the source category but are transferred out of the process for combustion elsewhere the emissions should be reported in the appropriate Energy Sector source category". The Party reported in the NIR (section 4.13) on its use of two different approaches to estimate the emissions for category 2.B.8: (1) a mass-balance (tier 2) approach for carbon black, ethylene oxide, ethylene and ethylene dichloride; and (2) a tier 1 approach for acrylonitrile and methanol. In the case of the mass-balance approach, all of the carbon input into the process is converted either into primary and secondary products or into CO_2. In the tier 1 approach, the emissions are calculated using the production of methanol and acrylonitrile as AD. During the review, the Party clarified that for acrylonitrile and methanol, combustion emissions from any energy use not associated with feedstock are accounted for as part of fossil fuel combustion in the industrial subsector emissions reported under the energy sector. The ERT confirmed that in the case of the emissions estimated by the tier 2 approach, all fuels are reported under the IPPU sector, while in the case of methanol and acrylonitrile, some fuels are considered under the energy sector. Furthermore, the ERT noted that the estimation approach followed for the energy sector (described in detail in annex 3 to the NIR) does not consider the different estimation approach followed for the IPPU sector (i.e. NIR annex 2.3 does not describe how the differences in the approaches followed for (1) acrylonitrile and methanol and (2) carbon black, ethylene oxide, ethylene and ethylene dichloride are reflected in the energy estimates for avoiding double counting), creating a potential overestimation of emissions and affecting the transparency of the national inventory and its comparability with the inventories of other Parties.	Resolved. Per question E.9, the issue of potential double counting was discussed in the 2024 submission. See for example, the 2024 NIR Section 3.2 for the following discussion: "This country specific approach taken is better able to reflect the national situation because it is accounting for secondary product imports and exports that are not included directly in the national energy statistics. Furthermore, it is compatible with the *2006 IPCC Guidelines* as discussed in Box 1.1 above, but also as the NEU emissions here represent different emissions from those covered in the IPPU petrochemical production category."

		The ERT considers that the recommendation has not yet been fully addressed because the Party has not implemented the IPCC methodology or transparently and specifically explained in the NIR how the country-specific approach is better able to reflect the Party's national situation and how this country-specific approach is compatible with the 2006 IPCC Guidelines.	
I.12	2.C.1 Iron and steel production – CO_2 (I.12, 2021) (I.16, 2020) (I.14, 2019) (I.17, 2018) (I.28, 2016) (I.28, 2015) Transparency	Not resolved. *Explain the allocation of the emissions from coke production and iron and steel production across both the energy and the 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 used to compile and quality check the inventory estimates).* The Party stated in the NIR (p.4-82) that "the approaches and emission estimates for both metallurgical coke production and iron and steel production…are presented in the IPPU Chapter because much of the relevant activity data is used to estimate emissions from both metallurgical coke production and iron and steel production". Furthermore, in annex 2.1, the Party stated that the consumption of coking coal, natural gas, distillate fuel and coal used in iron and steel production was adjusted under the energy sector to avoid the double counting of emissions. The ERT noted that the information reported in the NIR is confusing in terms of which emissions from iron and steel production are accounted for under the energy sector and which under the IPPU sector and because it does not specify what adjustments were made in the energy sector for each year of the time series to avoid the double counting of emissions. During the review, the Party clarified that NIR tables 4-67–4-68 (p.4-86) include a description of the flows accounted for in estimating emissions from coke production. The ERT noted that a quantitative summary of the carbon balance for iron and steel production was not provided in the NIR. The ERT considers that the recommendation has not yet been addressed because thorough information has not been included in the NIR regarding the allocation of emissions from iron and steel production between the energy and IPPU sectors.	Resolved. The United States reiterates that the Party has transparently reported the methodology for allocating emissions from iron and steel production between the energy and IPPU sectors in its NIR. See the 2024 NID Annex 2.1 for how emissions and carbon stored from iron and steel production have been allocated between the energy and IPPU sectors. The Party has also documented emission factors used in the iron and steel and coke production emissions estimates. See for example Table 4-76 on pp. 4-86, Table 4-79, Table 4-80, and Table 4-81 of the 2023 NIR. The same tables are in the 2024 NID as well.
I.13	2.C.1 Iron and steel production – CO_2 (I.13, 2021) (I.30, 2020) Accuracy	Revise estimates of CO_2 emissions from coke production taking into account national statistics on coke breeze production, for example from EIA quarterly coal reports, or demonstrate in the NIR that CO_2 emissions from coke production were not underestimated by using industry data on coke breeze production instead of EIA statistics and explain how there is a consistent approach used to track carbon throughout the calculations. Not resolved. The Party reported in NIR table 4-67 estimates for coke breeze production of 1,220 kt for 2019 and 981 kt for 2020. However, the ERT noted that actual data on coke breeze production in the United States can	Addressing. The United States notes that the methodology used to calculate coke production emissions is described in Section 4.17 of the 2023 NIR. See for example Tables 4-77 and 4-78 on pp. 4-87. The Party continues to assess EIA data on coke breeze production and the impact of this change on emission estimates. The Party will provide an update as appropriate in future submissions.

		be obtained from EIA quarterly coal reports. After comparing the estimated data on coke breeze production used in the GHG inventory (1,220 kt for 2019 and 981 kt for 2020) with the EIA statistics (653,000 short tons for 2019 and 507 thousand short tons for 2020), the ERT concluded that coke breeze production was potentially overestimated in the inventory. During the review, the Party clarified that the coke breeze production data used in the inventory come from iron and steel industry data from a report by the United States Department of Energy (2000), which are considered to be more representative of coke production mass balances used at steel production facilities. However, the ERT noted that the differences between this source and EIA statistics are highly significant, and no information is provided in the NIR on the rationale the Party followed for choosing AD on coke breeze production. The ERT considers that the recommendation has not yet been addressed because coke breeze production data have been updated in the inventory but information has not been included in the NIR regarding a comparison of data sources and the rationale for the selection of AD on coke breeze production.	
I.15	2.C.1 Iron and steel production – CO_2 (I.15, 2021) (I.32, 2020) Accuracy	Justify the reported carbon content value of 2 per cent for pellets, sinter and natural ore by describing the country-specific approach of assuming they have the same carbon content as direct reduced iron (2 per cent), with confirmation by references to the relevant data sources in the NIR, or otherwise revise the emission estimates for iron and steel production (category 2.C.1) by updating the carbon content value for pellets, sinter and natural ore used in pig iron production on the basis of relevant data sources. Addressing. The Party reported in its NIR (p.86) that, in the absence of a default value from the 2006 IPCC Guidelines or the 2019 Refinement to the 2006 IPCC Guidelines for the carbon content of pellets, sinter and natural ore consumed for pig iron production, it assumed a carbon content of 2 per cent for these input materials. The ERT noted that the Party did not provide the basis for this assumption in the NIR. During the review, the Party clarified that that the carbon content values used are validated annually by industry experts, therefore, it does not plan to update these parameters. The ERT noted that the assumption made as an expert judgment regarding the carbon content of pellets, sinter and natural ore consumed for pig iron production was not documented in the NIR following the guidance on expert elicitation provided in the 2006 IPCC Guidelines (vol. 1, chap. 2). The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet justified in the NIR the basis for the assumption made regarding the carbon content of pellets, sinter and natural ore consumed for pig iron production.	Resolved. The United States reiterates the previous clarification and response provided during the previous review. In the absence of a default carbon content value from the *2006 IPCC Guidelines* and the *2019 Refinement* for pellet, sinter, or natural ore consumed for pig iron production, the United States uses a country-specific approach based on Tier 2 methodologies. EPA assumes that pellets, sinter, and natural ore used as an input for pig iron production have the same carbon content as direct reduced iron (2 percent). See the 2023 NIR submission, IPPU chapter Section 4.17 for this clarification on this country-specific approach. Current QC and outreach do not indicate that this approach needs to be changed.

I.16	2.C.1 Iron and steel production – CO_2 (I.16, 2021) (I.33, 2020) Accuracy	Describe in the NIR the type of fluxes used in iron and steel production and ensure that only CO_2 emissions from the emissive sources of fluxes are reported under category 2.C.1 and that consumption of carbonates under category 2.A.4 is adjusted to subtract emissive sources accounted for elsewhere in the GHG inventory. Addressing. The Party reported in its NIR (p.89) the amount of flux stone used in iron and steel production for electric arc furnace and basic oxygen furnace steel production. The source of these data is the American Iron and Steel Institute. On page 4-27 of the NIR, the Party clarified that flux stone used during the production of iron and steel was deducted from category 2.A.4 (other process uses of carbonates) and attributed to category 2.C.1 (iron and steel production). However, the ERT noted that during the previous (2020) review, the Party clarified that the information provided by the American Iron and Steel Institute includes all flux types, including limestone, lime and fluorspar, but that the Party only accounts for the use of fluxes containing carbon (limestone and dolomite) in iron and steel production emissions because the emissions associated with other fluxes are reported under their individual categories (e.g. 2.A.2 (lime production)). The ERT could not find any other reference in the 2022 NIR to these other fluxes used in iron and steel production. During the review, the Party clarified that emissions associated with the use of the other fluxes in iron and steel production (if CO_2 emissions are released) are considered under those sources (e.g. emissions from lime production, emissions from other process uses of carbonates) in the inventory. The ERT noted that the scope of the information provided by the American Iron and Steel Institute is the production of iron and steel and there is no mention in the NIR about the consumption of carbonates in iron and steel production except category 2.A.2. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet demonstrated that all uses of carbonates as fluxes are included in the emission estimates for iron and steel reported in CRF table 2(I).A-Hs1.	Resolved. The United States reiterates the previous clarification and response provided during the previous review. The current 2024 NIR submission clarifies in the IPPU chapter Section 4.18 that the United States includes only carbon-containing fluxes (I.e., limestone and dolomite) in emissions calculations from electric arc furnace and basic oxygen furnace steel production. Section 4.18 also clarifies that the amount of carbon-containing flux (i.e., limestone and dolomite) used in EAF and BOF steel production was deducted from the "Other Process Uses of Carbonates" source category (CRT Source Category 2A4) to avoid double-counting. Furthermore, Section 4.4 of the current NIR indicates that emissions from limestone and dolomite used in the production of iron and steel and magnesium production are reported under Section 4.18, Iron and Steel Production (CRT Source Category 2C1). Section 4.2 of the current NIR discusses lime production and use. It mentions that the largest end use of lime is for iron and steel production. Use of lime (CaO) in iron and steel production does not result in any CO_2 emissions. As discussed in Section 4.18, iron and steel production only accounts for carbon-containing flux.
I.17	2.C.4 Magnesium production – SF_6 (I.17, 2021) (I.17, 2020) (I.15, 2019) (I.35, 2018) Consistency	Investigate the reasons for the SF_6 IEF increase between 2009 and 2011 and report in the NIR on the outcome of the investigation and on any recalculations of AD, EFs or emissions resulting from those investigations. Not resolved. The Party reported in its NIR (p.4-109) on the recalculations made for SF_6 emissions for category 2.C.4 for 2016–2019. Furthermore, the Party included in the NIR a more detailed description of the trends in magnesium production AD, EFs and emissions, including the reasons for the high emissions reported for 2009–2011 but not the reasons for the SF_6 IEF increase between 2009 and 2011. During the review, the Party clarified that the large increase in the SF_6 IEF	Resolved. See explanation included in Chapter 4.21 of the current report (2024 submission). Review of facility responses indicate that changes over time in the emission factors for this industry have occurred as facilities switch to using systems with cover gases other than SF_6 (e.g., SO_2) and also during time periods where back-up SF_6-based systems are used due to the failure of the primary (non-SF_6) system have occurred, leading to the periodic spike in SF_6 usage rates.

		from 2010 to 2011 is due to both a single facility reporting anomalously high emissions for 2011 and increased production. The ERT noted that increased production levels alone are not likely to be the reason for the increased IEF between 2010 and 2011. The ERT asked the Party to share the AD and calculations made to ascertain the consistency of the time series. However, the Party could not provide this information to the ERT owing to confidentiality constraints. Therefore, the ERT could not confirm the time-series consistency of SF_6 emissions for category 2.C.4. The ERT considers that the recommendation has not yet been addressed because the Party has not yet provided evidence for the SF_6 IEF increase between 2009 and 2011 for category 2.C.4.	
I.18	2.D Non-energy products from fuels and solvent use – CO_2 (I.18, 2021) (I.18, 2020) (I.16, 2019) (I.36, 2018) Comparability	Estimate separately CO_2 emissions from lubricants and paraffin wax use and report them under category 2.D. Not resolved. The Party reported CO_2 emissions from lubricants and paraffin wax as "IE" under category 2.D (non-energy products from fuels and solvent use) in CRF table 2(I).A-Hs1. The Party reported in its NIR (p.4-7) that CO_2 emissions from the NEU of fuels are reported under the energy sector owing to national circumstances. The Party reported non-energy fuel consumption for different sectors and fuel types in NIR table A-20 (annex 2). During the review, the Party clarified that it uses a country-specific approach to determining carbon storage from NEU fuels. This approach includes calculating carbon inputs from statistics on the NEU of fuels from EIA and adjusting for imports/exports of major petrochemicals used for industrial processes (e.g. reductants used in metallurgy, feedstocks used in carbon black production). The Party also clarified that wherever possible, feedstocks are separated and reported separately. The ERT noted that the data available on the NEU of fuels can be used to estimate the AD for category 2.D and can then be subtracted from the energy sector AD. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated and reported separately the CO_2 emissions from lubricants and paraffin wax for reporting under category 2.D.	Resolved. As per ID # above E.4, the United States reiterates that it uses a country-specific methodology for non-energy use of fuels in line with para. 10, Decision 24/CP.19 to most accurately portray U.S. emissions from NEU. The United States has improved the explanation of its country-specific approach to the allocation of NEU of fuels in the introduction of the IPPU Chapter 4 and Annex 2 of the 2021 NIR.
I.19	2.G.2 SF_6 and PFCs from other product use – SF_6 (I.19, 2021) (I.23, 2020) (I.22, 2019) (I.37, 2018) Completeness	Investigate possible SF_6 emissions from airborne warning and control systems, particle accelerators and radars and include them in the next inventory 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, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 8, pp.8.23–8.25 and 8.26–8.30). Not resolved. The Party reported SF_6 emissions for category 2.G.2 as "NE" in CRF table 2(II). During the review, the Party clarified that emissions of SF_6 and PFCs from other product use (i.e. from airborne warning and control systems, particle accelerators and radars) are not included in the national	Resolved. Estimates from SF_6 and PFCs from other product use are included in Chapter 4.27 of this report.

		GHG inventory. Estimates of fugitive and process SF_6 emissions, which are based on data obtained in 2018 from relevant government agencies (e.g. United States Department of Energy, United States Department of Defense), were provided in annex 5 to the NIR as an indication of the expected scale of emissions to demonstrate they are likely below the significance threshold. Furthermore, the Party clarified that there is potentially some overlap between the emissions based on government agency data reported in annex 5 and emissions reported elsewhere in the NIR (e.g. fugitive emissions from electrical transmission and distribution). The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated and reported SF_6 and PFC emissions from other product use.	
I.20	2.A.3 Glass production – CO_2 (I.20, 2021) Accuracy	The Party reported in its NIR (p.4-22) that the AD used for estimating CO_2 emissions from glass production consist of the amounts of limestone, dolomite and soda ash used in glass production. The Party also reported that the data are obtained from three sources: GHGRP, the United States Geological Survey and the United States Bureau of Mines. The Party stated in the NIR (p.4-22) that "GHGRP collects data from glass production facilities with greenhouse gas emissions greater than 25,000 metric tons CO_2 Eq". For soda ash, information on facilities with emissions below this threshold is obtained from the United States Geological Survey, but for limestone and dolomite, the source of this information is not described in the NIR. During the review, the Party clarified that some glass production facilities fall below the GHGRP reporting threshold for limestone and dolomite. The Party indicated that work on better assessing the completeness of emission estimates is ongoing. The ERT noted that the emissions from glass production are currently underestimated in the inventory for all years of the time series and pointed out that expert judgment could be used to derive the national total consumption of dolomite and limestone to produce glass. The ERT recommends that the Party estimate and report the emissions from all glass production occurring in the country by collecting the missing data from facilities whose production generates emissions that fall below the established threshold of 25,000 metric tonnes CO_2 eq used by the GHGRP, or by obtaining expert judgment on the national total consumption of dolomite and limestone in glass production, which is currently not considered.	Addressing. EPA is reviewing available data/experts to provide further input estimate the non-reporting population. This is a medium-term priority (i.e., to address in next 2-3 inventory cycles) and will be addressed accordingly.
I.21	2.B.1 Ammonia production – CO_2 (I.21, 2021) Not an issue/problem	The Party reported in its NIR (p.4-31) that the CO_2 that is captured during the NH_3 production process and used to produce urea does not contribute to the CO_2 emission estimates for NH_3 production. CO_2 emissions resulting from the consumption of urea are attributed to the category where urea is consumed or applied. CO_2 emissions from agricultural applications of urea	The United States notes, it has followed good practice guidelines in Volume 1, Chapter 5 of the IPCC guidelines, as described in the report to address this particular data gap using available data. In this situation, which is not typical, data are updated and estimates are recalculated

		are accounted for under the agriculture sector, in category 3.H (urea application) (NIR section 5.6). CO_2 emissions from non-agricultural applications of urea are accounted for under the IPPU sector, in category 2.B.10 (NIR section 4.6). In category 3.H, the data on urea application for 2017–2020 were not available so were estimated by the Party (NIR p.5-50) in line with 2006 IPCC Guidelines and then deducted from the total domestic supply of urea to estimate emissions from urea consumption for non-agricultural purposes under category 2.B.10 (other (chemical industry)). The ERT encourages the Party to continuing obtaining data on urea application from 2017 onward as in previous submissions.	in subsequent reports when data is available.
I.22	2.F.1 Refrigeration and air conditioning – HFCs (I.22, 2021) Accuracy	The Party reported in NIR equation A-8 (annex 3.9, p.A-238) the approach for estimating emissions from the manufacturing of refrigeration and air-conditioning equipment. In this equation, the quantity of chemical in new equipment is multiplied by an EF and adjusted for applicability to obtain the emissions. Manufacturing EFs used by the Party were reported in NIR table A-122 but the source of the EFs was not provided (see ID# I.23 below). During the review, the Party clarified that first-fill emissions are a function of the quantity of chemical contained in new equipment and the proportion of equipment that is filled with refrigerant in the United States. The Party also clarified that first-fill loss rates used were informed by several sources, including the 2006 IPCC Guidelines, Italy's NIR and reports published by the Department of Energy and Climate Change of the United Kingdom of Great Britain and Northern Ireland in 2011 and 2014 (with the more recent report containing individual end-use first-fill estimates). The ERT noted that the EFs provided in table 7.9 of the 2006 IPCC Guidelines (vol. 3, chap. 7) are expressed in percentage of initial charge, not in percentage of gas contained in the equipment after first filling. The ERT also noted that gas that is contained in new equipment is already deducted from the emissions that have occurred during the prefilling of gases in manufacturing operations. Therefore, applying the EF to the amount of gas contained in new equipment results in a potential underestimation of emissions from the manufacturing of refrigeration and air-conditioning equipment. Furthermore, the ERT noted that the Party did not provide evidence in the NIR that the emission estimates cover all gases used for first filling (either in the AD or the EF) in order to demonstrate that an underestimation of emissions does not occur. The ERT recommends that the Party either provide in the NIR evidence that the current estimates cover all the gases used in the first filling of refrigeration and air-conditioning equipment or recalculate HFC emissions for category 2.F.1 (refrigeration and air conditioning) by updating the amount of gas filled into new equipment or by adjusting the EF to account	Resolved. The Party does not agree with the assessment that first-fill emissions do not cover all gases used for first filling of equipment. As noted in equation "Calculation of Emissions from Refrigeration and Air-conditioning Equipment First-fill", the first-fill EF is applied to all equipment and all refrigerants used within the refrigeration and air-conditioning sector. Although the model assumes that equipment commences operation with a full charge less these first-fill/manufacturing emissions, the model also assumes that such emissions are replaced during equipment servicing in the first year of operation. Therefore, subsequent emissions factors are applied to the full charge of the equipment and the Party does not believe that there is an underestimation of total emissions. The first-fill emission are run for every applicable refrigerant in every applicable end-use. In the equation "Calculation of Emissions from Refrigeration and Air-conditioning Equipment First-fill", we identify that Qc is the total amount of the specific refrigerant. The equation is run for all such specific refrigerants for all applicable end-uses.

		for the prefilling emissions that occurred during manufacturing.	
I.23	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.23, 2021) Convention reporting adherence	The Party described in its NIR (section 4.24) the approach followed for estimating emissions from product uses as substitutes for ODS (category 2.F), providing the HFC and PFC emissions as well as information on the subcategories estimated in the inventory: 2.F.1 (refrigeration and air conditioning), 2.F.4 (aerosols), 2.F.2 (foam blowing agents), 2.F.5 (solvents) and 2.F.3 (fire protection). During the review, the Party explained that it uses the Vintaging Model for estimating category 2.F emissions. As noted in the NIR (p.4-140), the model "predicts ODS and ODS substitute use in the United States based on modelled estimates of the quantity of equipment or products sold each year containing these chemicals and the amount of the chemicals required to manufacture and/or maintain equipment and products over time". The Party referred the ERT to annex 3.9 to the NIR, in which it provided a brief description of the modelling approach, the methodology followed and assumptions made by subcategory, and the model outputs. Regarding the AD used, the Party stated (NIR p.A-236) that the Vintaging Model synthesizes data from a variety of sources, including the ODS tracking system maintained by the Stratospheric Protection Division of EPA, the GHGRP run by the Climate Change Division of EPA, submissions to EPA under its Significant New Alternatives Policy programme, and various sources published by international organizations. The information provided on assumptions includes information on market transition assumptions and parameters used in the estimation (i.e. EFs and lifetime of equipment). The market transition assumptions consist of a definition of substitutes by end-use category and the average growth rate for individual market sectors from the base year to 2030. Regarding the parameters used in the estimation, the Party provided summary information by end use, using ranges to represent the values that are used within specific end-use categories. The ERT noted that according to paragraph 50 of the UNFCCC Annex I inventory reporting guidelines, "the NIR shall include: (a) Descriptions, references and sources of information for the specific methodologies, including higher-tier methods and models, assumptions, EFs and AD, as well as the rationale for their selection. For tier 3 models, additional information for improving transparency," with footnote 11 specifying that "Parties should, as applicable, report information on: basis and type of model, application and adaptation of the model, main equations/processes, key assumptions, domain of application, how the model parameters were estimated, description of key inputs and outputs, details of calibration and model evaluation, uncertainty and sensitivity analysis, QA/QC procedures adopted and references to peer-reviewed literature". The ERT also noted that the Party did not provide in the NIR the	Resolved. Where possible (i.e., without revealing confidential data), in Annex 3.9 of the 2024 NIR we have provided additional, more disaggregated data and inputs for transparency. In "Recalculations Discussion" of Section 4.25 of the 2024 NIR EPA references four memos that provide data and sources for specific updates made. These memoranda are included in the NIR records or archive. With respect to performing a Tier 1 analysis, according to the IPCC guidelines, data needed to perform such an analysis includes "Data on chemical sales by application." For instance, to perform a Tier 1 analysis of the Refrigeration and Air Conditioning application area, the Guidelines indicate data is need on "Sales of a specific refrigerant in the year to be reported." EPA does not have data on either "sales" or "refrigerant." EPA has data on consumption (production + import – export – destruction – transformation) of individual HFCs. EPA also has information on inventory stockpiles of individual HFCs for the year 2022. At best, to perform a Tier 1 analysis, EPA would need to make assumptions regarding which chemicals were sold into the refrigeration market, noting that some are sold to multiple markets (e.g., HFC-134a is used in refrigeration and air conditioning, aerosols, foams, and others). There does not appear to be guidance in the IPCC guidelines on how to make those assumptions.

		input data used in the calculations (see ID# I.26 below) or describe in sufficient detail how the parameters used in the model were estimated (see ID#s I.24 and I.25 below). Furthermore, references to peer-reviewed literature and information on the sensitivity of the estimations were not provided. Additionally, the ERT noted that the Party did not report in the QA/QC section the results of a comparison of the estimates obtained from the Vintaging Model with those obtained using the tier 1 approach. The ERT recommends that the Party report information on key input and output data used in the Vintaging Model, a detailed description of how the parameters used in the model at end-use category were estimated, references to peer-reviewed literature on the modelling approach followed by the model, a sensitivity analysis of the estimates made by the model, and a comparison of the estimates obtained from the model with those obtained using the tier 1 estimation approach.	
I.24	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.24, 2021) Accuracy	The Party reported in NIR tables A-121 and A-123–A-128 (annex 3.9) average annual growth rates for individual market sectors by gas and equipment type. The Party stated that "the market for each equipment type is assumed to grow independently, according to annual growth rates" (p.A-239). The ERT noted that the raw data used by the Vintaging Model and information on how annual growth rates are used in the methodology to estimate the AD are not included in the NIR. During the review, the Party explained that the Vintaging Model estimates begin with a 1985 stock and sales estimate for each end use. An annual growth rate is then applied to the 1985 sales estimate to reflect growth in the market. In a given year, total stock for each end use is equivalent to the stock from the previous year plus new units/chemical entering the market less units/chemical reaching end of life (i.e. disposed) or emitted. Furthermore, the Party clarified that owing to confidentiality concerns and the other assumptions applied, it was unable to share 1985 stock and sales estimates for every end use. However, the Party provided an example for motor vehicle air conditioning, where the annual growth rate assumption was applied annually since 1985 to a sales estimate to calculate the total stock as the stock in the previous year, plus sales in the current year, minus the amount disposed of in the current year. The ERT concluded that the Party has applied the splicing technique 'surrogate data' (2006 IPCC Guidelines, vol. 1, chap. 5), using 1985 data as the basis for estimating the AD for the whole time series, and noted that this approach substantially increases the uncertainty of category 2.F, which is a key category for the level and the trend (NIR table 1.4, p.1-20). The ERT recommends that the Party collect data with which to update the 1985 estimate of stock of gases in operation, recalculate the emissions for the entire time series (1990–2020) and report the differences between the current and recalculated	Addressing. EPA will continue its investigations for possible updates to the 1985 estimates used in the NIR.

		estimates in the next inventory submission. The ERT encourages the Party to prioritize this category in the improvement plan of the inventory given the importance of the emissions source (2.F is a key category for the level and the trend) and the very high uncertainty of the estimates.	
I.25	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.25, 2021) Accuracy	The Party reported in its NIR (pp.4-141–4-142) that data from HFC suppliers have been collected under the GHGRP since 2011, but that "GHGRP data is not used directly to estimate emissions of ODS Substitutes because it does not include complete, publishable information on the sectors or end-uses in which that chemical will be used, so it does not provide the data that would be needed to calculate the source or time that chemical is emitted". Furthermore, the Party noted in the NIR (p.4-145 and annex 3) that GHGRP data are not considered complete because suppliers could be underreporting to the GHGRP. Despite this potential underreporting, the ERT noted that, for 2020, GHGRP data are 22 per cent higher than the input data used by the Vintaging Model (NIR table 4- 105 and annex 3). The ERT also noted that the Vintaging Model does not include every saturated HFC that is reported under the GHGRP (NIR p.4-144 and annex 3). During the review, the Party clarified that information on the differences between the data from the two sources is reported in the NIR (p.4-142 and annex 3) and highlighted that the GHGRP data relate to net supply, and therefore the comparison with the Vintaging Model input data used for the inventory is one of potential emissions versus actual emissions. The ERT noted that the data have different scopes (supply versus estimated consumption). However, as noted in the NIR, the GHGRP data are not complete (not all HFC supply is considered), and despite the time lapse between supply and consumption, the comparison between the summation of all years for which data are available leads to differences of more than 10 per cent, reflecting inconsistencies in the approach followed by the Vintaging Model (either in the growth rates used to calculate the input gases or in the assumptions made to calculate the amount of gases in operation in equipment). The Party informed the ERT that future reporting under the American Innovation and Manufacturing Act may provide some useful information for verifying and possibly improving the Vintaging Model, although this reporting is not expected to resolve the fact that bulk supply data are not available at the level of detail necessary to allocate quantities to each end use. The Party indicated that any improvements using these new data will be incorporated into the 2024 or 2025 submission at the earliest. The ERT recommends that the Party (1) collect new input data for the Vintaging Model (including data on the amount of gas used in manufacturing, amount of gas contained in equipment in operation and amount of gas disposed of) that will allow it to recalculate the emissions for	Resolved. The United States has noted in previous NIRs that there was a likelihood that HFCs were being imported in bulk and stockpiled, rather than put directly into equipment. The United States provided evidence of such stockpiling in Annex 3.9 of the current NIR. EPA said "Based on information collected by the EPA at the time, such stockpiling behavior was seen during ODS phasedowns, and it is concluded that such behavior similarly exists amongst HFC suppliers in anticipation of current and recently promulgated controls on HFCs. Inventories of HFCs reported at the end of 2022 exceeded consumption by 55 percent (EPA 2024), indicating stockpiling had been going on for some time. Any such activity would increase the GHGRP data as compared to the modeled data. This effect is likely the major reason why there is a divergence in the comparison above, with the GHGRP data in 2017 through 2021 (i.e., the years following agreement of the Kigali Amendment to the Montreal Protocol) significantly higher than the modeled data."

		category 2.F for the entire time series (1990–2020); and (2) find a way to enhance the completeness of reporting to include all fluorinated gases used in the country.	
I.26	2.F Product uses as substitutes for ozone-depleting substances – HFCs and PFCs (I.26, 2021) Transparency	The Party reported in NIR table A-122 (annex 3.9) the EFs used for calculating HFC emissions from refrigeration and air conditioning, by end use, including information on the lifetime of equipment. Furthermore, the Party explained in the NIR that EFs for disposal emissions were developed taking into account the original charge capacity of the equipment. The original charge of the equipment was also used in equations A-8, A-9 and A-10 to calculate emissions from manufacturing, operation and disposal respectively. However, the ERT noted that the amount of gases charged into the equipment (i.e. the nominal capacity of gases) was not reported in the NIR. During the review, the Party clarified that information on charge amounts was gathered from sources similar to those from which the assumptions used for deriving EFs were obtained. Furthermore, the Party provided charge amounts by equipment type that are representative of the ODS charge amount assumptions used in the Vintaging Model for some end uses. However, the HFC charge amount of the equipment was not provided. The ERT recommends that the Party report in the NIR information on the charge capacity of equipment, by equipment type, used in estimating emissions for category 2.F, specifying the source of information and clarifying the assumptions made, if any.	Resolved. In Annex 3.9 of the 2024 NIR, EPA has provided charge sizes for each applicable combination of equipment type / introduction date / chemical (or blend).
I.27	2.F.1 Refrigeration and air conditioning – HFCs (I.27, 2021) Transparency	The Party reported in NIR table A-122 (annex 3.9) the parameters used for calculating HFC emissions from refrigeration and air conditioning, by end use, including information on the lifetime of equipment. The lifetime data and EFs were presented as ranges for most end-use categories to protect the confidentiality of the source of individual EFs used, as noted in the NIR (p.A-236), including for centrifugal chillers, commercial unitary air conditioning, industrial process refrigeration, mobile air conditioners and transport refrigeration. The ERT noted that presenting the information in the form of ranges prevents a detailed assessment of the adequacy of the EFs used at the equipment level and the source of information for each of the parameters used was not provided in the NIR. During the review, the Party clarified that some of the end-use categories presented in NIR table A-122 include multiple end uses, in particular transport refrigeration and mobile air conditioners, which results in a wide-ranging annual emission rate estimate. The Party provided the EFs used for calculating emissions from stocks in transport refrigeration and mobile air conditioners, as follows (in per cent): transport refrigeration (aggregated), 19.4–36.4; road transport, 23.2–36.4; intermodal containers, 19.4–26.4; merchant fishing transport, 33.2; reefer ships, 23.2; modern rail transport, 33.2; mobile air	Resolved. In Annex 3.9 of the 2024 NIR, EPA has provided emission factors (first-fill, annual, and disposal) for each applicable combination of equipment type / introduction date / chemical (or blend).

		conditioners (aggregated), 2.3–18.0; light-duty vehicles, 66.4–18.0; light-duty trucks, 5.9–13.0; heavy-duty vehicles, 13.0; school and tour buses, 9.6; transit buses, 9.6; and trains, 2.3. The Party also provided references to the source of information on the lifetime of equipment as follows: stand-alone commercial applications (2006 IPCC Guidelines), small retail food equipment (EPA, 2016; United Nations Environment Programme, 2010), ice makers/machines (EPA, 2016) and vending machines (EPA, 2016; United States Department of Energy, 2001; Lawrence Berkeley National Laboratory, 2004; National Automatic Merchandising Association, 2007; Oko-Recherche GmbH, 2011; ARMINES, 2010). The ERT noted that the EFs provided by the Party fall outside the default EF ranges provided in the 2006 IPCC Guidelines (vol. 3, table 7.9) for light-duty vehicles, light-duty trucks, school and tour buses, transit buses and trains; for these end uses, the Party did not specify in the NIR the source of information for the EFs used or an explanation of the differences between the EFs used and the default EFs from the 2006 IPCC Guidelines. The ERT also noted that the EFs reported in NIR table A-122 are provided in the form of ranges for most end-use categories, and transport refrigeration is not differentiated from mobile air conditioning. Furthermore, the ERT noted that the rationale behind the assumptions made regarding the selection of EFs and the lifetime of equipment was not reported in the NIR. The ERT concluded that the information reported in the NIR does not allow a determination of the EFs used by the Party by end-use category. During the review, the Party noted that the assumption and inputs are based on sources specific to the United States where possible and may differ from default values in the 2006 IPCC Guidelines. Furthermore, the Party noted that the EF ranges presented in NIR annex 3.9 represent the EFs for all vintages within a specific equipment type that are within the installed base in the baseline years of the NIR (therefore, older vintages with higher EFs than newer vintages may be represented in the ranges provided). The Party indicated that it intends to investigate the possibility of providing further disaggregated data as described. If such data can be reported without divulging confidential business information used to develop the model, they will be included as available, starting with the 2025 inventory submission. The ERT recommends that the Party report (or provide a reference to) in the NIR disaggregated information on the EFs and lifetime of equipment by type of equipment under each end-use category, avoiding the use of ranges where it does not divulge confidential information, providing the source of information for each parameter and justifying the selection of each parameter.	
I.28	2.F.1 Refrigeration and air conditioning – HFCs	The Party reported in NIR tables A-121 and A-123–A-128 (annex 3) the assumptions made regarding the penetration of new equipment into the	Resolved. In Annex 3.9 of the 2024 NIR, EPA has provided emission factors (first-fill, annual, and disposal) for each

	(I.28, 2021) Transparency	market for the different activities under category 2.F. The Party noted in the NIR (p.A-239) that "as new technologies replace older ones, it is generally assumed that there are improvements in their leak, service, and disposal emission rates". The ERT noted that the impact on the inventory methodology (i.e. AD and EFs used) of the assumptions made regarding the penetration of new equipment and the improvement in leaks is not described in the NIR. During the review, the Party clarified that while its discussions with equipment manufacturers indicate that it is widely maintained that new equipment generally has an improved leak rate, not all refrigeration and air- conditioning equipment is modelled to have an incremental improvement in leak rate over time in the Vintaging Model. The Party described the example of motor vehicle air conditioners, which are estimated in the Vintaging Model using average vehicle leak rates for passenger vehicles reported to the Minnesota Pollution Control Agency. The Party provided information on the evolution of the average EFs by vehicle type for 2009–2018. The ERT noted that the information provided by the Party consists of average EFs by equipment type and year for the end-use category mobile air conditioning. This information suggests that the penetration assumptions reported in the NIR impact the average EFs used by equipment type under each end-use category. The ERT also noted that the Party complemented the transition assumptions with additional assumptions from different sources to estimate the time series of each EF. The ERT further noted that information specifying the assumptions made and their source and the rationale behind the method for estimating the temporal evolution of EFs are not provided in the NIR. The ERT recommends that the Party report in the NIR information on the time series of EFs by equipment type, specifying what assumptions have been made to estimate the temporal evolution of these EFs and providing the source of information on each assumption made.	applicable combination of equipment type / introduction date / chemical (or blend) and how these change over time, including denotations of "Improvements" whereby the same chemical is used but a lower charge size and/or lower emission factors are applied.
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O (A.1, 2020) (A.1, 2021) (A.25, 2019) Completeness	Addressing. *Include in the NIR (e.g. in annex 5) an indication of the sources and categories not estimated for Alaska and Hawaii, or, if the emissions are insignificant, justify their exclusion on the basis of the likely level of emissions in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.* The Party did not provide in NIR table A-235 (annex 5, p.A-476) an update in relation to agriculture sector sources and categories not estimated for Alaska and Hawaii. During the review, the Party clarified that work on collecting these data for Alaska and Hawaii is ongoing. The Party indicated that the data will be included in the 2024 submission at the earliest. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported an indication of the sources and categories not estimated	This issue is redundant with G.1, G.2, and others included in the report. The United States continues to assess data availability for Alaska and Hawaii that will allow for the use of Tier 1 estimates for relevant categories.

		for Alaska and Hawaii.	
A.2	3. General (agriculture) – CH_4 and N_2O (A.2, 2021) (A.2, 2020) (A.26, 2019) Consistency	Addressing. *Explore the use of alternative data sources to derive AD for the years of the time series where no DAYCENT data are available (2013–2017), and if alternative data sets are not available, use proxy data or extrapolation methods to derive AD*. The Party reported in its NIR that surrogate data, trend analysis and statistical approaches were used to estimate CH_4 emissions from rice cultivation for 2015–2020 (p.5-21), N_2O emissions from the cultivation of organic soils for 2018–2020 (p.5-37) and GHG emissions from the field burning of agricultural residues for 2014–2020 (p.5-54). However, the ERT noted that the AD reported in CRF table 3.C for 2015–2020, the area of cultivated organic soils for 2018–2020 and CRF table 3.F for 2014–2020 are held constant. During the review, the Party clarified that it continues to work with relevant government agencies to assess alternative data sources and also the possibility of reducing the time lag in availability of AD for the GHG inventory. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided AD for the years of the time series where no DAYCENT data are available.	Addressing. The United States will continue to seek out other data sources to drive the *Inventory* estimates for the portion of the time series not covered by the NRI. This is a medium- to long-term update.
A.5	3.A Enteric fermentation – CH_4 (A.5, 2021) (A.3, 2020) (A.2, 2019) (A.16, 2018) Convention reporting adherence	Addressing. *Undertake a quantitative uncertainty assessment in conjunction with future planned methodological updates*. The Party reported in its NIR (p.5-9) the same uncertainty range as in previous inventory submissions (i.e., 11 per cent below to 18 per cent above the 2020 emission estimates). The ERT noted that the most recent quantitative uncertainty analysis for CH_4 emissions from enteric fermentation was undertaken for the 2003 submission. During the review, the Party clarified, as it had done in previous reviews, that updates to the uncertainty assessment will be considered in conjunction with the methodological refinements that are planned or under way and will be implemented for future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet updated its quantitative uncertainty assessment for this category.	Addressing. The United States reiterates its previous response that updates will be considered with methodological refinements planned and underway in future submissions. In the interim, EPA has assessed uncertainties using Approach 1 analysis for comparison with the current Approach 2 uncertainty assessment. See uncertainty discussion in Chapter 5.1 for more information.
A.6	3.A.1 Cattle – CH_4 (A.6, 2021) (A.4, 2020) (A.6, 2019) (A.20, 2018) Accuracy	Addressing. *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.* The Party reported in its NIR (annex 3, pp.A-281–A-284) additional information relating to cattle DE, Ym and GE values for animal type and region, including supplemental diet in NIR tables A-145–A-148. During the review, the Party clarified that an evaluation of the results of two ruminant nutrition models (one for beef and one for dairy cattle), run using recent national and state-level feed data along with corresponding default/average animal characteristics consistent with CEFM inputs, is under way but not yet complete. Model outputs	Addressing. Work is underway to address this in future submissions; the earliest will be the next (i.e., 1990 through 2023) or 2025 submission.

		include Ym and DE values for dairy feedlot cattle in seven regions of the United States. The Party informed the ERT that the results of this work will be included in the 2024 submission at the earliest. The ERT considers that the recommendation has not yet been fully addressed because work on updating the cattle nutrition models in order to better reflect differences in diets across farms and states is still under way.	
A.8	3.A.1 Cattle – CH_4 (A.8, 2021) (A.8, 2020) (A.5, 2019) (A.19, 2018) Accuracy	Addressing. *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 the NIR*. The Party reported in its NIR (annex 3.10, p.A-271) that the number of calf births from dairy cows is assumed to be distributed equally throughout the year, but noted in the planned improvements section (p.5-10) that it is seeking data for births by month. During the review, the Party informed the ERT that an assumption is applied to country- specific data on calf births from USDA, which are for annual births, to distribute the data equally throughout the year in order to ensure consistency with the CEFM calculations. The primary data source does not provide monthly data on calf births, but work is under way to identify other sources of data. The Party stated that improving data collection is a long-term process starting at USDA and improved data will be included in the 2024 submission at the earliest. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet managed to collect data on calf births by month and report them in its NIR.	Addressing. To date, the primary data source identified did not provide monthly data on calf births. This is a longer-term improvement and the earliest this could be incorporated would be the 2025 submission.
A.10	3.B Manure management – CH_4 (A.10, 2021) (A.10, 2020) (A.11,2019) (A.25, 2018) Convention reporting adherence	Addressing. *Update the quantitative uncertainty assessment for CH_4 emissions from manure management*. The Party reported in its NIR (p.5-17) that the quantitative uncertainty analysis for CH_4 and N_2O emissions from manure management was performed in 2002 using a method consistent with approach 2 from the 2006 IPCC Guidelines, and that the uncertainty estimates were applied directly to the values for 2020. During the review, the Party clarified, as it had done in previous reviews, that updates to the uncertainty assessment will be considered in conjunction with the methodological refinements that are planned or under way and will be implemented for future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet updated its quantitative uncertainty assessment for this category.	Addressing. The United States reiterates its previous response that updates will be considered with methodological refinements planned and underway in future submissions. In the interim, EPA has assessed uncertainties using Approach 1 analysis for comparison with the current Approach 2 uncertainty assessment. See uncertainty discussion in Chapter 5.2 for more information.
A.14	3.B.1 Cattle – N_2O (A.14, 2021) (A.15, 2020) (A.29,2019) Accuracy	Not resolved. *Report the correct Nex values for beef cattle calves, dairy cattle calves and beef replacement heifers in CRF table 3.B(b) so that they reflect the true average Nex rate* . The ERT noted that some discrepancies remain in the reported total N excreted and the Nex values calculated by	Resolved. CRT-reported Nex rates are average N excretion rates for all U.S. states. For cattle, the United States calculates the N excreted for each state using a state-specific N excretion rate factor and then combines

		multiplying population by Nex rate for beef cattle calves and dairy cattle calves in CRF table 3.B(b). During the review, the Party clarified that it calculates Nex values for each state using a state-specific Nex rate factor and then adds the totals for all states to determine the national total Nex value, which is reported in CRF table 3.B(b). Therefore, the values will not be the same as if the average Nex rate reported for each animal class were used to calculate the total Nex. The Party noted that using different values for the Nex rate (i.e. other than the weighted values currently reported) would not accurately reflect the information used in estimating emissions and that it is not appropriate to report an average value only to ensure that Nex values align. The Party indicated that it plans to further review the typical animal mass values used in the calculations for enteric fermentation (using CEFM) and for manure management to ensure that reported N and Nex values are correct. The ERT considers that the recommendation has not yet been addressed because the Party has not yet ensured that the correct values of N and Nex, based on typical animal mass values, are used in the calculations for enteric fermentation (using CEFM) and for manure management.	all states to calculate and report the total national N excreted value shown in the CRT table. The total reported N excreted by MMS type and total N excreted reported in the CRTs reflect the actual totals calculated. Reporting a different value for Nex rates other than the weighted values currently reported would not accurately reflect the information used in calculating emissions. Therefore, the United States does not believe it is appropriate to report a different, average value just to ensure values N excretion values align.
A.15	3.B.1 Cattle – N_2O (A.15, 2021) (A.16, 2020) (A.30,2019) Transparency	Not resolved. *Replace "IE" for the Nex rate for heifer stockers and beef replacement heifers with the actual Nex rates applied for those animal classes in CRF table 3.B(b); and replace the Nex rates for dairy cattle and non-dairy cattle with "IE" and explain in the documentation box of CRF table 3.B(b) that the Nex rates are reported for individual livestock classes*. The Party continued to report the Nex rate for heifer stockers and beef replacement heifers as "IE" in CRF table 3.B(b). During the review, the Party clarified that it is currently investigating the possibility of providing disaggregated Nex rates for these cattle types in future inventory submissions (at the earliest in the 2024 submission). The ERT considers that the recommendation has not yet been addressed because the Party has not yet provided disaggregated Nex rates for different cattle classes.	Addressing. The United States is currently investigating the possibility of providing the Nex values for these disaggregated cattle types in a future *Inventory*. The earliest EPA could disaggregate Nex rates by cattle type is the 2025 submission.
A.17	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O (A.17, 2021) (A.18, 2020) (A.19,2019) (A.30, 2018) Completeness	Not resolved. *Include all N_2O emissions for Alaska and Hawaii in the emissions reported under this category or clearly outline in the improvement plan steps for including those emissions in the inventory*.. The Party reported in its NIR (p.5-46) that emissions for Alaska and Hawaii are not included for any sources in the inventory for agricultural soils, with the exception of (1) N_2O emissions from drained organic soils in cropland and grassland (Hawaii) and (2) managed manure N and pasture, range and paddock N additions for grassland (Alaska and Hawaii). During the review, the Party clarified that the collection of data on Alaska and Hawaii to allow their inclusion in the agricultural soils N_2O estimates is under way and that this improvement will be included in the 2024 submission at the earliest.	Addressing. Work is underway to assemble this data for inclusion in the agricultural soils N_2O estimates. This will be provided in the 2025 submission at the earliest.

		The ERT considers that the recommendation has not yet been addressed because the Party has not yet included N_2O emissions for Alaska and Hawaii in the emissions reported under this category.	
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L.1	4. General (L.1, 2021) (L.1, 2020) (L.1, 2019) (L.2, 2018) (L.2, 2016) (L.2, 2015) (81, 2013) Completeness	Not resolved. *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*. The United States reported carbon losses in the living biomass and DOM pools for categories 4.B.2.1 (forest land converted to cropland), 4.C.2.1 (forest land converted to grassland) and 4.E.2.1 (forest land converted to settlements) and in the living biomass pool only for category 4.D.2.3.1 (forest land converted to other wetlands) for the first time for 2018. The Party reported as "NE" categories 4.D.2.2.1 (forest land converted to peat extraction) in CRF table 4.D and 4.F.2.1 (forest land converted to other land) in CRF table 4.F. During the review, the Party clarified that it does not currently include estimates for forest land converted to peat extraction or other land. These categories will be included in future inventory submissions and will contain the estimates of carbon stock loss as a result of converting forest to the respective land use. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated and reported the carbon stock changes in the living biomass and DOM pools for each conversion category from forest land to any other land use.	Not resolved. The United States does not currently include estimates for the categories of forest land converted to other land. These categories will be included in a future *Inventory* submission and will contain the estimates of carbon stock loss as a result of converting forest to these lands. The United States does not currently include estimates for the categories other land/land converted to other land. Related to flooded lands, it will take several years to disaggregate the carbon stock changes from lands converted to flooded lands by the individual land use categories. Overall, this should be a very minor category as most flooded lands in the United States were created well before 1990.
L.2	4. General (L.2, 2021) (L.2, 2020) (L.2, 2019) (L.3, 2018) (L.3, 2016) (L.3, 2015) (82, 2013) (97, 2012) Completeness	Not resolved. *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*. The land-use matrix of CRF table 4.1 and the land representation tables in the NIR (tables 6-4 and 6-5, pp.6-10–6-11) include all areas of managed and unmanaged land in the United States except for United States territories. During the review, the Party noted that the following tables are included in the NIR: (a) Table 6-31: Area of managed land in cropland remaining cropland that is not included in the current inventory; (b) Table 6-35: Area of managed land in land converted to cropland that is not included in the current inventory; (c) Table 6-39: Area of managed land in grassland remaining grassland in Alaska that is not included in the current inventory; (d) Table 6-47: Area of managed land in land converted to grassland in Alaska that is not included in the current inventory; (e) Table A-212: Forest land area estimates and differences between estimates in NIR sections 6.1 ("Representation of the US land base") (CRF category 4.1) and 6.2 ("Forest land remaining forest land") (CRF category	See the following tables included in 2022 NIR: Table 6-31: Area of Managed Land in Cropland Remaining Cropland that is not included in the current Inventory (Thousand Hectares) Table 6-35: Area of Managed Land in Land Converted to Cropland that is not included in the current Inventory (Thousand Hectares) Table 6-39: Area of Managed Land in Grassland Remaining Grassland in Alaska that is not included in the current Inventory (Thousand Hectares) Table 6-47: Area of Managed Land in Land Converted to Grassland in Alaska that is not included in the current Inventory (Thousand Hectares) Annex Table A-213: Forest Land Area Estimates and Differences Between Estimates in 6.1 Representation of the U.S. Land Base (CRF Category 4.1) and 6.2 Forest Land Remaining Forest Land (CRF Category 4A1) (kha) Annex Table A-217: Land Converted to Forest Land area

		4.A.1); (f) Table A-216: Land converted to forest land area estimates and differences between estimates in NIR section 6.1 ("Representation of the US land base") (CRF category 4.1) and land converted to forest land (CRF category 4.A.1). The Party indicated that efforts are under way to improve land representation and ensure consistency with the area data used to develop the estimates for individual land use and land-use conversion categories and that it will continue to make efforts to include all managed land in the territories of the United States, as well as grassland in Alaska, in the inventory but doing so will take some time as AD are lacking. The ERT considers that the recommendation has not yet been addressed because the Party has not yet included all managed land in the inventory, improved the time-series consistency of national areas and reported the achievements made.	estimates and differences between estimates in the Representation of the U.S. Land Base (CRF Category 4.1) and Land Converted to Forest Land (CRF Category 4A1) (kha)
L.3	4. General (L.3, 2021) (L.3, 2020) (L.3, 2019) (L.36, 2018) Convention reporting adherence	Not resolved. *Until the Party is able to report anthropogenic emissions and removals from the entire national managed land area, report non-estimated managed land as a subdivision in the relevant CRF tables (i.e. tables 4.A–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.E*. The Party did not report the entire national land area, managed and unmanaged, or include the non-estimated area as a subdivision in the relevant CRF tables, and did not estimate emissions and removals from the entire national managed land area. During the review, the Party clarified that it will consider implementing this recommendation (i.e. using the notation key "NE" in the relevant CRF tables) for the 2023 or 2024 submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet reported as a subdivision in the relevant CRF tables the area of non- estimated managed land until which time it can estimate emissions and removals from the entire national managed land area.	Not resolved. The United States will consider this suggestion for the 2025 NIR and CRT submission (i.e., use of notation key NE) at the earliest.
L.4	4. General (L.4, 2021) (L.4, 2020) (L.41, 2019) Transparency	Not resolved. *Report in the NIR preliminary emission or removal estimates for the land areas of the United States territories reported as a preliminary result of the planned improvement carried out for the inventory*. The Party did not include in the NIR the preliminary emission or removal estimates for the land areas of the territories of the United States reported as a preliminary result of the planned improvement carried out for the inventory. The ERT acknowledges that the Party reported preliminary estimates of land use in United States territories in the NIR (box 6-2). During the review, the Party clarified that work on developing the AD needed to estimate emissions and removals for the territories of the United States is still under way. The ERT considers that the recommendation has	Addressing. Estimates of carbon stocks and stock changes on forest land in Hawaii and the U.S. Territories of American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands were included for the first time in the 2025 *Inventory*. Work is still underway to develop the activity data needed to estimate emissions and removals from U.S. Territories for other categories.

		not yet been addressed because the Party has not yet included in the NIR the preliminary emission or removal estimates for the land areas of the territories of the United States reported as a preliminary result of the planned improvement carried out for the inventory.	
L.5	Land representation – CO_2, CH_4 and N_2O (L.5, 2021) (L.5, 2020) (L.4, 2019) (L.7, 2018) (L.21, 2016) Consistency	Addressing. *Resolve the inconsistencies in land-use areas in the time series reported in the CRF tables*. The Party included in its NIR (p.6-9) a description of the national land-use representation system and in the documentation boxes in CRF tables 4.A–4.E. During the review, the Party clarified that a splicing method was applied to calculate soil carbon stock changes from 2016 to 2019 for land converted to forest land because mineral soil areas were not compiled for 2016–2019. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported a consistent land-use area time series in the CRF tables.	Resolved. See explanation included in NID Chapter 6 Section 6.1 and documentation box in CRT Table 4.A.
L.6	Land representation – CO_2, CH_4 and N_2O (L.6, 2021) (L.6, 2020) (L.42, 2019) Accuracy	Not resolved. *Include the land-use changes that occurred during the periods 1971–1978 for land converted to cropland, grassland and settlements, and 1971–1981 for land converted to forest land, in order to ensure that the areas of land converted categories for all inventory years since 1990 contain the accumulated total of the land-use changes over the past 20 years*. The Party did not estimate carbon stock changes considering a 20-year transition period. During the review, the Party clarified that the primary data set (USDA National Resources Inventory) used to develop these estimates does not go back to 1971. The Party indicated that work on resolving this issue is still under way, with the goal of reporting the missing periods of land-use changes in the 2023 or 2024 submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet included the land-use changes to ensure that the areas of land converted categories for all inventory years since 1990 contain the accumulated total of the land-use changes over the past 20 years.	Not resolved. Work is still underway with the goal of reporting in the 2025 submission at the earliest.
L.7	Land representation – CO_2, CH_4 and N_2O (L.7, 2021) (L.7, 2020) (L.43, 2019) Accuracy	Not resolved. *Revise the area of unmanaged grassland for Alaska and report on the changes in the NIR*. The Party did not report in its NIR a revised area of unmanaged grassland for Alaska. During the review, the Party clarified that work on reconciling the area of managed grassland in Alaska and the area estimate reported in the inventory is still under way. An update is planned for the 2023 or 2024 submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet revised the area of unmanaged grassland for Alaska.	Addressing. Work is still underway to reconcile the area of managed grassland in Alaska and the area estimated in the *Inventory*. This will be updated for the 2025 submission at the earliest.
L.8	Land representation – CO_2, CH_4 and N_2O (L.8, 2021) (L.8, 2020) (L.43, 2019)	Addressing. *Increase the transparency of the approach to classifying managed and unmanaged land and include a specific example of the change from managed land to unmanaged land in the NIR because this type of land-use change is not common in the inventory reporting of other*	Addressing. The Land Representation chapter of the NIR provides detailed information on the definition of managed and unmanaged land, the sources of land-use data, the criteria used to designate managed lands (with

	Transparency	*Parties.* The Party reported in its NIR (p.6-9) a description of the national land-use representation system. During the review, the Party clarified that the land representation section (6.1) of the NIR provides detailed information on the definition of managed and unmanaged land, the sources of land-use data, the criteria used to designate managed lands (with lands not designated as managed being unmanaged lands) and the approach for combining the land-use data sets. A multi-year effort to improve land representation, including the use of additional data sets, is under way. The initial updates are expected to be completed in time for inclusion in the 2023 or 2024 submission. The Party provided one example of an area whereby livestock data are collected annually by USDA, and no livestock have occurred in this area since the mid-1970s; therefore, there is no longer active management through livestock grazing. The Party indicated that this is a remote area, at least 10 miles from roads and settlements, and therefore the land is no longer managed on the basis of the implementation criteria. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet fully documented how the assessment of the managed and unmanaged land area has been carried out and has not provided an example in the NIR of the transition from managed to unmanaged land (see also ID#s L.3 and L.7 above).	lands not designated as managed being unmanaged lands) and the approach for combining the land-use data sets. EPA is unaware of a reporting specific example of the change from managed to unmanaged land and appreciate clarity on the basis for this reporting. A multi-year effort to improve on the land representation, including the use of additional datasets, is underway and will improve on the transparency of the methods. While this effort will be ongoing for years to come, the initial updates should be completed by 2025 submission.
L.10	4.A Forest land – CO_2 (L.10, 2021) (L.11, 2020) (L.10,2019) (L.39, 2018) Convention reporting adherence	Not resolved. *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*. The Party included in its NIR (pp.A-378–A-379) the section "Tier 3 model description, parameterization and evaluation" for agricultural lands and provided in annex 3.12 to the NIR details on the methods used to estimate changes in mineral soil carbon stocks in land converted to forest land. However, the Party did not report specific information on the verification of the outputs of the model used for estimating soil carbon stock changes. During the review, the Party clarified that it will include the relevant information (e.g. tables by broad forest type and average carbon stock per unit area, as well as stock changes), expand the discussion on uncertainty to cover the issue of consistency in soil depth across land-use categories and provide data on plot-level soil carbon in a future inventory submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet reported up-to-date information on the verification of the outputs of the model used to estimate SOC changes in mineral soils.	Addressing. The United States does include description of Tier 3 Model Description, Parameterization and Evaluation for agricultural lands. And as referenced in Annex 3.13, details on the methods used to estimate changes in mineral soil C stocks in the land converted to forest land is included in Annex 3.12.

L.11	4.A Forest land – CO_2 and N_2O (L.11, 2021) (L.13, 2020) (L.13,2019) (L.42, 2018) Transparency	Not resolved. *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*. The Party reported in its NIR (annex 3.13, p.A-404) that, for each inventory plot in each state, field data from the Forest Inventory and Analysis programme of the USDA Forest Service are used alone or in combination with auxiliary information (e.g. on climate, surficial geology or elevation) to predict carbon density for each forest ecosystem carbon pool (i.e. above-ground and below-ground biomass, deadwood, litter, SOC). However, the Party did not provide appropriate information on the calculation of carbon stock changes in each carbon pool and did not adequately explain the recalculations performed. During the review, the Party clarified that it will include the relevant information (e.g. tables by broad forest type and average carbon stock per unit area, as well as stock changes), expand the discussion on uncertainty to cover the issue of consistency in soil depth across land-use categories and provide data on plot-level soil carbon in a future inventory submission. The ERT found that the current methodology for calculating carbon stock change in forest land is appropriately applied taking into account the information provided by the Party. However, the ERT also noted that this understanding was not clear from the information provided in the NIR and considers that the recommendation has not yet been addressed because the Party has not yet provided appropriate information on the calculation of carbon stock changes in each carbon pool and has not adequately explained the recalculations performed.	Resolved. In Annex 3.13 of the 2024 NID, the United States provides detailed information on the compilation of population estimates using NFI plot data.
L.13	4.B Cropland – CO_2 (L.13, 2021) (L.15, 2020) (L.16,2019) (L.18, 2018) (L.14, 2016) (L.14,2015) (93, 2013) (107,2012) Completeness	Not resolved. Estimate the carbon stock changes in living biomass in perennial crops for all years in the time series. The Party did not report carbon stock changes in living biomass for category 4.B (cropland) in CRF table 4.B. During the review, the Party clarified that it is working on resolving the issue and will address the recommendation in a future inventory submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated the carbon stock changes in living biomass for cropland.	Addressing. This work is underway and will be included in the next (2025) submission at the earliest.
L.14	4.B.2.2 Grassland converted to cropland – CO_2 (L.14, 2021) (L.17, 2020) (L.18,2019) (L.46, 2018) Completeness	Addressing. *Estimate biomass carbon stock changes using the IPCC default method and factors or, where available, country-specific methods and factors, and report the estimates in the NIR*. The Party reported estimates of carbon stock changes for mineral and organic soils for grassland converted to cropland in CRF table 4.B, but did not estimate and report living biomass carbon stock changes for grassland converted to cropland. During the review, the Party clarified that it is working on resolving the issue and will address the recommendation in the next (2023) or a later inventory submission. The Party noted that, as reported in the NIR (p.6-66, footnote 46), SOC stock changes are estimated and reported for land	Addressing. This work is underway and will be included in the next (2025) submission at the earliest.

		converted to cropland but reporting of carbon stock changes for the above-ground and below-ground biomass, deadwood and litter pools is limited to forest land converted to cropland – the reporting of these pools for other conversions to cropland is a planned improvement. The Party stated that it is currently improving the GHG inventory by estimating the changes in biomass carbon for additional land uses and land-use changes, including grassland converted to cropland. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet estimated and reported the living biomass carbon stock changes for grassland converted to cropland.	
L.15	4.B Cropland 4.C Grassland – CO_2 and N_2O (L.15, 2021) (L.18, 2020) (L.19,2019) (L.47, 2018) Convention reporting adherence	Not resolved. *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, 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.* The Party did not report in its NIR (p.6-64 for cropland and p.6-80 for grassland) additional information on the verification of the model's output. During the review, the Party clarified that efforts to improve the documentation and calibration of the model are ongoing, as is the implementation of additional verification procedures, in line with ongoing methodological refinements for estimating soil carbon, soil N_2O emissions and soil CH_4 emissions. The recommendation will be addressed in the next (2023) or a later inventory submission.The ERT considers that the recommendation has not yet been addressed because theParty has not yet provided information on the model's output verification.	Addressing. As noted to the prior ERT, efforts to improve the documentation and calibration are ongoing as well as implementation of additional verification, in step with ongoing methodological refinements for estimating soil carbon, soil N_2O and soil CH_4. This will be addressed in the next (2025) submission at the earliest.
L.16	4.C Grassland – CO_2 (L.16, 2021) (L.20, 2020) (L.21, 2019) (L.49, 2018) Accuracy	Not resolved. *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 estimates in the NIR*. The Party did not report woody grassland as a subdivision of the grassland category in CRF table 4.C. During the review, the Party clarified that carbon stock changes are reported for all pools for a component of grassland referred to as woodlands. Woodlands are former forest lands that no longer meet the definition of forest land and are now classified under the grassland category. Because these woodlands were formerly part of the forest land category, data are collected on woody/perennial biomass and these data are used to report on the carbon stock changes. For grassland not part of woodlands, the Party indicated that it does not have woody/perennial biomass data but is assessing how to collect them. Perennial biomass data for other grassland will be included in the next (2023) or a later inventory submission. The ERT considers that the recommendation has not yet been	Not resolved. The United States reports carbon stock changes for all pools for a subcomponent of grasslands referred to as woodlands. Woodlands are former forest lands that no longer meet the definition of forest lands and are now classified in the grassland category. Because these woodlands were formerly part of the forest land category, data are collected on woody/perennial biomass and these data are used to report on the carbon stock changes. For other grasslands not part of the woodlands, EPA does not have woody/perennial biomass data and is not able to report at this time. EPA is assessing how to assemble perennial biomass data for these other grasslands for future reporting. The earliest this would occur is the next (2025) submission.

		addressed because the Party has not yet reported woody grassland as a subdivision of the grassland category in CRF table 4.C.	
L.17	4.C.2.2 Cropland converted to grassland – CO_2 (L.17, 2021) (L.22, 2020) (L.24,2019) (L.51, 2018) Completeness	Not resolved. 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. The Party did not estimate and report the living biomass carbon stock changes for cropland converted to grassland, but it did report estimates of carbon stock changes for mineral and organic soils for grassland converted to cropland, in CRF table 4.B. During the review, the Party clarified that it is working on resolving the issue and will address the recommendation in the next (2023) or a later inventory submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated and reported the living biomass carbon stock changes for cropland converted to grassland.	Addressing. This work is underway and will be included in the next (2025) submission at the earliest.
L.21	4.E Settlements – CO_2 (L.21, 2021) (L.27, 2020) (L.29,2019) (L.27, 2018) (L.15, 2016) (L.15,2015) (94, 2013) Accuracy	Not resolved. Eliminate the overlap between the urban forest inventory and the forest inventory. The Party did not eliminate the overlap between the urban forest inventory and the forest inventory. During the review, the Party clarified that, as noted in the uncertainty sections of the NIRs of recent inventory submissions, the overlap between the urban forest inventory and the forest inventory, and how to eliminate it with new National Land Cover Database data, is still being investigated. As indicated in the planned improvements section of the NIR, the Party anticipates reporting an updated status of this issue in the next (2023) inventory submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet eliminated the overlap between the urban forest inventory and the forest inventory.	Addressing. This overlap is still being investigated with new NLCD data. EPA anticipates reporting an updated status of this consideration in the next (i.e., 2025) submission.
L.22	4.E.1 Settlements remaining settlements – CO_2 (L.22, 2021) (L.28, 2020) (L.30,2019) (L.55, 2018) Comparability	Not resolved. *Remove the reporting of the carbon stock change associated with yard trimmings and food scraps under the settlements category and allocate it to the category other under the relevant sector*. The Party did not remove the estimates of carbon stock changes associated with yard trimmings and food scraps from category 4.E (settlements) (see ID#s L.23 and L.29 below). The Party reported carbon stock changes from landfilled yard trimmings and food scraps in CRF table 4.E. During the review, the Party clarified that carbon stock estimates from landfilled yard trimmings and food scraps are reported under category 4.E.1 (settlements remaining settlements) because the bulk of the carbon, which comes from yard trimmings, originates from settlement areas. While the majority of food scraps originate from cropland and grassland, in the 2022 inventory, they are reported with yard trimmings under settlements remaining settlements. Additionally, landfills are considered part of the managed land base under settlements (see NIR section 6.1 ("Representation of the US land base")) and the reporting of these carbon stock changes that occur	Resolved. The United States considers this issue as resolved or not an issue. Carbon stock estimates are reported as negative "Emissions" under 4.H. The estimates for landfilled yard trimmings and food scraps are estimates of changes in carbon stock, rather than emissions. Carbon stock change is not included as a measure for 4.H Other category. Carbon storage estimates within the Inventory are associated with particular land uses. For example, harvested wood products are reported under Forest Land Remaining Forest Land because these wood products originated from the forest ecosystem. Similarly, C stock changes in yard trimmings and food scraps are reported under Settlements Remaining Settlements because the bulk of the C, which comes from yard trimmings, originates from settlement areas. While the majority of food scraps

		entirely within landfills fits most appropriately within settlements remaining settlements given circumstances specific to the United States and the country-specific approach so they are, therefore, reported under category 4.E.1. The ERT considers that the recommendation has not yet been addressed because the Party has not yet removed the estimates of carbon stock change associated with yard trimmings and food scraps from the settlements category and did not report the emissions from landfilled yard trimmings and food scraps under category 4.H (other), applying a country-specific method or under category 4.G (HWP) as an additional "other" HWP pool in solid waste disposal sites while continuing to ensure that the methods used are consistent with the waste sector reporting as per the 2006 IPCC Guidelines (vol. 4, chap. 12.2.1, and vol. 5, chap. 3.4).	originate from cropland and grassland, in this Inventory they are reported with the yard trimmings in the Settlements Remaining Settlements section. Additionally, landfills are considered part of the managed land base under settlements (see Section 6.1 Representation of the U.S. Land Base), and reporting these C stock changes that occur entirely within landfills fits most appropriately within the Settlements Remaining Settlements section given these U.S.-specific circumstances and country approach, and therefore reported under 4.E.1.
L.24	4.E.2.2 Cropland converted to settlements4.E.2.3 Grassland converted to settlements – CO_2 (L.24, 2021) (L.30, 2020) (L.32,2019) (L.56, 2018) Completeness	Not resolved. *Estimate biomass carbon stock changes 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, vol. 4, chap. 8) or, where available, country-specific methods or factors, and explain the estimations in the NIR*. The Party reported AD for land converted to settlements in CRF table 4.E. Emissions from biomass and DOM pools were estimated and reported only for forest land. The Party did not estimate biomass carbon stock changes for cropland converted to settlements (category 4.E.2.2) or for grassland converted to settlements (category 4.E.2.3). During the review, the Party clarified its plans to report these estimates in future inventory submissions. The Party also clarified that the planned improvements section of the NIR includes the estimation, using tier 1 methods and default data, of all the land conversion categories that are currently not estimated. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated biomass carbon stock changes for cropland converted to settlements (category 4.E.2.2) and for grassland converted to settlements (category 4.E.2.3).	Work is planned to report on this information in a future submission.
L.25	4.F Other land – CO_2, CH_4 and N_2O (L.25, 2021) (L.40, 2020) Comparability	Addressing. *Report numerical values in CRF table 4.F for managed areas of other land and "NE" for carbon pools for which numerical values cannot be reported, or otherwise develop an assumption for carbon pools being in equilibrium*. The Party reported in CRF table 4.F managed land areas and carbon stock change of other land as "NE". During the review, the Party clarified that while the notation keys used in CRF table 4.F were changed to "NE" for the current submission, area estimates will be provided in future inventory submissions. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported numerical values in CRF table 4.F for managed land areas of other land. The ERT notes that	Addressing. The notation keys for Table 4.F have been changed to NE for the current submission. Area estimates will be provided in future submissions.

		reporting of carbon stock change values is considered under ID# L.26 below.	
L.26	4.F.2 Land converted to other land – CO_2 (L.26, 2021) (L.31, 2020) (L.33, 2019) (L.57, 2018) Completeness	Not resolved. Report estimates of carbon stock change for land converted to other land using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 9) or, where available, country-specific methods or factors, and explain the estimations in the NIR. The Party reported in CRF table 4.F carbon stock changes for land converted to other land as "NE". During the review, the Party clarified its plans to report estimates of carbon stock changes for land converted to other land in future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated carbon stock changes for land converted to other land.	Note resolved. Work is planned to report on this information in a future submission.
L.27	4.G HWP – CO_2 (L.27, 2021) (L.32, 2020) (L.34,2019) (L.58, 2018) Transparency	Not resolved. *Complete CRF table 4.Gs2 with aggregated values in t C 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 applied to obtain carbon weight for each subcategory*. The Party reported in CRF table 4.Gs2 the HWP AD for sawn wood and wood panels as "IE", while numerical values were reported for the paper and paperboard AD for 1990–2020. During the review, the Party clarified its plans to improve the reporting of HWP in CRF Reporter for the 2023 or 2024 submission. The ERT considers that the recommendation has not yet been addressed because the Party has not yet reported the HWP AD in CRF table 4.Gs2 for sawnwood and wood panels for the entire time series and paper and paperboard prior to 1990.	Note resolved. Work is planned to improve reporting of HWP in a future submission.
L.29	4.H Other (L.29, 2021) (L.34, 2020) (L.36,2019) (L.60, 2018) Accuracy	Addressing. *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*. The previous ERT had suggested that, to resolve this issue, the Party could demonstrate that carbon losses resulting from the decay of yard trimmings and food scraps, as calculated under LULUCF, are coherent with the waste sector estimates of CH_4 emitted from landfills or perform a model calculation of CH_4 emissions from the yard trimmings and food scraps carbon pool in landfills and compare the results with the waste sector CH_4 estimates. The Party did not demonstrate that carbon losses resulting from the decay of yard trimmings and food scraps, as calculated under LULUCF, are coherent with the waste sector estimates of CH_4 emitted from landfills. The ERT found no evidence in the NIR that the Party performed a model calculation of CH_4 emissions from the yard trimmings and food scraps carbon pool in landfills and compared the results with the waste sector CH_4 estimates. The Party included in its NIR (p.6-165) a section on the changes in yard trimmings and food scraps carbon stocks in landfills (which includes	Addressing. EPA continues to assess this issue and appropriateness of a comparison of carbon inputs/estimates, and will report on progress of implementation in the next *Inventory* (2025).

		NIR table 6-122, containing the decay rates) and reported related carbon stock changes in CRF table 4.E. During the review, the Party clarified that all the emissions calculated for yard trimmings and food scraps are based on this on-site carbon stock, including both the CO_2 emissions given off from decay of DOM and the CO_2 sink (in the form of carbon) arising from the annual deposition of yard trimmings (degradable and non-degradable portions) into landfills. The components of annual production that can be reasonably expected to stay on site include all carbon deposited to a landfill concerning yard trimmings. This includes the degradable and non-degradable portions of yard trimmings and the net CO_2 emissions that are produced from them. The Party also clarified that its estimation follows the 2006 IPCC Guidelines in only estimating on-site DOM emissions; as reported in the NIR (section 7.1, p.7-5), CH_4 and CO_2 are the primary constituents of landfill gas generation and emissions. However, according to the 2006 IPCC Guidelines, biogenic CO_2 emissions are not to be reported under the waste sector. The net CO_2 flux from carbon stock changes in landfills are estimated and reported under the LULUCF sector in the NIR (chapter 6). The Party explained that the waste sector calculations focus on methanogenesis (namely, anaerobic decomposition), whereas the LULUCF sector calculations focus only on aerobic decomposition. Landfills are considered a part of the managed land base under settlements (NIR section 6.1 ("Representation of the US land base"), p.6-9) and the reporting of these carbon stock changes that occur entirely within landfills fits most appropriately within the settlements remaining settlements category (4.E.1). In the NIR, the settlements remaining settlements section (6.10), including the changes in yard trimmings and food scraps section, covers only on-site carbon stock changes, reporting changes as either net emissions or net sinks. However, since 1990, landfilled yard trimmings and food scraps have had more deposition of carbon than release as CO_2 emissions, and CO_2 emissions originating from yard trimmings in landfills are considered as on-site emissions. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet demonstrated that carbon losses resulting from the decay of yard trimmings and food scraps, as calculated under LULUCF, are coherent with the waste sector estimates of CH_4 emitted from landfills or performed a model calculation of CH_4 emissions from the yard trimmings and food scraps carbon pool in landfills and compared the results with the waste sector CH_4 estimates.	
L.31	4(III) Direct N_2O emissions from N mineralization/	Not resolved. *Estimate N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, wetlands, settlements and other land, as well as for their conversion to and from*	Note resolved. Work is underway to report these emissions for all land categories in future submissions.

	immobilization – N_2O (L.31, 2021) (L.37, 2020) (L.37, 2019) (L.61, 2018) Completeness	*cropland and grassland, using the IPCC default method and factors (2006 IPCC Guidelines, vol. 4, chap. 11) or, where available, country-specific methods or factors, and report the estimates in CRF table 4(III) and the NIR*. The Party reported "NE" in CRF table 4(III) for N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils for forest land, settlements and other land, as well as for their conversion to and from cropland and grassland and reported "NA" for wetlands. During the review, the Party clarified its plans to report emissions for all land categories in future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated N_2O emissions associated with the mineralization of the N 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.	
L.32	4(IV) Indirect N_2Oemissions from managed soils – N_2O (L.32, 2021) (L.38, 2020) (L.38,2019) (L.62, 2018) Completeness	Not resolved. *Estimate indirect N_2O emissions associated with the mineralization of the N 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*. The Party did not estimate indirect N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils from land-use categories other than settlements. For settlements (category 4.E), the Party reported estimates of these emissions in CRF table 4(IV) and provided information on how the estimates were calculated in the documentation box of that table. During the review, the Party clarified its plans to report these emissions for all land categories in future inventory submissions. The ERT considers that the recommendation has not yet been addressed because the Party has not yet estimated indirect N_2O emissions associated with the mineralization of the N content of SOC losses in mineral soils from land-use categories other than settlements.	Work is underway to report these emissions for all land categories in future submissions.
L.33	4(V) Biomass burning – CH_4 and N_2O (L.33, 2021) (L.39, 2020) (L.39,2019) (L.35, 2018) (L.42, 2016) (L.33,2015) Completeness	Addressing. *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).* The Party did not estimate emissions from biomass burning for land converted to wetlands, cropland, grassland and settlements. In CRF table 4(V), the Party reported GHG emissions from biomass burning for land converted to forest land, cropland (controlled burning) and grassland (controlled burning) as "IE", while it reported GHG emissions from biomass burning for cropland (wildfires) and for land converted to grassland, wetlands, settlements and other land as "NE". During the review, the Party clarified that it is unable to report these emissions at the level of land-use conversion but it will continue to explore approaches for doing so for future inventory submissions. The ERT	Addressing. As noted in EPA's original response, EPA is unable to report on these emissions at the level of land use conversion but will continue to explore approaches for doing this in future *Inventories*.

		considers that the recommendation has not yet been fully addressed because the Party has not yet estimated emissions from biomass burning for land converted to wetlands, cropland, grassland and settlements.	
L.34	Land representation (L.34, 2021) Accuracy	The Party reported in its NIR (section 6.1 ("Recalculations discussion"), p.6-23) that no recalculations were performed for the 1990–2019 portion of the time series, thus the land-use areas for 2020 were assumed to be the same as those for 2019. The ERT noted that the area of forest land has been recalculated. During the review, the Party clarified that the AD reported in CRF table 4.A have not been recalculated, while the corresponding forest land data in CRF table 4.1 have been recalculated. The Party also clarified that land representation was not updated for the 2022 submission, in either the NIR or the CRF tables, because updates were not ready in time for the QA processes planned (NIR pp.6-10 and 6-23). The Party further clarified that data from the updated Forest Inventory and Analysis programme of the USDA Forest Service were included in the estimates related to forest land (NIR p.6-10), which explains the differences in data reported across CRF tables 4.1 and 4.A and sections of the NIR (i.e. 6.1 on land representation and 6.2 on forest land). The Party informed the ERT that for the 2022 submission, a simple approach to extend the land representation to 2020 was applied and that a complete updated land representation will be reported in the 2023 submission, resolving the existing discrepancies. The ERT noted that this is inconsistent with the 2006 IPCC Guidelines (vol. 4, chap. 3 (land representation)) because the data reported in the land matrix table should be consistent with the AD reported in the sectoral background tables used for the estimation of emissions and removals. The ERT recommends that the Party ensure that land representation is consistent throughout the next inventory submission, with AD on the assessed land-use categories being used consistently for estimating emissions and removals and reported consistently in the relevant CRF tables, as well as being described adequately in the relevant sections of the NIR.	Resolved. The time series was recalculated in the 2023 NIR.
L.35	4(V) Biomass burning – CH_4 and N_2O (L.35, 2021) Not an issue/problem	The Party reported CH_4 and N_2O emissions from biomass burning in forest land remaining forest land in CRF table 4(V). The ERT noted that the areas affected by fires were recalculated for the entire time series but a summary table containing the recalculations performed by year and the key drivers of the recalculations was not provided in the NIR. During the review, the Party clarified that for Alaska, areas affected by fires were updated for the entire time series while for the conterminous United States, they were updated for 2000–2020. The Party confirmed that, as reported in the NIR (p.6-41), these data updates resulted in recalculations for specific years. In addition, as described in the NIR (pp.6-37 and 6-41), updates to the fire methodology mean that emission estimates for	The United States notes this is not an issue, but will consider this encouragement in reporting on recalculations in future *Inventory* submissions.

		prescribed fires are no longer reported separately, which necessitated broader recalculations across the time series. The ERT encourages the Party to increase the transparency of its reporting by including in the NIR a summary table containing the recalculations performed, by year, and the key drivers of the recalculations for CH_4 and N_2O emissions from biomass burning in forest land remaining forest land.	
Waste			
W.3	5.A.1.a Anaerobic – CH_4 (W.3, 2021) (W.9, 2020) (W.7, 2019) (W.16, 2018) Comparability	Not resolved. *Estimate and report separately the amounts of CH_4 flared and CH_4 for energy recovery for anaerobic waste disposal sites in CRF table 5.A.* The Party reported the amounts of CH_4 flared and CH_4 for energy recovery for anaerobic waste disposal sites as "NE" in CRF tables 5.A and 9 and in the NIR (annex 5) for 2005–2020. During the review, the Party indicated that it plans to implement technical changes to the GHGRP to allow waste disposal site operators to provide the volumes of CH_4 flared and CH_4 for energy recovery; however, the timing of such changes has not been settled on.	Addressing. This issue was addressed in the 2020 submission. See CRF Tables 5.A and Table 9 of the 2020 submission and NIR Annex 5. CH_4 has been reported as NE. Per engagement with the reporting community, future technical corrections to EPA's GHGRP may allow for reporters to indicate volumes of gas sent to flaring and to energy projects. Reporting of this information by facilities would allow EPA to report separate amounts for CH_4 flared and CH_4 for energy recovery. The timing for such updates has not been proposed and the initial data reported will only reflect information for the latest year of time series and will require some effort to develop time series information to include in the national Inventory submission.
W.4	5.A.1.a Anaerobic – CH_4 (W.4, 2021) (W.10, 2020) (W.8,2019) (W.7, 2018) (W.12, 2016) (W.11,2015) Accuracy	Addressing. *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*. The Party reported in its NIR that it assumes that most of the organic waste placed in industrial waste landfills originates from the food processing (meat, vegetables, fruits) and pulp and paper sectors; thus, its estimates of industrial landfill emissions focus on these two sectors. EPA validated this assumption by analysing GHGRP data for 2016 (the waste disposal information for pulp and paper facilities correlates well with the AD currently used to estimate emissions but not with the waste disposal information on food and beverage facilities). EPA conducted a literature review in 2020 to investigate other sources of industrial food waste and decided to maintain the currently used methodology because of questions around data availability across the time series and because the level of effort required to reproduce and/or merge estimates across the time series is high (2021 NIR section 7.1, p.7-11). The amount of waste landfilled is assumed to be a fraction of production that is held constant over the time series (2021 NIR, annex 3.14). During the review, the Party indicated that a memorandum summarizing the literature research and data availability is being finalized by EPA. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet presented in the NIR up-to-date data on the type and	Resolved. The April 2023 NIR incorporates completion of this work, reflecting an update to organic waste disposed in industrial landfills. See pp. 11-14 in Chapter 7 of the April 2023 inventory submission, also available on EPA's website here: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

		fractions of organic waste placed in industrial waste landfills and, as necessary, updated the estimates for industrial waste landfills.	
W.5	5.B.2 Anaerobic digestion at biogas facilities – CH_4 (W.5, 2021) (W.11, 2020) (W.9,2019) (W.8, 2018) (W.14, 2016) (W.13, 2015) Transparency	Addressing. *Estimate and report CH_4 emissions from unintentional leakages using the default value of 5 per cent provided in the 2006 IPCC Guidelines.* The Party included in its NIR (section 7.4) and CRF table 5.B estimates from anaerobic digestion at biogas facilities using a tier 1 methodology but it is unclear whether the Party estimated and reported CH_4 emissions from unintentional leakages using the default value of 5 per cent provided in the 2006 IPCC Guidelines. During the review the Party clarified that the assumptions (amount of biogas recovered by all AD operations) include unintentional leakages. The ERT considers that the recommendation has not yet been fully addressed because while the Party has estimated and reported CH_4 emissions from anaerobic digestion at biogas facilities, it has not transparently explained how it accounts for unintentional leakages.	Resolved. The method was updated for April 2024 submission to use the 5 percent leakage default. See Section 7.4 of the Waste chapter of the current NIR submission.