

Greenhouse Gas Inventory Management Plan and Reporting Document (IMPRD)



Entergy Corporation
New Orleans, LA

Prepared by: Steve Tullos (stullos@entergy.com)
Senior Manager, Environmental Strategy & Policy
Sustainability & Environmental Policy Group

Original Draft: July 2005
Finalized: December 2005
Latest Update: March 2019

Entergy's GHG Commitment Snapshot

Base Year – 2000

Original Commitment Years –	2001 to 2005
Original Commitment –	Stabilize at 2000 levels direct CO ₂ emissions from power plants
Original Commitment Funding –	\$25 million (\$5 million per year)
Second Commitment Years –	2006 to 2010
Second Commitment –	20% below 2000 levels direct CO ₂ emissions & cont. purchased power
Second Commitment Funding –	\$3.25 million (\$650K per year)
Third Commitment Years –	2011 to 2020
Third Commitment –	20% below 2000 levels direct CO ₂ emissions & cont. purchased power
Third Commitment Funding –	\$10 million (\$1 million per year)

Entergy Corporation Greenhouse Gas Inventory Management Plan and Reporting Document

Introduction and Background

In May 2001, Entergy publicly committed to stabilize CO₂ emissions from its power plants at year 2000 levels through 2005, and dedicated \$25 million in supplemental corporate funding to achieve this target over the five-year period. This commitment was focused on CO₂ emissions from fuel combustion at the company's power plants and required that Entergy:

- Stabilize CO₂ emissions from its U.S. power plants at year 2000 levels through 2005.
- Establish the \$25 Million Environmental Initiatives Fund (EIF) in support of achieving the 2001-2005 stabilization targets.
- Document activities and annually report progress.
- Employ an independent third party organization to verify measurement of Entergy's CO₂ emissions from U.S. power plants.

Entergy joined EPA's Climate Leaders Program in 2004 (the program was discontinued in 2010) and began the process of renewing its GHG commitment by developing a detailed inventory of all GHGs resulting from its operations. The inventory development and results were documented in this Inventory Management Plan and Reporting Document (IMPRD). Entergy's second commitment included:

- Stabilize CO₂ emissions from all Entergy power generation plants plus controllable purchased power at 20% below 2000 levels through 2010.
- Commit funding of \$3.25 million in support of achieving the 2005-2010 target.
- Document activities and annually report progress.

In 2011, Entergy once again renewed its commitment to stabilize GHGs with a third commitment:

- Stabilize CO₂ emissions from all Entergy power generation plants plus controllable purchased power at 20% below 2000 levels through 2020.
- Commit funding of \$10 million in support of achieving the 2011-2020 target.

- Document activities and annually report progress.

Beginning in 2012, Entergy decided to conduct the third-party verification audit to the [International Standards Organization \(ISO\)](#) standard for GHG development and verification (ISO 14064-3:2006).

This IMPRD has been created and subsequently revised according to the requirements in the [World Resources Institute](#) and the [World Business Council for Sustainable Development](#) Greenhouse Gas Protocol, [2004 revised edition](#), and formatted according to the US EPA Climate Leaders 2004 draft checklist of IMPRD components.

This IMPRD is used to create and document an inventory that was previously reported to the Climate Leaders program and other external parties. However, EPA announced in 2010 that the Climate Leaders program was being discontinued. This IMPRD will continue to be updated and used to document Entergy's GHG Inventory methodology and results on an annual basis. Entergy has made an estimate of emissions, including small sources, for reporting externally. Entergy registers its emissions and offset purchases to the American Carbon Registry (www.americancarbonregistry.org) and posts the GHG Inventory, along with this document, on the company's website (www.entergy.com).

The current GHG Inventory (by calendar year) is attached to this document as Attachment 1 and is referenced throughout.

Reporting Entity Information

Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately 30,000 megawatts of electric generating capacity, including nearly 9,000 megawatts of nuclear power. Entergy delivers electricity to 2.9 million utility customers in Arkansas, Louisiana, Mississippi and Texas. Entergy has annual revenues of \$11 billion and nearly 13,700 employees.

Additional company information can be located at www.entergy.com.

Company address: 639 Loyola Avenue
New Orleans, Louisiana 70113

IMPRD/GHG Inventory Contact: Chuck Barlow – Vice President, Sustainability &
Environmental Policy
Sustainability & Environmental Policy (SEP) Group
(504) 576-4000
cbarlow@entergy.com

Boundary Conditions

Consolidated Approach for Emissions Reporting – Entergy has elected to include all company-owned assets and those under a capital lease, consistent with “equity share” reporting under WRI reporting protocols. Where partial ownership share of an asset exists, only Entergy’s owned portion of the asset/emissions is included in the inventory. Additionally, Entergy has opted to include some emissions associated with the electricity purchased to support grid operations and meet customer demand. The GHG emissions resulting from the full life cycle of the various fuel sources are not included in the inventory.

Other emission sources that have emissions estimated to be less than 1% of the total inventory are considered *de minimus* unless they are anticipated to change dramatically and grow above this threshold. Emissions of each GHG from facilities/assets that are *de minimus* are estimated and included in the inventory for each gas and/or source. The same data are used for future years unless one of the categories of emissions changes significantly. These estimates will be recalculated approximately every five years (or as updated data becomes available), after major equipment changes, asset acquisition and/or asset divestiture in order to reconfirm *de minimus* status.

Some emission sources require reporting under EPA’s Mandatory GHG Reporting Rule. These emissions are included for the previous calendar year due to the timing of the reporting cycle. The methodology for calculation of these categories is the same as is required under this EPA reporting program.

Facilities List –The majority of Entergy’s emissions are from fossil-fueled electricity generation facilities. However, other sources include small sources at other company facilities. A full list of facilities included in the inventory is contained in Attachment 1. This list identifies Entergy’s fossil-fueled electricity generation assets and ownership share. All other GHG emissions-producing assets are assumed to be 100% owned by Entergy.

List of GHGs Included – Entergy includes the following GHG gasses associated with various sources in its inventory and management program:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Sulfur Hexafluoride (SF₆)
- Hydrofluorocarbons (HFC)

Perfluorocarbons and Nitrogen Trifluoride are not included in Entergy’s inventory given the nature of its business and that this class of chemicals is not used in any of Entergy’s operations in any sizeable amount.

Entergy Corporation Emission Sources

Process for Identifying Emissions Sources – A spreadsheet was created by Platts/E source as contractors to EPA’s Climate Leaders program, and was utilized as an overall roadmap to help identify GHG emission sources at Entergy locations. Within each category, a determination was made as to the applicability to Entergy’s operations. The findings of this analysis are presented in the section below. Additionally, publicly-available data, previous equipment inventories, internal company data, and existing air permit information were utilized to identify GHG sources at company locations. This includes an extensive analysis and estimates of emissions from small combustion sources co-located at electrical power generating facilities or at stand-alone facilities. The specific information gathered (updated annually) and its sources are shown in Attachment 1 and summarized in the sections below. Additionally, this information was further refined and updated based on data submitted to the EPA for the mandatory GHG reporting rule beginning in 2011. Entergy is confident that this methodology has captured emission estimate information for the majority of small source equipment at its locations.

Direct Sources

Entergy's direct emissions are included in the following categories:

- ⇒ Stationary combustion: Entergy's direct sources of GHGs include emissions from the direct combustion of fossil-fuels in electrical generation boilers and small sources at company facilities.
- ⇒ Mobile Combustion: Fossil fuels combusted in company fleet vehicles, including corporate aircraft.
- ⇒ Fugitive Emissions: Methane (CH₄) from natural gas distribution systems, SF₆ from power transmission and distribution equipment, and HFCs from building HVAC systems and mobile air conditioning sources (vehicles).

Company activity data sources including contacts and information for the various emissions from and/or usage of these assets are included in Attachment 2.

Indirect Sources

Entergy's indirect sources of emissions include those from some purchased electricity and electrical line transmission/conversion losses. Data sources for the various emissions from and/or usage of these assets are included in Attachment 1. All electricity consumed in the operation of the utility generating plants and consumed in Entergy's various administrative and commercial buildings and operations are accounted for in Entergy's direct emissions for stationary combustion. However, electricity consumed by the wholesale generation plants and associated facilities is accounted for separately in the inventory. Additionally, line losses for self-generated and purchased electricity are accounted for by the additional generation necessary to make-up for these losses. There are no other indirect sources included in Entergy's inventory or program.

Optional Sources

Entergy is reporting some emissions associated with power purchased to meet customer demand and support grid operations. This emission source is not required under EPA and WRI reporting protocols. Entergy has elected to report some of these emissions because it has decreased its self-generation while increasing the amount of power it purchases. Beginning in 2014, employee commuting and customer combustion of the company's product (natural gas) were added to the inventory. Other optional sources such as

employee business travel and full lifecycle/supply chain emissions are not included at this time; however, these will be evaluated for inclusion in the future.

GHG Emissions Quantification

Quantification Method and Emission Factors

The quantification methodologies used in the Entergy inventory are commonly accepted methods for measuring GHG emissions. For inventory years 2000-2004, Entergy used methodologies outlined in the EPA Climate Leaders Protocol, or methodologies proposed by Platts/E-source (a technical consultant working for EPA as a part of the Climate Leaders Program) staff and approved by EPA Climate Leaders staff – these methodologies were carried forward in future inventory years, unless supplanted by an updated method. In a number of cases, Entergy has used conservative estimation methodologies for expected *de minimus* emission sources (<1% of corporate total). In all cases, these estimation methodologies were reviewed and approved by EPA Climate Leaders staff and subsequently verified by a third-party. When emissions are based on these conservative estimates, they are identified as such below.

Emission factors used for the initial inventory were derived from various sources including *USEPA Climate Leaders GHG Protocol* (derived from GHG Protocol and AP-42), US DOE, and EPA's eGRID system; these factors are updated as needed. The quantification methodologies, emission factors and their sources can be found in the GHG inventory calculation spreadsheets, accessible through Entergy's external website (<http://www.entergy.com/environment/performance.aspx>). Entergy remained engaged with the EPA Climate Leaders Program updates and staff until the program was eliminated by the agency. Entergy will monitor WRI protocol and other leading sources for updates in order to stay aware of any changes to quantification methodologies, emission factors, or protocol changes.

These approaches for emission quantifications were chosen because they represent the most accurate and, in most cases, the only data source for such an exercise. Other methods were not chosen due to the fact that other methods simply do not exist.

Direct Emissions

Entergy's direct emissions are either measured directly via a continuous emissions monitoring (CEM) system, calculated using emission factors and fuel throughput or other relevant data, or estimated using equipment capacity factors and maximum fuel throughput data. Direct GHG emissions are quantified separately for each GHG, and then aggregated across Entergy by GHG constituent. The quantification method and data source for each major category of direct GHG sources is detailed below.

Fossil-Fuel Combustion Boilers and Gas Turbines – Entergy's electrical generation equipment is heavily regulated by state and federal agencies and is required to report emissions on a periodic basis. A continuous emission monitoring (CEM) system is used at most plants to directly monitor emissions. CO₂ is directly monitored in these systems and other GHGs, such as CH₄ and N₂O, are calculated based on the data collected by these systems. However, in some cases, CO₂ is calculated based on fuel throughput and heat rate data. However the CO₂ number is derived, it is reported to the EPA as required under various agency regulatory programs. In 2018, this category represented 87.9% of the corporate total.

Source: This GHG emissions data is reported to the SEP Group by Entergy's Power Generation Environmental Support Group quarterly.

Small Sources at Company Facilities – This category includes equipment such as emergency generators, house service boilers, natural gas-fired comfort heaters, and other small combustion/emission sources not monitored by CEM systems at company facilities. Inventories for 2000 to 2010 used an available equipment inventory and information contained in facility air permits and compiled by facility personnel, small source emissions were calculated for each plant for which this data was available. This data was compiled in 1994 in the Power

Generation Operations Equipment Inventory. Similarly, an inventory of small sources also was conducted at the Nuclear facilities in 2005 – these numbers are carried forward from year-to-year.

Beginning in 2011, Entergy reported small sources at the Power Generation plants to the EPA under the mandatory GHG reporting rule Subpart C. These numbers were used beginning with the 2011 inventory in order to align regulatory reporting with this voluntary inventory. Changes to the overall number were not material. In 2018, this category represented 0.7% of the corporate total.

Transportation Fleet Vehicles – Entergy’s Transportation Group maintains a detailed inventory of vehicles owned and/or leased throughout the company. This group also tracks information regarding the fleet’s fuel usage and miles traveled. Additionally, Entergy’s Aviation Group (part of Human Resources and Administration) maintains fuel usage information for our fleet of corporate aircraft. This information is updated with 2017 data and used to calculate GHG emissions for this equipment category. In 2017, this category represented 0.1% of the corporate total. Entergy decided not to include GHG emissions resulting from employee business travel; however, it may be included in the future. Fleet emissions were quantified using units of all mobile fossil fuels and default emission factors.

Source: The source of this information is the Manager, Transportation and the Aviation Group.

Fugitive Emissions: Methane – This category of emissions includes losses of methane from Entergy’s natural gas distribution system and Entergy’s natural gas storage facility. Losses of methane from the distribution system were estimated using the Gas Research Institute’s protocol. This protocol uses input data such as miles of pipe and number of services (steel, coated, and plastic), number of meters (commercial and residential) and gas vented to estimate methane emissions from these types of distribution systems. The emissions from the storage facility were

estimated, using Tier 1 factors for natural gas storage for both vented and fugitive natural gas. In 2018, this category represented 0.2% of the corporate total.

Source: These input data were obtained from the Manager, Gas Distribution Operations and Power Generation, Sabine Plant.

Fugitive Emissions: HFCs – This category of emissions includes losses of HFCs from HVAC equipment at buildings which Entergy owns or for which it holds a capital lease and from Entergy vehicular air conditioning. For the indoor air cooling equipment, square footage of company building space was collected and an emission factor developed by Platts/E-Source was applied to this number in order to estimate HFC losses from this equipment. This emission factor is based on national averages of tonnage of equipment per square foot of space and average leakage rates of common air conditioning equipment. An investigation revealed that no HFC-based air or water pre-cooling is performed at any Entergy electric power generation facilities. Additionally, vehicle HFC emissions were also estimated in a similar manner. Conservative estimates were completed for all sources of HFC emissions; this category of emissions was determined to be *de minimus*. In 2016, these categories represented <0.1% of the corporate total. PLEASE NOTE: Entergy's district cooling/thermal operations were sold to a third-party in December of 2013. Due to the *de minimus* nature of emissions associated with these assets, no adjustments were made to the 2013 inventory; however, these assets were removed from the inventory beginning in 2014. The calculations behind all factors used in estimating HFC emissions can be found in the inventory spreadsheet (Attachment 1).

Source: The source of this information was the Manager, Real Estate Operations and the Manager, Transportation.

Fugitive Emissions: SF₆ – This category of emissions includes operational and unintentional releases of SF₆ used in electricity transmission equipment. Emissions of this gas were previously estimated using a protocol similar to the

protocol utilized for EPA's SF₆ Emission Reduction Partnership Program. However, beginning in 2014, the methodology was updated to be consistent with the EPA Mandatory GHG Reporting Rule. This category is reported under Subpart DD of this rule; the number included in this inventory represents the number reported under this compliance program. The emission estimate provided is from calendar year 2017 and this category represented 0.6% of the corporate total.

Source: The source of this information is the Manager, Environmental Management in Entergy's Distribution Operations Organization. SF₆ emission estimates are reported to SEP at least once per year.

For *de minimus* fugitive emission categories described above, a consistent quantity of emissions is included in the inventory and will be carried forward annually; However, SF₆ emissions will be updated annually.

Indirect Emissions

Transmission/Distribution System Line Losses – Line losses associated with power purchased to support the utility operations are considered required indirect emissions under EPA and Scope 2 Indirect under WRI reporting requirements. Emissions from T&D losses of purchased power are calculated by applying Entergy's system loss factor to the total amount of power purchased. The custom loss factor is developed using power data from the 5 utilities' FERC Form 1s (specific data noted in "purchased power" worksheet in inventory). This custom factor was calculated for 2004 data using 2004 FERC forms and applied to purchased power amounts of previous years of GHG inventories (2000-2003) rather than recalculating this factor for each prior year. This emission estimate is calculated and presented; however, it is not subtracted from the purchased power emission number described below since it is assumed that the bulk of purchased power is generated from within Entergy's service area. T&D line losses are already accounted for in the extra generation required to make up for these losses.

Beginning in 2013, an estimate of emissions associated with off-site electricity usage of the generation plants (and associated facilities) was included in the inventory.

Optional Emissions

Purchased Power – This category of emissions includes some of the emissions from power purchased by Entergy to supplement its own supply in order to meet customer demand and/or support utility operations. In some cases, the source of this power is known and an actual buying decision is made by Entergy (controllable or unit-contingent purchases). The remaining sources of purchased power are either not known (non-controllable or grid purchases) or cannot be controlled for some other reason (i.e., Qualifying Facility Puts [QF Puts] under PURPA). Under the EPA and WRI protocols, including emissions from power purchased by utilities is optional. From 2000 to 2013, Entergy opted to include all purchased power in its GHG inventory and subsequent tracking; however, beginning in 2014, Entergy does not include non-controllable purchases in the inventory. Non-controllable purchases are those that do not meet the definition of a controllable purchase (i.e., the source is unknown OR there is no buying decision made regarding the power). In December of 2013, Entergy transitioned into the Midwest Independent System Operator (MISO) system. As a result, there is a large decrease in the amount of controllable purchases (roughly half). Additionally, there is no mechanism for knowing from which plant/unit the power purchases from MISO are sourced. Accordingly, beginning in 2014, only purchases made under long-term contracts and other bilateral arrangements are included in the inventory. This approach avoids the potential for double counting, as some of the power purchased to serve Entergy load may actually be generated by company-owned assets already accounted for in the direct emissions category described in previous sections. In 2018, this category represented 8.3% of the corporate total.

Controllable purchase information (in terms of millions of megawatt-hours) was collected. Supplier and unit-specific emission rate information from eGRID, where available, was used to develop a supplier-specific custom CO₂ emissions factor (regional emission factors were used for other GHGs). If supplier-specific GHG emission factors were not available, the regional grid factor from eGRID was used as a default.

Source: All data regarding power purchases (TRADES database and ISB system) were obtained and are available from Entergy's System Planning Group. Primary contact for the data was the Sr. Staff Engineer in the Energy Analysis and Reporting Group.

Product Combustion – This optional category of emissions includes combustion of the natural gas distributed to customers in Baton Rouge and New Orleans, the only areas of the service territory where Entergy distributes natural gas to retail customers. Entergy began including these emissions in the 2014 inventory to be consistent with the EPA Mandatory GHG Reporting Rule. This category is reported under Subpart NN of this rule; the number included in this inventory represents the number reported under this compliance program. The emission estimate provided is from calendar year 2013. In 2018, this category represented 1.8% of the corporate total.

Source: All data regarding this category is sourced from the Manager, Gas Operations.

Employee Commuting – This optional category of emissions was estimated using employee survey data collected in 2014 and using EPA methodologies for Scope 3 emission estimations and emission factors. The full calculation methodology is shown on the appropriate spreadsheet of Attachment 1. In 2016, this category represented 0.1% of the corporate total. Accordingly, this is a *de minimus* category that will be carried forward annually.

Source: Survey data was provided by Corporate Communications.

Data Management

Activity Data

In all cases, the best available activity data was used to calculate or estimate emissions from a specific source. All collected data for each source is maintained by the data source identified in the previous section.

The primary source of data related to Entergy's largest category of emissions (representing 87.0% of total corporate emissions in 2017) is CEM system data. CEM system data from monitored plants is managed by Entergy's Power Generation Environmental Support Group. CEM system data is closely managed and maintains a high level of quality control as required by EPA regulations (40 CFR Part 75). The Director, Power Generation Environmental Support is responsible for maintaining these data; the primary contact for these data is the Supervisor, Emission Monitoring and Markets. CEMS data is sourced from the data acquisition and handling system (DAHS), which is the software package used to manage and query CEMS data. A report is generated for the annual CO₂ emissions and provided to the Director, Environmental Strategy & Policy (see further description below of how the inventory is generated).

Controllable Power purchase information is managed by the Manager, System Planning using an internally developed software package called TRADES. This system is used by the power buyers to track, validate and eventually invoice long-term power purchase contracts necessary to support grid operations. Additionally, the ISB system is used to track the final settlement of power purchases. Where there were discrepancies in the data, the ISB system was used as the correct value. Other data categories are managed as described in the section above.

Entergy transitioned system dispatch and the bulk of power purchasing operations to MISO on December 19, 2013. This transition greatly impacts the manner in which power is purchased and dispatched for Entergy. Beyond the long-term power purchase contracts described above, all power necessary to support grid operations is purchased directly from MISO. The source plant/unit of this power is not known and may in fact include power generated by Entergy.

Data Management

All data required for the inventory is either reported to or collected by the Senior Manager, Environmental Strategy & Policy in the SEP Group in the December/January/February timeframe. This information is maintained in electronic files and calculation spreadsheets. The specific steps of the process are described further below:

- **DATA RECEIPT** – the data described above are transmitted to ESP in the form of spreadsheet files via email attachment. This transmittal method is secure and reliable. Once received, the spreadsheet files are saved to a shared Directory under the ‘GHG Inventory’ folder.
- **DATA REVIEW AND MANIPULATION** – spreadsheets are accessed and reviewed for the relevant information. In some cases, the data are sorted, totaled and formatted to facilitate entry into the inventory spreadsheet. The data also is reviewed during this step to evaluate the overall magnitude to identify any obvious errors or omissions.
- **DATA ENTRY** – data is entered into the draft working version of the GHG inventory. During this step, an additional review for data reasonableness and completeness is performed. Any obvious errors or omissions are addressed directly with the data manager by phone or email, as needed. All of the data sources are either entered directly into the inventory or are used for further calculation of the necessary data points required to develop the overall inventory. All supporting calculations and spreadsheets are housed on the shared directory noted above.
- **QA/QC AND TECHNICAL REVIEW** – where data entry is required, a double check and a reverse double check is always performed. A double check review is simply another review of the numbers entered into the working draft version of the inventory, while a reverse double check is an evaluation of the data entered

against the working draft version of the inventory to ensure all data points are included. Once this review is completed, the draft version is circulated to several technical reviewers within the company; feedback is used to modify the inventory as needed.

Annual inventories and IMPRD updates are published and posted on SEP's SharePoint site, Entergy's intranet site for all information maintained by ESP. Additionally, Entergy posts the total inventory number, along with the verification statement and other information to its registry account with the American Carbon Registry (www.americancarbonregistry.org) and on Entergy's external website (<http://www.entergy.com/environment/performance.aspx>). Entergy will continue to use and update the inventory template in future years in order to remain as consistent as possible.

Key Performance Indicator Selection and Data Collection

Entergy's current goal is to stabilize GHG emissions at 20% below 2000 levels on an absolute basis through 2020. The goal does not use emissions intensity; however, on an as needed basis, Entergy does calculate and evaluate GHG emission intensities. The primary intensity measure used is tons of emissions per megawatt hour.

Data Collection Process Quality Assurance

The owners of data identified in the previous section are responsible for maintaining data quality assurance. Every effort should be made to ensure that the data reported are accurate and complete. SEP will evaluate the data, once collected, to ensure that it is reasonable and consistent with past years. SEP will also conduct and document QA checks during the production of the inventory.

As part of the process each data manager uses for collecting GHG data, they must define and document any areas of possible error and the QA/QC actions they use to maintain accuracy. CEMS data quality is maintained in accordance with the compliance requirements contained in EPA regulations (40 CFR Part 75). Any departures from these

data quality measures (i.e. non-compliance events) should be communicated to ESP. Possible errors in emissions factors and calculations are also documented with the emissions factors and calculations records. Any inconsistencies and large unexpected changes from the previous year's data should be sufficiently explained when the data is transmitted. The Senior Manager, Environmental Strategy & Policy will compare the current year's data for each source category to the previous year's data in order to identify any large, unexpected variations. The data also is reviewed and all calculations validated to ensure that the calculations are correct.

Data Collection System Security and Integrated Tools

Data is typically transferred through Entergy's e-mail system. Security of this system is the responsibility of the IT group. Security of the data once it is collected and consolidated is the responsibility of SEP. Every effort will be made to ensure the security of the inventory information, primarily by saving this information to the shared directory in the 'GHG Inventory' folder. The shared directory is only accessible by employees in the SEP group. Entergy's external website (www.energy.com) and the Entergy's registry account with the American Carbon Registry (www.americancarbonregistry.org) will serve as the final publication repository for the GHG inventory using read-only, redacted versions.

Frequency

Data will be reported to/collected by SEP on an annual basis (at a minimum). This information will be used to produce an updated GHG inventory each year. No later than the end of the 1st quarter of each year, SEP will produce an updated inventory for the previous calendar year. A verification audit will be conducted by an independent third-party. Beginning in 2012, this verification audit will be conducted in accordance with the international standard – ISO 14064.3. This updated inventory will be used to track progress against the reduction goal discussed above.

Base Year

Adjustment for Structural Changes – The base year (2000) will be adjusted for material mergers, acquisitions, and divestitures that occur during the reporting time frame for the goal. Actual yearly emissions the acquisition of each material emission-producing entity/asset that existed during the base year will be added to the base year and each year that follows. Emissions from divestitures of material emission-producing assets that existed during the base year will be removed from the base year and every year that follows. Mergers and capital leases on material emission-producing assets will be planned in the same manner as the acquisitions to the degree that it is practical. There are no planned adjustments for outsourcing. Mergers, acquisition, divestitures, and capital leases will be identified by SEP and integrated into the GHG inventory for the calendar year when the deal closes. Additionally, data managers should keep SEP informed of any such changes. Finally, SEP will monitor such changes through the investment approval process, which it participates in on as a subject matter expert for environmental issues.

Since 2000, Entergy has purchased and divested several assets. The table below shows these transactions and describes any adjustments to the base year that were required, along with a justification of such changes.

Transaction/Asset	Year of Close	Year of COD	Comments
Union Plant (acquisition)	2016	2003	Did not exist in base year – no adjustment needed
Top of Iowa Windfarm (divestiture)	2016	2003	No emissions from these assets – did not exist in base year – no adjustment needed
White Deer Windfarm (divestiture)	2016	2003	No emissions from this asset – did not exist in base year – no adjustment needed
Ninemile 6 – NOLA (new self-build CCGT)	NA	2014	Did not exist in base year – no adjustment needed
Thermal Plant – Houston (divestiture)	2013	Pre-2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed
Thermal Plant – NOLA (divestiture)	2013	Pre-2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed
Hinds County Plant (acquisition)	2012	2001	Did not exist in base year – no adjustment needed
Hot Spring Plant (acquisition)	2012	2002	Did not exist in base year – no adjustment needed
Rhode Island Plant (acquisition)	2011	2002	Did not exist in base year – no adjustment needed

Rhode Island Plant (divestiture)	2015	2002	Did not exist in base year – no adjustment needed
Harrison County Plant (divestiture)	2011	2003	Did not exist in base year – no adjustment needed
Acadia Plant (acquisition)	2011	2002	Did not exist in base year – no adjustment needed
Ouachita Plant (acquisition)	2008	2002	Did not exist in base year – no adjustment needed
Calcasieu Plant – Unit 1 (acquisition)	2008	2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed
Calcasieu Plant – Unit 2 (acquisition)	2008	2001	Did not exist in base year – no adjustment needed
Perryville Plant (acquisition)	2005	2001/2	Did not exist in base year – no adjustment needed
Attala Plant (acquisition)	2003	2001	Did not exist in base year – no adjustment needed
Spindletop Gas Storage (acquisition)	2004	Pre-2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed
Thermal Plant – Houston (acquisition)	2003	Pre-2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed
Thermal Plant – NOLA (acquisition)	2000	Pre-2000	Estimated plant emissions fall well below materiality threshold (1%) – no adjustment needed

Adjustment for Methodology Changes - Changes will be made to calculations and emissions factors only if justified by regulatory changes, scientific/engineering judgment, or updates to the various protocols employed. As an example, several emission factors were updated in 2014 due to adjustments made by EPA. The Vice President, Sustainability & Environmental Policy will make the final decision as to whether or not make such adjustments. In cases where changes are made, the changes will be made to all years in the inventory, including the base year, so that all emissions are reported using the same basis for all years.

An **IMPRD Revision Log** is included in this document as Attachment 3 and should be used to document any structural or methodological changes to corporate greenhouse gas inventories or this IMPRD.

Management Tools

Roles and Responsibilities

The Vice President, Sustainability & Environmental Policy is responsible for overall GHG program management and external reporting. This individual is also responsible for compiling the data required to update the GHG inventory on an annual basis before the end of Q1 and for evaluating the reasonableness of the GHG data.

He/she also reviews changes to the programs that Entergy participates in and updates the IMPRD as needed. These responsibilities are defined in more detail in specific sections of this IMPRD. SEP then produces and distributes needed reports summarizing the emissions inventory and progress toward the goal.

SEP also provides guidance and feedback to relevant company Managers and Directors on what sources to include in the inventory, what data to use and collect, and what emissions factors are most appropriate.

Various Managers and Directors around the company are responsible for maintaining the data necessary to complete the inventory and subsequent updates. Entergy's Environmental Leadership Team (ELT) reviews and approves the summary of each year's data.

Communication

The IMPRD will be communicated upon initial finalization and subsequently on a periodic basis, when major revisions occur or as needed. Opportunities for communication with Data Managers include when training is delivered, when data requests are made, during the third-party review of the inventory, and when the IMPRD is revised.

Training

Entergy currently has no training materials available regarding GHG management or inventory. Training will be delivered on an ad hoc basis to employees involved in the

process. The Senior Manager, Environmental Strategy & Policy (or designee) will conduct this training as needed.

Document Retention and Control Policy

Entergy's GHG management program and all relevant records and documentation should be managed in accordance with [Entergy's Records Management & Retention Policy](#). Entergy's external website will serve as the final publication repository for the GHG inventory. The external website is accessible via the internet. Additionally, the annual inventory, verification statement and IMPRD will be submitted to the American Carbon Registry for posting on Entergy's registry account. This is accessible to anyone via the ACR website (www.americancarbonregistry.com).

Data verification and documentation is essential for the authenticity of this program. To maintain a high standard, all records verifying the GHG inventories and registry contents will be maintained by SEP for a minimum of three years. Documentation of GHG reduction project expenditures and project close-out reports shall also be maintained for a minimum of three years.

Auditing and Verification

Internal Auditing

Internal auditing of the GHG program will be conducted by SEP staff or designee. Some of the data used to develop emission estimates are also audited through Entergy's Safety and Environment Audit Program (i.e., CEMS data/processes, reporting under the Mandatory Reporting Rule, etc.) administered by SEP. Findings related to the GHG Inventory will be provided to the VP, SEP who will determine the responsible individual for each finding's corrective action. The audit will include a review of the IMPRD and the latest version of the inventory. A consistency check is also performed against the prior year's data, especially in the area of direct emissions. Changes to the IMPRD driven by audit results will also be entered into the IMPRD Revision Log (Attachment 3).

External Validation and/or Verification

Entergy is committed to an external third-party audit of the GHG baseline/inventory data, calculations, and records. This third-party verification of the program will be conducted at least every other year, including 2006 and the goal year. Since 2006, Entergy has sought annual, third-party verification of the GHG Inventory. The verification statement and report are made available via the ACR website and Entergy's external website.

In 2012, Entergy decided to elevate this third-party verification audit to the ISO standard for GHG Inventory preparation and verification (ISO 14064.3). This is an expanded verification effort that requires a higher level of scrutiny and additional data review/evaluation. The verification report will include a statement regarding the type of verification, level of assurance and an uncertainty analysis. The uncertainty analysis identifies, describes and quantifies the largest sources of uncertainty for the GHG Inventory. See Attachment 2 for the full verification report.

Management Review

The GHG emissions summary data will be reviewed and approved annually by the ELT. Goal setting, progress toward meeting goals, and any additional action or options necessary to meet the goals will be covered in this management review. The VP, SEP

will verify that the information has been reviewed and found to be substantially compliant with this IMPRD. Additionally, this information will be presented to the Audit Committee of the Board of Directors during the annual reporting cycle.

Corrective Action

Any findings identified through QA/QC and internal and external reviews related to the greenhouse gas inventory or IMPRD are assigned to the appropriate Manager or Director for action by the VP, SEP. The VP, SEP will maintain a list of identified gaps related to the program, the person that is responsible for closing the gap, and the required timing for gap closure. Changes to the IMPRD driven by this process will also be entered into the IMPRD Revision Log (Attachment 3).

Any findings identified through QA/QC and internal and external audits related to the GHG emission inventory, calculations, or reporting are assigned to the VP, SEP or his designee.

Voluntary Commitment and Reduction Efforts

Voluntary Commitments

In May 2001, Entergy publicly committed to stabilize CO₂ emissions from its power plants at year 2000 levels through 2005, and dedicated \$25 million in supplemental corporate funding to achieve this target over the five-year period. This commitment was focused on CO₂ emissions from fuel combustion at the company's power plants and required that Entergy:

- Stabilize CO₂ emissions from its U.S. power plants at year 2000 levels through 2005.
- Establish the \$25 Million Environmental Initiatives Fund (EIF) in support of achieving the 2001-2005 stabilization targets.
- Document activities and annually report progress.
- Employ an independent third-party organization to verify measurement of Entergy's CO₂ emissions from U.S. power plants.

Entergy completed this first commitment 23 percent below year 2000 levels.

Entergy's second commitment, made in 2005, included:

- Stabilize CO₂ emissions from all Entergy operations at 20% below 2000 levels through 2010.
- Commit funding of \$3.25 million in support of achieving the 2005-2010 target.
- Document activities and annually report progress.

Entergy completed this second commitment more than three percent below the target. On a cumulative basis, Entergy bettered the two commitments by over 14 percent.

In 2011, Entergy once again renewed its commitment to stabilize GHGs with a third commitment:

- Stabilize CO₂ emissions from all Entergy operations at 20% below 2000 levels through 2020.
- Commit funding of \$10 million in support of achieving the 2011-2020 target.
- Document activities and annually report progress.

Additional information on these commitments can be viewed on [Entergy's website](#).

Voluntary Reductions

Since 2001, Entergy has invested in various types of internal and external emission reduction projects. These projects range from internal plant efficiency improvements, to reforestation projects, to carbon offset purchases. These projects are described annually in the Environmental Section of [Entergy's Integrated Report](#).

In addition to the projects described above, Entergy owns several facilities that generate electricity without emission of GHGs. Entergy's nuclear fleet (9,000 MW), hydro plants (74 MW), and solar PV facilities (2.5 MW) generate virtually emission-free electricity and constitute a major portion of Entergy's overall generation mix (more than 30% at the end of 2017).

Attachment 1

2018 GHG Inventory – FINAL and VERIFIED

2018 Entergy Corporate GHG Emissions breakdown by category

All numbers represent CO2 equivalents (CO2e)

Unhide columns I - U for additional calculations and conversions -->

Operational Emissions Category	Emissions Source Category	Corporate emissions source	Greenhouse gas	Total emissions short tons CO2e	Total emissions in metric tons CO2e	percentage of total corporate emissions	Calculation worksheet in inventory document	
Direct Emission Sources	Stationary Combustion	Power generating units (includes emergency and backup generators)	CO2	39,644,952	35,965,295	87.9%	Stationary Combustion CEM	
			CH4	15,735	14,275	0.0%	Stationary Combustion CEM	
			N2O	87,398	79,286	0.2%	Stationary Combustion CEM	
		Small stationary combustion sources (co-located at generation stations and stand alone units)	CO2, CH4, N2O	296,959	269,397	0.7%	All small stat cbn totals	
		Biomass power generation	CO2	0	0	0.0%	NA	
	Mobile Combustion	Corporate fleet	CO2	51,557	46,771	0.1%	Mobile Combustion	
			CH4	76	69	0.0%	Mobile Combustion	
			N2O	404	366	0.0%	Mobile Combustion	
		Biomass fleet	CO2	0	0	0.0%	NA	
	Fugitive Emissions	Natural gas transmission and distribution	CH4	70,238	63,718	0.2%	Fugitive CH4-NG T&D	
		Electricity transmission and distribution	SF6	261,989	237,672	0.6%	Fugitive SF6	
		Cooling/air-conditioning (building, mobile and nuclear cooling eqpt)	HFCs	6,161	5,589	0.0%	Fugitive HFCs	
	Process emissions	none applicable	NA	0	0	0.0%	NA	
	Total Emissions from Direct Sources				40,435,468	36,682,440	89.7%	
	Indirect Emission Sources	Purchased Electricity	Power purchased for business operations outside Entergy service territory	CO2	36,446	33,063	0.1%	Purchased power
		T&D losses	Entergy purchased power consumed on Entergy T&D system	CO2, CH4, N2O	132,829	120,500	Note: these emissions are included within the Optional emissions	Purchased power
Total Emissions from Indirect Sources				169,274	153,563			
Optional Emissions Sources	Purchased power (controllable)	Controllable purchased power sold to customers	CO2, CH4, N2O	3,758,378	3,409,543	8.3%	Purchased power	
	Purchased power (uncontrollable)	Uncontrollable purchased power sold to customers	CO2, CH4, N2O	<i>Not Applicable beginning in 2014 - See *** Note at the bottom of the Purchased power tab</i>				
	Product combustion	Combustion of natural gas distributed to customers (Scope 3 for Entergy, Scope 1 for customers)	CO2, CH4, N2O	811,260	735,963	1.8%	Natural Gas Combustion	
	Employee Commuting	Estimation of emissions resulting from employee commutes	CO2, CH4, N2O	51,557	46,772	0.1%	Employee Commuting	
Total Emissions from Optional Sources				4,621,195	4,192,277	10.2%		
GHG Stabilization Commitment Total (progress toward third GHG commitment)				43,700,289	39,644,235	96.9%		
Total Corporate emissions				45,093,109	40,907,780	100.0%		

Direct Emissions from fossil fuel usage at generating facilities using CEM data

2018

Generating facility and EPA Acid Rain Unit ID	EPA Acid Rain Unit ID (Entergy ID if different)	Max capacity (MW)	State	Entergy equity share of unit	Primary fuel(s)	CO2 from CEM		CH4	N2O	Total Facility CO2e in short tons	Total CO2e in metric tons
						Total unit CO2 (1)	Entergy equity share of unit CO2 emissions	Entergy share CH4 emissions from generation (2)	Entergy share N2O emissions from generation (3)		
						short tons CO2	short tons CO2	short tons CO2e	short tons CO2e		
Acadia (Unit 2)	CT3	580	LA	100%	Natural Gas	612,524.00	612,524.00	287.89	343.01		
Acadia (Unit 2)	CT4		LA	100%	Natural Gas	612,524.00	<u>612,524.00</u>	<u>287.89</u>	<u>343.01</u>		
Totals							1,225,048.00	575.77	686.03	1,226,309.80	1,112,489.54
Attala	A01	480	MS	100%	Natural Gas	492,643.50	492,643.50	231.54	275.88		
Attala	A02		MS	100%	Natural Gas	<u>492,643.50</u>	<u>492,643.50</u>	<u>231.54</u>	<u>275.88</u>		
Totals		480					985,287.00	463.08	551.76	986,301.85	894,757.98
Baxter Wilson	1	550	MS	100%	Gas/Oil	573,267.00	573,267.00	269.44	321.03		
Baxter Wilson	2	771	MS	100%	Gas/Oil	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>		
Totals		1321					573,267.00	269.44	321.03	573,857.47	520,594.74
Big Cajun 2 ⁽⁵⁾	2B3 (3)	257	LA	42% ⁽⁵⁾	Coal	3,240,827.00	<u>1,361,147.34</u>	<u>367.51</u>	<u>6,887.41</u>		
Totals		257					1,361,147.34	367.51	6,887.41	1,368,402.26	1,241,393.64
Calcasieu Plant	GTG1	322	LA	100%	Natural gas	81,049.00	81,049.00	38.09	45.39		
Calcasieu Plant	GTG2		LA	100%	Natural gas	<u>86,045.00</u>	<u>86,045.00</u>	<u>40.44</u>	<u>48.19</u>		
Totals		322					167,094.00	78.53	93.57	167,266.11	151,741.26
Gerald Andrus	1	761	MS	100%	Gas/Oil	<u>604,812.00</u>	<u>604,812.00</u>	<u>284.26</u>	<u>338.69</u>		
Totals		761					604,812.00	284.26	338.69	605,434.96	549,241.35
Hinds Energy Facility	H01	456	MS	100%	Gas CT	646,946.50	646,946.50	304.06	362.29		
Hinds Energy Facility	H02		MS	100%	Gas CT	<u>646,946.50</u>	<u>646,946.50</u>	<u>304.06</u>	<u>362.29</u>		
Totals							1,293,893.00	608.13	724.58	1,295,225.71	1,175,009.00
Hot Spring Energy Facility	CT-1	620	AR	100%	Gas CT	724,122.50	724,122.50	340.34	405.51		
Hot Spring Energy Facility	CT-2		AR	100%	Gas CT	<u>724,122.50</u>	<u>724,122.50</u>	<u>340.34</u>	<u>405.51</u>		
Totals							1,448,245.00	680.68	811.02	1,449,736.69	1,315,179.00
Independence	1	472	AR	56.5%	Coal	5,336,445.00	3,015,091.43	814.07	15,256.36		
Independence	2	332	AR	39.37%	Coal	<u>5,250,189.00</u>	<u>2,066,999.41</u>	<u>558.09</u>	<u>10,459.02</u>		
Totals		804					5,082,090.83	1,372.16	25,715.38	5,109,178.38	4,634,968.66
Lake Catherine	4	547	AR	100%	Gas/Oil	<u>209,557.00</u>	<u>209,557.00</u>	<u>98.49</u>	<u>117.35</u>		
Totals		547					209,557.00	98.49	117.35	209,772.84	190,302.72
Lewis Creek	1	260	TX	100%	Gas/Oil	609,003.00	609,003.00	286.23	341.04		
Lewis Creek	2	260	TX	100%	Gas/Oil	<u>561,712.00</u>	<u>561,712.00</u>	<u>264.00</u>	<u>314.56</u>		
Totals		520					1,170,715.00	550.24	655.60	1,171,920.84	1,063,148.70
Little Gypsy	1	244	LA	100%	Gas/Oil	0.00	0.00	0.00	0.00		
Little Gypsy	2	436	LA	100%	Gas/Oil	556,282.00	556,282.00	261.45	311.52		
Little Gypsy	3	573	LA	100%	Gas/Oil	<u>461,931.00</u>	<u>461,931.00</u>	<u>217.11</u>	<u>258.68</u>		
Totals		1253					1,018,213.00	478.56	570.20	1,019,261.76	924,658.71
Ninemile Point	3	135	LA	100%	Gas/Oil	0.00	0.00	0.00	0.00		
Ninemile Point	4	748	LA	100%	Gas/Oil	1,756,130.00	1,756,130.00	825.38	983.43		
Ninemile Point	5	763	LA	100%	Gas/Oil	1,052,780.00	1,052,780.00	494.81	589.56		
Ninemile Point	6A	280	LA	100%	CCGT	865,671.00	865,671.00	406.87	484.78		
Ninemile Point	6B	280	LA	100%	CCGT	<u>865,671.00</u>	<u>865,671.00</u>	<u>406.87</u>	<u>484.78</u>		
Totals		1646					4,540,252.00	2,133.92	2,542.54	4,544,928.46	4,123,089.74
Ouachita Power	CTGEN1	789	LA	100%	Natural gas	627,886.00	627,886.00	295.11	351.62		
Ouachita Power	CTGEN2		LA	100%	Natural gas	453,362.00	453,362.00	213.08	253.88		

Generating facility and EPA Acid Rain Unit ID	EPA Acid Rain Unit ID (Entergy ID if different)	Max capacity (MW)	State	Entergy equity share of unit	Primary fuel(s)	Total unit CO2 (1)	Entergy equity share of unit CO2 emissions	Entergy share CH4 emissions from generation (2)	Entergy share N2O emissions from generation (3)	Total Facility CO2e in short tons	Total CO2e in metric tons
Ouachita Power	CTGEN3		LA	100%	Natural gas	545,842.00	545,842.00	256.55	305.67		
Totals		0					1,627,090.00	764.73	911.17	1,628,765.90	1,477,591.57
Perryville	1-1		LA	100%	Gas/Oil	803,037.50	803,037.50	377.43	449.70		
Perryville	1-2	718	LA	100%	Gas/Oil	803,037.50	803,037.50	377.43	449.70		
Perryville	2-1		LA	100%	Gas/Oil	31,298.00	31,298.00	14.71	17.53		
Totals		0					1,637,373.00	769.57	916.93	1,639,059.49	1,486,929.76
R S Cogen ⁽⁴⁾	RS-5	425	LA	50%	Natural gas	818,936.70	409,468.35	192.45	229.30		
R S Cogen ⁽⁴⁾	RS-6		LA	50%	Natural gas	784,441.90	392,220.95	184.34	219.64		
Totals		425					801,689.30	376.79	448.95	802,515.04	728,029.40
R S Nelson	4	500	LA	100%	Gas/Oil	0.00	0.00	0.00	0.00		
R S Nelson ⁽⁶⁾	6	385	LA	80.9%	Coal	3,426,142.00	2,771,748.88	748.37	14,025.05		
Totals		885					2,771,748.88	748.37	14,025.05	2,786,522.30	2,527,890.51
Rex Brown	3	349	MS	100%	Gas/Oil	15.00	15.00	0.01	0.01		
Rex Brown	4		MS	100%	Gas/Oil	152,057.00	152,057.00	71.47	85.15		
Totals		0					152,072.00	71.47	85.16	152,228.63	138,099.49
Sabine	1	230	TX	100%	Gas/Oil	190,449.00	190,449.00	89.51	106.65		
Sabine	2	230	TX	100%	Gas/Oil	0.00	0.00	0.00	0.00		
Sabine	3	420	TX	100%	Gas/Oil	696,338.00	696,338.00	327.28	389.95		
Sabine	4	530	TX	100%	Gas/Oil	1,077,274.00	1,077,274.00	506.32	603.27		
Sabine	5	480	TX	100%	Gas/Oil	724,652.00	724,652.00	340.59	405.81		
Totals		1890					2,688,713.00	1,263.70	1,505.68	2,691,482.37	2,441,671.74
Sterlington	7AB	102	LA	100%	Gas/Oil	2,430.50	2,430.50	1.14	1.36		
Sterlington	7C	101	LA	100%	Gas/Oil	2,430.50	2,430.50	1.14	1.36		
Totals		203					4,861.00	2.28	2.72	4,866.01	4,414.37
Union Power Station ⁽⁷⁾	CT 1	495	AR	100%	Gas	530,569.50	530,569.50	249.37	297.12		
Union Power Station	CT 2		AR	100%	Gas	530,569.50	530,569.50	249.37	297.12		
Union Power Station	CT 3	495	AR	100%	Gas	494,204.00	494,204.00	232.28	276.75		
Union Power Station	CT 4		AR	100%	Gas	494,204.00	494,204.00	232.28	276.75		
Union Power Station	CT 5	495	AR	100%	Gas	520,896.50	520,896.50	244.82	291.70		
Union Power Station	CT 6		AR	100%	Gas	520,896.50	520,896.50	244.82	291.70		
Union Power Station	CT 7	495	AR	100%	Gas	452,627.00	452,627.00	212.73	253.47		
Union Power Station	CT 8		AR	100%	Gas	452,627.00	452,627.00	212.73	253.47		
Totals		1980					3,996,594.00	1,878.40	2,238.09	4,000,710.49	3,629,383.51
Waterford	1	411	LA	100%	Gas/Oil	451,556.00	451,556.00	212.23	252.87		
Waterford	2	411	LA	100%	Gas/Oil	550,616.00	550,616.00	258.79	308.34		
Waterford	4		LA	100%	Oil	9,782.00	9,782.00	4.60	5.48		
Totals		822					1,011,954.00	475.62	566.69	1,012,996.31	918,974.80
White Bluff	1	465	AR	57%	Coal	3,819,075.00	2,176,872.75	587.76	11,014.98		
White Bluff	2	481	AR	57%	Coal	5,432,215.00	3,096,362.55	836.02	15,667.59		
Totals		946					5,273,235.30	1,423.77	26,682.57	5,301,341.64	4,809,296.24

Totals	52,463,311.60	39,644,951.65	15,735.48	87,398.17	39,748,085.31	36,058,856.44
	short tons CO2	short tons CO2	short tons CO2e	short tons CO2e	Total Facility CO2e in short tons	Total CO2e in metric tons
	Total unit CO2 (1)	Entergy equity share of unit CO2 emissions	Entergy share CH4 emissions from generation (2)	Entergy share N2O emissions from generation (3)		

Generating facility and EPA Acid Rain Unit ID EPA Acid Rain Unit ID (Entergy ID if different) Max capacity (MW) State Entergy equity share of unit Primary fuel(s)

Total unit CO2 (1)	Entergy equity share of unit CO2 emissions	Entergy share CH4 emissions from generation (2)	Entergy share N2O emissions from generation (3)
CO2 from CEM		CH4	N2O

Total Facility CO2e in short tons	Total CO2e in metric tons
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(1) CEM data reported to EPA Acid Rain program - can be verified at EPA's Clean Air Market's Database located at http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard&EQW_datasetSelection=

(2) Emissions factor derived from CH4 (in CO2e) as percentage of emissions from CO2 for a specific fuel type. See "Emissions and Conversion Factors" for EPA emissions factors for specific fuels; emissions factor for natural gas used for all dual-fuel units as this represents the larger fuel input

(3) Emissions factor derived from N2O (in CO2e) as percentage of emissions from CO2 for a specific fuel type. See "Emissions and Conversion Factors" for EPA emissions factors for specific fuels; emissions factor for natural gas used for all dual-fuel units as this represents the larger fuel input

(4) Emission data obtained directly from the EPA's Database located at <http://ampd.epa.gov/ampd/>

(5) While Entergy owns 42% of Big Cajun 2 Unit 3, our actual consumption of the MWhs generated from this facility varies from 42% to 45%. CO2 emission number shown is based on actual consumption of MWhs received from Fossil Operations.

(6) During 2012, EWC (EAM Nelson Holdings, LLC) acquired 10.9% of this unit. Therefore, Entergy's overall ownership share of this unit increased to 80.9%

Additional Notes

- Emissions from Louisiana Station Plant 1 (Units 1A, 2A, 3A, 4A, 5A) are not included in the inventory; these units exist for the sole use of Exxon under a long term lease agreement.
- The following units were removed from the Inventory in 2014 - Lynch 2&3, Couch 1&2, Lake Catherine 1-3, Louisiana Station 2 (units 10-12), Ninemile 1&2, Nelson 3, Richie 1&2, and Sterlington 10. These units are either permanently retired (decommissioned in some cases) or are in extended reserve shutdown and are not expected to return to service.
- The following units were ADDED to the inventory in 2014 - Ninemile 6A and 6B - these units came online during December of 2014.
- The Acadia power plant has two units - Unit 1 (CT1 & CT2) is owned by CLECO, while Unit 2 (CT3 & CT4 as shown above) is owned by Entergy.

Small combustion sources at all generation stations - Updated for 2017

Small stationary combustion sources were initially calculated for all known equipment co-located at generating stations using parameters (such as max energy input/hour) developed in internal emissions compliance documents and assumed equipment capacity factors.

Starting in 2013, Entergy reported the previous year's GHG (CO2e) emissions from small sources co-located at Fossil plants in compliance with the EPA Mandatory Reporting Rule (General Stationary Fuel Combustion - Subpart C).

These updated values are substituted for the older, 2005 calculations in order to be consistent with mandatory GHG reporting. Nuclear estimates continue to rely on the 2005 calculations unless otherwise noted. The Thermal assets were divested in late 2013, so these assets and emission are removed from the inventory.

More detail on each of these facilities, the specific data collection methods, and the calculation methodology, can be found in the GHG Monitoring Plan required by the EPA Mandatory Reporting Rule.

Plant	CO2e Emissions reported under Mandatory Reporting Rule (short tons of all gases in 2017) [obtained from Power Generation unless otherwise noted]	CO2e Emissions reported under Mandatory Reporting Rule (metric tons of all gases in 2017) [obtained from Power Generation unless otherwise noted]	
Fossil fuel generating stations			
Atalla	0.0	0.0	
Baxter Wilson	0.0	0.0	
Buras	0.0	0.0	
Calcasieu	0.0	0.0	
Gerald Andrus	4,348.0	3,944.5	
Hinds County	1,422.4	1,280.4	
Hot Spring	7.4	6.7	
Independence	521.4	473.1	(~50% ownership share)
Lake Catherine	1,169.5	1,061.0	
Lewis Creek	111,606.0	101,249.0	
Little Gypsy	928.8	842.6	
RS Nelson	0.0	0.0	(80.9% ownership share)
Ninemile Point	5,794.3	5,256.6	
Ouachita	140.2	127.2	
Perryville	2,611.9	2,369.5	
Rex Brown	628.3	570.0	
Sabine	94,853.7	86,051.3	
Sterlington	-	-	Below reporting threshold
Union	-	-	No Subpart C affected sources
Waterford 1&2	963.2	873.8	
White Bluff	163.0	147.9	(57% ownership share)
Power Gen TOTAL	225,158.3		

Nuclear generating stations ⁽²⁾⁽³⁾	Plant total small sources CO2e (short tons using 2005 estimate calculations)	
Pilgrim	14,818.0	Closure expected May 31, 2019
River Bend	687.0	
Indian Point 2	18,558.0	Slated to close in 2020
Indian Point 3	80.0	Slated to close in 2021
Palisades ⁽¹⁾	7,757.0	Slated to close in 2022
Waterford 3	7,042.0	
Grand Gulf	11,131.0	
Arkansas Nuclear 1&2	11,728.0	
Nuclear TOTAL (short tons)	71,801.0	
All small source totals	296,959.3	

Direct Emissions from fossil fuel usage for company mobile fleet ("Mobile Combustion")

Note: The information below was collected and results calculated based on 2016 data.

Beginning in 2013, the GWP for N2O and CH4 was modified based on the EPA final rule effective 1/1/14.

Fuel Description	Fuel Code	Units consumed (gal)	Assumptions/Comments
Diesel	D	2,671,325	Based on 2017 Entergy data provided by Carolanne Nichols, it is assumed that totals for all bi-fuel categories are split at a 90/10 ratio between constituent fuel types and are calculated as such. Bi-fuels are separated below into its constituent fuel type category and emissions calculated. Green Plug-In (JEMS) units run on diesel on the highway and electricity on the job site. CNG is measured in Gallons of Gasoline Equivalency or GGE. One gallon of CNG or GGE has the same energy value as a gallon of gasoline. "Unknown" split evenly (50/50) between diesel and gasoline.
Gasoline	G	842,819	
BiFuel-Gasoline/Ethanol	S	705,341	
BiFuel-Gasoline/CNG	A	19	
BiFuel-Gasoline/LPG	B	25	
BiFuel-Diesel/Electricity	F	0	
Propane	P	77	
CNG	C	62	
LPG	L	253	
Green Plug-In JEMS	J	35,557	
BiFuel-Gasoline/Electricity	H	1,770	
Unknown	-	0	
Jet fuel		613,272	
Total gallons consumed		4,870,520	

Total units of each fuel type				CO2 using EPA Climate Leaders Efs		CO2 using WRI/WBCSD Protocol Efs	
Fuel	Total units consumed (GALLONS) - from inputs above	conversion to energy content (MMBtu/gallon)	Total MMBtu consumed	Emissions Factor (lbs CO2/MMBtu)	Total CO2 Emissions (short tons)	Emissions Factor (kg CO2/Gallon)	Total CO2 Emissions (short tons)
Diesel	2,706,882	0.1387	375,445	159.68	29,975	10.15	30,285
Gasoline	1,479,436	0.1251	185,077	156.44	14,477	8.81	14,367
Ethanol (E85)	70,534	0.0843	5,946	149.59	445	5.56	432
CNG	64	0.1251	8	116.41	0	See note	0
LPG	256	0.092	24	138.76	2	5.79	2
Propane	77	0.092	7	138.32	0	5.79	0
Jet fuel	613,272	0.135	82,792	154.72	6,405	9.57	6,469
Totals	4,870,520		649,298		51,304		51,557

Note: Emissions from Ethanol are considered "biogenic" emissions and do not contribute to net CO2 additions to the atmosphere. They are included with fossil fuel CO2 because it is de minimus.

Regarding CNG, no SCF measurement is available; used the EPA CL number as a proxy.

Direct Emissions of N2O and CH4 from mobile fleet ("Mobile Combustion")

The calculation below uses conservative N2O and CH4 emissions factors to estimate these emissions from mobile sources. The emissions factors are from EPA Climate Leaders Guidance for construction vehicles.

NOTE - Emission factors for these gases were not available for all fuel types - a conservative approach was used by using the emission factor for diesel.

N2O from mobile sources					
N2O	gallons consumed	g N2O/gal fuel	total kg N2O	short tons	CO2e short tons
Gasoline	1,479,436	0.22	325.48	0.366	108.92
Diesel	2,706,882	0.26	703.79	0.790	235.53
Jet Fuel	613,272	0.26	159.45	0.179	53.36
Propane	77	0.26	0.02	0.000	0.01
CNG	64	0.26	0.02	0.000	0.01
LPG	256	0.26	0.07	0.000	0.02
Ethanol	70,534	0.26	18.34	0.021	6.14
total					403.98

CH4 from mobile sources					
CH4	gallons consumed	g CH4/gal fuel	total kg CH4	short tons	CO2e short tons
Gasoline	1,479,436	0.50	739.72	0.831	20.77
Diesel	2,706,882	0.58	1,569.99	1.763	44.08
Jet Fuel	613,272	0.58	355.70	0.399	9.99
Propane	77	0.58	0.04	0.000	0.00
CNG	64	0.58	0.04	0.000	0.00
LPG	256	0.58	0.15	0.000	0.00
Ethanol	70,534.10	0.58	40.91	0.046	1.15
total					75.99

Total N2O and CH4 CO2e	479.97
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Total Estimated Emissions from Mobile Sources (short tons CO2e)	52,037
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Emissions from natural gas from T&D operations

The calculation for Gas Operations below is based on as reported data from the GHG Summary Report for 2016. The Spindletop Gas Storage facility emissions are calculated using GRI emission factors (see notes below).

Gas Operations	CO2 equivalent emissions from facility subparts C-II, SS, and TT (metric tons) Subpart W, Fugitive	Total CO2 equivalent emissions (short tons)
Entergy Louisiana, L.L.C. Gas Business	9,860.2	10,869.0
Entergy New Orleans, Inc. Gas Business	31,540.8	34,767.7
SUB-TOTAL		45,636.7

Spindletop Storage					
Storage facilities	# storage facilities	Emissions factor (metric ton CH4/station-yr)	Total metric tons CH4	Total short tons CH4	Total short tons CO2e (Cell E x 25)
Fugitive Emissions from Storage Facilities	1	675.4	675.40	744.50	18,612.50
Vented Emissions from Storage Facilities	1	217.3	217.30	239.53	5,988.30
SUB-TOTAL					24,600.80

See note 3
See note 4

TOTALS FROM FUGITIVE NATURAL GAS 70,238 short tons CO2e

GENERAL NOTES:

- Source for emissions factors by equipment type is the Gas Research Institute (GRI), which provides factors in metric units only.
- Fugitive and oxidized CO2 are known sources of GHG emissions from a natural gas T&D system; however these were not calculated as they are determined to be de minimus compared to CH4 from this source.

SPECIFIC NOTES:

- (1) Compressors are assumed to be for natural gas transmission, not storage.
- (2) general emissions factor used for vented gas; GRI provides emissions factors for specific equipment venting.
- (3) EF from API Table 6-1, (American Petroleum Institute), Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry.
- (4) EF from GRI

Direct Emissions of Escaped SF6 in Electricity T&D System ("Fugitive Emissions")

Note: The information below was as reported to the EPA under Subpart DD of the Mandatory GHG Reporting Rule.

More detail on the specific data collection methods, and the calculation methodology, can be found in the GHG Monitoring Plan required by the EPA Mandatory Reporting Rule.

2018 Fugitive SF6 Emissions Estimate			
SF6 Emissions (short tons) (1)	Global Warming Potential (GWP) (2)	Total CO2 Equivalent Emissions (short tons)	Total CO2 Equivalent Emissions metric tons
11.49	22,800	261,988.6	237,671.9

(1) Converted 22,981.46 pounds to short tons - the amount of emissions reported for CY 2017.

Direct Emissions of Fugitive HFCs in all utility cooling and A/C equipment

This sheet contains calculations for all sources of fugitive HFCs. HFCs from all sources are considered de minimus (i.e. insignificant in the Entergy corporate total). The activity data required to provide the highest level of accuracy is difficult and impractical to obtain for such a small source. Instead, emissions factors have been created based on national averages for a number of variables to provide a rough estimate of these emissions. The methodology behind these emissions factors is found below.

These CO2e totals are calculated using data, provided by Real Estate as of December 31, 2016, that does not change significantly between inventory years. These same data and emissions totals are used each year.

2010 Update - Facilities indicates that there is no significant change to these numbers; therefore, these numbers will continue to be carried forward each year.

2013 Update - carried historical data forward; however, updated the GWP consistent with an EPA final rule that became effective on 1/1/14.

2014 Update - removed the Thermal Operations facilities, as these were sold in late-2013.

2015 Update - No changes made

2016 Update - Values updated as of December 31, 2016

2017 Update - No changes made

2018 Update - No changes made

	square footage air conditioned	EF: fugitive HFCs (short tons CO2e/sq ft)	Facility fugitive HFC (short tons CO2e)
Entergy owned space	2,158,989	0.00078	1,683
Entergy capital lease space	1,708,276	0.00078	1,332
Generation plant space	1,700,000	0.00078	1,325
Total Fugitive HFCs	5,567,265		4,340

Generation plant space assumes 50,000 sq. ft. per plant; 34 plants assumed.

From Nuclear facility			
	lbs HFC charged to equipment	EF: fugitive HFCs as CO2e (GWP=1300)	Facility fugitive HFC (short tons CO2e)
	0	1300	0

Entergy nuclear facilities **do not** use HFCs for cooling

From all Entergy-owned vehicles			
	Total CO2 from mobile sources (short tons)	EF: HFC as % of CO2 emissions **	Facility fugitive HFC (short tons CO2e)
Vehicular A/C	52,037	3.50%	1,821

Total CO2 from all mobile source fuels are included

Total fugitive HFC emissions 6,161 short tons CO2e

* Calculation for estimating fugitive HFC emissions from building space using A/C

The calculation used in calculating the emissions factor for metric tons of CO2e fugitive HFC.	Average cooling capacity of chiller (ft2/ton of cooling capacity)	HFCs in chiller (kg HFC/tons of cooling)	Annual HFC loss factor (percent)	Total Annual HFC losses (MT HFC/1000 ft2)	Total Annual HFC losses (MT CO2e)/1000 ft2	Total Annual HFC losses (MT CO2e)/ ft2	Total Annual HFC losses (short tons CO2e)/ ft2
	280	1.2	15%	0.000642857	0.71	0.00071	0.00078

Source: ASHRAE (http://www.themoder mottgroup.com/News worthy/HVAC%20essu es/Rule%20of%20Thu mb%20Sizing.htm) Note that this is a conservative estimate - a reasonably designed building should be more like 400.

Source: http://www.usgbc.org/LEED/sac/energy.asp

Source: EPA Climate Leaders Guidance, January 2004. Note: This estimate is the source of the greatest uncertainty in the calculation, since the range is 2-15%, and the average is probably more like 5%.

This is the emissions factor that is applied to the square footage of air-conditioned space. This EF includes the global warming potential for HFC 134a (1,100).

Emissions factor for MT CO2e per ft2.

Emissions factor for short tons CO2e per ft2; conversion factor 1.1023

Calculation to estimate HFCs from mobile A/C as percentage of CO2 emissions from mobile sources using national averages for equipment leakage and miles/gallon

Vehicle type	HFC Emissions Estimate			CO2 Emissions Estimate				Emissions factor: HFC emissions (CO2e) to CO2 (as %)
	HFC capacity (kg HFC)	annual leakage rate (percentage)	CO2 emissions (kg CO2e/yr-veh); GWP=1100	Miles per gallon	Miles per year	Emission factor (kg CO2/gal)	CO2 Emissions (kg CO2/yr-veh)	
Car	0.8	20%	176	20	15,000	8.87	6,653	2.6%
light truck	1.2	20%	264	15	15,000	8.87	8,870	3.0%

Power purchased to serve utility customers
Controllable power purchases - 2018

				2018			
Code	Plant description	FACILITY CODE (SPO)	State	Total Energy purchased from plant (MWh)	Unit/Plant-Specific Emission Factor (lbs CO2/MWh), Based on Total Output [from eGRID2016 data, released 2/15/2018 unless otherwise noted]	CO2 emissions from purchased power (short tons) [using eGRID Unit-Specific Factors (when available)]	Comments/Notes
				65,831.0	14.9	490.6	
				3,019,521.1	729.1	1,100,752.8	
				1,303,896.1	872.6	568,914.6	
				93,424.0	1,517.9	70,905.4	
				26,280.0	-	-	
				1,512,866.2	1,062.6	803,793.4	
				2,819,176.3	822.7	1,159,692.1	
				215,150.4	-	-	
				32,760.0	2,360.7	38,668.8	
Totals				9,088,905.1		3,743,217.8	short tons CO2
N2O emissions from controlled purchases (SERC MS Valley Total Output Rate, eGRID2016)				0.007	lbs/MWh	9,479.7	short tons CO2e
CH4 emissions from controlled purchases (SERC MS Valley Total Output Rate, eGRID2016)				0.050	lbs/MWh	5,680.6	short tons CO2e

- some units may be in different control areas or eGRID subregions; however, impact to the overall GHG inventory is expected to be negligible.

Total CO2e from Controllable Purchases

TOTAL	3,758,378.1	short tons CO2e
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Indirect Emissions associated with purchased power

	Totalpchs'd power MWh	Loss factor %	Total power lost MWh	
CO2 emissions from T&D losses of purchased power on Entergy system	9,088,905	3.485%	316,725	130,441.3 short tons CO2
CH4 emissions from T&D losses of purchased power on Entergy system				27.7 short tons CO2e
N2O emissions from T&D losses of purchased power on Entergy system				2,359.6 short tons CO2e
TOTAL				132,828.7 short tons CO2e

Grid Power purchased for EWC plants/operations (non-Energy power)

Plant and associated facilities ⁽¹⁾	2016 Electricity Usage (kwh)	eGRID Subregion	eGRID2016 Emission Factor (lb CO2e/MWh)	Estimated Emissions (short tons CO2e)
Indian Point Energy Center (IPEC)	96,050,000	NYCW	637.08	30,986.7
James A. Fitzpatrick (JAF)	15,799,000	NYUP	295.94	2,337.6
Pilgrim (PIL)	12,461,000	NEWE	563.72	3,512.2
Palisades (PAL) ⁽²⁾	-	RFCM	1,278.90	0.0
TOTAL	124,310,000			36,445.7 short tons CO2e

(1) Provided by Anthony Dichman based on Station Service Purchases from ISOs. Calculations on file.

(2) Vermont Yankee entered decommission status and did not operate beginning in 2016 - according to Nuclear, their power usage is negligible, so this was removed beginning in 2016.

*** 2014 NOTE - Due to the transition in late 2013 to MISO, Entergy is no longer quantifying emissions from "non-controllable purchases" due to the fact that there is a risk that double counting may occur.

Operating Company	Generation GWh	Purchases GWh	Total Power	Losses	% Lost
EAI	26,428	4,134	30,562	1,300	0.042536483
ELL	40,762	23,112	63,874	2,125	3.32686226
EMI	8,633	5,999	14,632	705	4.81820667
ENOI	2,677	4,795	7,472	119	1.59261242
ETI	6,620	14,278	20,898	308	1.473825246
SERI	6,623	-	6,623	(52)	-0.785142685
ELIM		(14,783)	(14,783)		
TOTALS*	91,743	37,535	129,278	4,505	0.034847383

*Per Kyle Sennino

Source: 2017 Stat Rpt Pages 35 and 36

4,505.00 Total Loss
 129,278.00 Total Power
 0.0348 % Loss

Product Combustion - Emissions from combustion of Natural Gas distributed to retail customers

Values below represent those reported in the 2016 Annual GHG Inventory Report submitted by Gas Operations and provided to ESP for each location.

Gas Operation	CO2 equivalent emissions from supplier subparts LL-QQ (metric tons) Subpart NN Product Combustion	Total CO2 equivalent emissions (short tons)
Entergy Louisiana, L.L.C. Gas Business	328,015.6	361,574.9
Entergy New Orleans, Inc. Gas Business	407,948.0	449,685.2
TOTAL	735,963.6	811,260.0

Employee Commuting Emission Calculations

Commuter Travel Calculations

Commuting Method (more than 75% of time)	Number of Employees =
Walkers =	144
Bikers =	44
Carpoolers =	1154
Vanpoolers =	33
Public Transportation =	67
Individual Drivers =	12558
Total	14000

Survey # (n)	%
13	1.03%
4	0.32%
104	8.24%
3	0.24%
6	0.48%
1132	89.70%
1262	100.00%

Commuting Distance (miles one-way)	Low	Avg	High	# Employees	SURVEY RESPONSES (#)	SURVEY RESPONSES (%)
0.0	0.5	0.9	202	25	1%	
1.0	3.0	5.0	1553	192	11%	
6.0	8.0	10.0	2572	318	18%	
11.0	15.5	20.0	3227	399	23%	
21.0	25.5	30.0	2548	315	18%	
31.0	35.5	40.0	3998	482	23%	
Total	70.0	88.0	105.9	14000	1731	100%

Distribution of Commuting Method by Miles	Individual Drivers	Carpoolers	Vanpoolers	Public	Bikers	Walkers
	181	-	-	-	1	108
	1393	-	-	-	7	36
	2307	-	-	-	12	-
	2886	-	-	-	15	-
	2285	-	-	-	12	-
	3497	1154	33	-	19	-
Total	12558	1154	33	67	44	144

Method of Transportation	Miles Traveled by Method (using midpoint of mileage range)			Estimated Emissions			
	one way	round trip	yearly miles	yearly gallons	lbs	short tons	met tons
Walkers =	157	314	66811	-	-	-	-
Bikers =	122	244	51890	-	-	-	-
Carpoolers =	40957	81914	17447772	230796	5815924	2908	2638
Vanpoolers =	1181	2363	503301	3355	67107	34	30
Public Transportation =	1325	2650	564467	2258	45157	23	20
Individual Drivers =	249991	499981	106498040	4259842	85196832	42598	38645
Total			125130281	4556251	911250280	45563	41334

Employee Commuter Travel 2014

Commuting method (more than 75% of the time)	Miles travelled per year	Total emissions kg CO2e	Total emissions short tons CO2e	Total Emissions metric tons CO2e	% total commuting emissions
Individual car	106,496,040	39,890,328	43,971	39,891	77.8%
Vanpool	503,301	268,927	296	269	13.1%
Public Transportation	564,467	77,304	85	77	3.8%
Carpool	17,447,772	6,535,429	7,204	6,535	5.3%
Bikers	51,890	-	-	-	0.0%
Walkers	66,811	-	-	-	0.0%
Total	125,130,281	46,771,989	51,557	46,772	100.0%

Commuting method (more than 75% of the time)	Miles travelled per year	Greenhouse gas	Total emissions kg CO2e	Total emissions short tons CO2e	Total Emissions metric tons CO2e	% total commuting emissions
Individual car	106,496,040	CO2	38,764,559	42,730	38,765	82.9%
		CH4	69,329	76	69	0.1%
		N2O	1,056,441	1,165	1,056	2.3%
Vanpool	503,301	CO2	261,213	298	261	0.6%
		CH4	380	0.42	0.38	0.0%
		N2O	7,333	8	7	0.0%
Public Transportation	564,467	CO2	77,077	85	77	0.2%
		CH4	25	0.03	0.02	0.0%
		N2O	201	0.22	0.20	0.0%
Carpool	17,447,772	CO2	6,350,989	7,001	6,351	13.6%
		CH4	11,358	12.52	11.36	0.0%
		N2O	173,082	191	173	0.4%
Bikers	51,890	CO2	-	-	-	0.0%
		CH4	-	-	-	0.0%
		N2O	-	-	-	0.0%
Walkers	66,811	CO2	-	-	-	0.0%
		CH4	-	-	-	0.0%
		N2O	-	-	-	0.0%
Total	125,130,281		46,771,988	51,557	46,772	100.0%

Calculation for Public Transportation	# of miles	Total emissions kg CO2e
50% Bus	282,233	30,246
5% Intercity Rail	28,223	5,231
5% Commuter Rail	28,223	4,864
40% Transit Rail	225,787	36,962
Total	564,467	77,304

EPA Methodology

$E = VMT * (EF_{CO2} + EF_{CH4} * 0.021 + EF_{N2O} * 0.310)$
E = total CO2e
VMT = vehicle miles travelled per year
EF _{CO2} = CO2 emissions factor
EF _{CH4} = CH4 emissions factor
EF _{N2O} = N2O emissions factor
0.021 = conversion factor
0.310 = conversion factor
*used for individual car, carpool and vanpool

Method of travel	EF _{CO2} (kg CO2/vehicle-mile)	EF _{CH4} (g CH4/vehicle-mile)	EF _{N2O} (g N2O/vehicle-mile)
Individual car	0.364	0.031	0.032
Vanpool	0.519	0.036	0.047
Carpool	0.364	0.031	0.032
Bus	0.107	0.0006	0.0005
Short haul airline (domestic)	0.185	0.0104	0.0085
Medium haul airline (continental)	0.229	0.0104	0.0085
Long haul airline (intercontinental)	0.277	0.0104	0.0085
Intercity rail	0.185	0.002	0.001
Commuter rail	0.172	0.002	0.001
Transit rail	0.163	0.004	0.002

$E = PMT * (EF_{CO2} + EF_{CH4} * 0.021 + EF_{N2O} * 0.310)$
E = total CO2e
PMT = passenger miles travelled per year
EF _{CO2} = CO2 emissions factor
EF _{CH4} = CH4 emissions factor
EF _{N2O} = N2O emissions factor
0.021 = conversion factor
0.310 = conversion factor
*used for bus, air and rail travel

Estimating Fuel Use		
FU = Fuel use = DT * FE		
DT = Distance travelled activity factor		
FE = Fuel economy factor (ie. kgCO2/mile, gCH4/mile, gN2O/mile) *see emissions factors chart above		
*used to determine the breakdown of CO2, CH4, N2O within total CO2e.		

EPA Methodology sourced from EPA website
http://epa.gov/climateleadership/documents/resources/commute_travel_product.pdf
http://www.epa.gov/climateleadership/documents/resources/mobilesource_guidance.pdf

Assumptions
 9/80 schedule - all employees commute nine days every two weeks
 2 weeks of vacation
 12 holidays
 For a total of 213 work days per employee per year
 Walkers and bike riders all put into 0 to 5 miles
 Carpoolers and Vanpoolers all put in the over 30 miles category
 Used midpoint of mileage ranges surveyed
 Assuming 20 pounds of CO2 emitted per gallon of fuel burned
 Methodology sourced from EPA Climate Leaders: Greenhouse Gas Inventory Protocol Core Module Guidance
 Specific sections: *Optional Emissions from Community Business Travel and Product Transport*
 Data sourced from Copy of Employee Commuting Emission Estimation 2014.
 Public transportation method compiled from percentages estimated from data recording passenger trips in urbanized areas: 50% bus, 5% intercity rail, 5% commuter rail and 40% transit rail.
 Source: US Census Bureau, Statistical Abstract of the United States: 2012
 Mileage based off of a survey of 1400 employees.
 Data sourced from Copy of Employee Commuting Emission Estimation 2014.

EPA Climate Leaders Emissions Factors for Fossil Fuel and Biomass Combustion

The emissions factors below have been updated from the EPA Climate Leaders GHG inventory Protocol, October 2004 and with any other EPA Final Rules.

Fuel type	Heating Value (HHV); custom heating values should be used if available	Carbon content coefficient (kg C/MMBtu) (based on HHV)	Fraction oxidized	CO2 Emissions -- kg			CO2 Emissions -- lbs			CH4 Emissions				N2O Emissions			
				EPA emission factor (kg CO2/MMBtu (HHV)*	EPA emission factor (kg CO2/mass or volume unit)	EPA emission factor (kg CO2/mass or volume unit)	EPA emission factor (lbs CO2/MMBtu (HHV)*	EPA emission factor (lbs CO2/mass or volume unit)	EPA emission factor (lbs CO2/mass or volume unit)	EPA emission factor (g CH4/MMBtu)	EPA emission factor (kg CO2e/MMBtu) GWP=25	EPA emission factor (lbs CO2e/MMBtu)	CH4 (CO2e) emissions factor (lbs CO2e CH4/lb CO2)	EPA emission factor (g N2O/MMBtu)	EPA emission factor (kg CO2e/MMBtu) GWP=298	EPA emission factor (lbs CO2e/MMBtu)	N2O (CO2e) emissions (lbs CO2e N2O/lb CO2)
Liquid fossil	MMBtu/bbl			kg CO2/gallon	kg CO2/bbl		lbs CO2/gallon	lbs CO2/bbl									
Gasoline / petrol	5.253	19.34	0.99	70.95	8.79	369.18	156.44	19.38	814.04								
Kerosene	5.670	19.72	0.99	71.58	9.66	405.88	157.84	21.31	894.97	Note: CH4/N2O emissions factors for all mobile sources are dependent on many variables; for mobile sources consult the EPA Guidance Protocol							
Jet Fuel	5.670	19.33	0.99	70.17	9.47	397.74	154.72	20.88	877.02								
Aviation gasoline	5.048	18.87	0.99	68.50	8.23	345.66	151.04	18.15	762.18								
Distillate fuel (# 1,2,4, diesel)	5.825	19.95	0.99	72.42	10.08	423.36	159.68	22.23	933.51	1.8 (ind)	0.045	0.099	0.0006	.54 (ind)	0.16092	0.355	0.0022
Residual fuel oil (#5,6)	6.287	21.49	0.99	78.01	11.68	490.44	172.01	25.75	1,081.42	2.7 (elect gen)	0.068	0.149	0.0009	.54 (elect gen)	0.16092	0.355	0.0022
LPG	3.861	17.25	0.99	62.62	5.65	237.45	138.07	12.47	523.58	1.8 (ind)	0.045	0.099	0.0006	1.8 (ind)	0.16092	0.355	0.0021
Propane	3.824	17.2	0.99	62.44	5.71	239.90	137.67	12.59	528.98	2.7 (elect gen)	0.068	0.149	0.0009	2.7 (elect gen)	0.16092	0.355	0.0021
Ethane	2.916	16.25	0.99	58.99	4.12	172.91	130.07	9.08	381.27	Note: CH4/N2O emissions factors for all mobile sources are dependent on many variables; for mobile sources consult the EPA Guidance Protocol							
n-Butane	4.326	17.72	0.99	64.32	6.66	279.80	141.83	14.69	616.96								
Isobutane	4.162	17.75	0.99	64.43	6.42	269.52	142.07	14.15	594.29								
E85	see EPA Guidance					0.00	0.00		0.00								
CNG	1.027	14.47	0.995	52.79	.054 /cf			.12 /cf									
LNG					5.91 /gal			13.01 /gal									
Petroleum coke	6.024	27.85	0.99	101.10	609.00		0.00		0.00								
Gaseous fossil	MMBtu/mcf				cu. ft.			cu. ft.									
Natural gas (dry)	1.027	14.47	0.995	52.79	0.0542		116.41	0.1195		4.75 (ind)	0.119	0.262	0.00225	0.095 (ind)	0.028	0.062	0.0005
										0.95 (elect gen)	0.025	0.055	0.00047	0.095 (elect gen)	0.030	0.066	0.0006
Solid fossil	MMBtu/short ton				short ton			short ton									
Anthracite	25.09	28.26	0.99	102.58	2,573.83		226.20	5,675.30		10.0 (ind)	0.250	0.551	0.00265	1.4 (ind)	0.42	0.92	0.0044
Bituminous coal	24.93	25.49	0.99	92.63	2,306.74		204.03	5,086.36		1.0 (elect gen)	0.025	0.055	0.00027	1.4 (elect gen)	0.48	1.05	0.0051
Sub-bituminous coal	17.25	26.48	0.99	96.12	1,658.11		211.95	3,656.13		Use the CH4/N2O emissions factors above for all coal types							
Lignite	14.21	26.3	0.99	95.47	1,356.61		210.51	2,991.33		% of "unspecified coal"							
Coke	24.80	27.85	0.99	101.10	2,507.17		222.92	5,528.31		% of "unspecified coal"							
Unspecified (elec gen)	20.63	25.98	0.99	94.31	1,945.56		207.95	4,289.96									
Unspecified (indus)	23.03	25.75	0.99	93.47	2,151.84		206.11	4,744.81									
Biofuels																	
Wood and wood waste	15.38 MMBtu /short	25.6	0.995	92.93	1,429.23 /short		204.91	3,135.2 /short		30.1 (ind/elect gen)	0.753	1.659	0.0081	4.01 (ind/elect gen)	1.19	2.63	0.0129
Landfill gas (50/50)	502.5 Btu/cu ft.	14.2	0.995	51.81	.0260 /cf		114.24	.05733 /cf		Note: CH4 and N2O factors for wood are significant. All fossil fuels are less than 1% compared to the factors for CO2.							
Biodiesel					9.29 /gal			20.48 /gal	860.35 /gal	Note: CH4/N2O emissions factors for all mobile sources are dependent on many variables; for mobile sources consult the							
Ethanol (100)	3.539 MMBtu/bbl	17.99	0.99	65.30	5.5 /gal		143.99	12.13 /gal	509.46 /bbl								

Note: It is assumed the combustion of biomass and biofuels does not contribute to net CO2 emissions. As a result, Partners are required to list biomass CO2 emissions in terms of total gas but the emissions are not included in the overall CO2-equivalent emissions corporate inventory.

Conversion Factors used in this inventory

Mass

1 pound (lb)	453.6 grams (g)	0.4536 kilograms (kg)	0.0004536 metric tons (tonne)
1 kilogram (kg)	2.205 pounds (lb)		.0011023 short tons
1 short ton (ton)	2'000 pounds (lb)	907.2 kilograms (kg)	.9072 metric tons
1 metric ton	2'205 pounds (lb)	1'000 kilograms (kg)	1.1023 short tons (tons)

Volume

1 cubic foot (ft ³)	7.4805 US gallons (gal)	0.1781 barrel (bbl)	
1 cubic foot (ft ³)	28.32 liters (L)	0.02832 cubic meters (m ³)	
1 US gallon (gal)	0.0238 barrel (bbl)	3.785 liters (L)	0.003785 cubic meters (m ³)
1 barrel (bbl)	42 US gallons (gal)	158.99 liters (L)	0.1589 cubic meters (m ³)
1 litre (L)	0.001 cubic meters (m ³)	0.2642 US gallons (gal)	
1 cubic meter (m ³)	6.2897 barrels (bbl)	264.2 US gallons (gal)	1,000 liters (L)

Energy

1 kilowatt hour (kWh)	3,412 Btu (btu)	3,600 kilojoules (KJ)	
1 megajoule (MJ)	0.001 gigajoules (GJ)		
1 gigajoule (GJ)	0.9478 million Btu (million btu)	277.8 kilowatt hours (kWh)	
1 Btu (btu)	1,055 joules (J)		
1 million Btu (million btu)	1.055 gigajoules (GJ)	293 kilowatt hours (kWh)	
1 therm (therm)	100,000 btu	0.1055 gigajoules (GJ)	29.3 kilowatt hours (kWh)

Other

kilo	1,000		
mega	1,000,000		
giga	1,000,000,000		
tera	1,000,000,000,000		
1 psi	14.5037 bar		
1 kgf / cm ³ (tech atm)	1.0197 bar		
1 atmosphere (atm)	0.9869 bar	101.325 kilo pascals	14.696 pounds per square inch (psia)
1 mile (statue)	1.609 kilometers		
1 metric ton CH ₄	21 metric tons CO ₂ equivalent		
1 metric ton N ₂ O	310 metric tons CO ₂ equivalent		
1 metric ton carbon	3.664 metric tons CO ₂		

Global Warming Potentials and Atmospheric Lifetimes (years)		
Gas Atmospheric Lifetime GWP ^a		
Greenhouse Gas	Atmospheric Lifetime	Global Warming Potential
Carbon dioxide (CO ₂)	50-200	1
Methane (CH ₄) ^{b,c}	12 +/- 3	25
Nitrous oxide (N ₂ O) ^c	120	298
HFC-23 ^c	264	14,800
HFC-125 ^c	32.6	3,500
HFC-134a ^c	14.6	1,100
HFC-143a ^c	48.3	4,470
HFC-152a ^c	1.5	124
HFC-227ea ^c	36.5	3,220
HFC-236fa ^c	209	9,810
HFC-4310mee ^c	17.1	1,640
CF ₄	50,000	6,500
C ₂ F ₆	10,000	9,200
C ₄ F ₁₀	2,600	7,00
C ₆ F ₁₄	3,200	7,400
SF ₆ ^c	3,200	22,800

Source: Unless otherwise noted by note 'c' below, IPCC's Fourth Assessment Report (2007) GWPs.

a using a 100 year time horizon

b The methane GWP includes the direct effects and those indirect effects due to the production of tropospheric ozone and stratospheric water vapor.

c Effective January 1, 2014, the Environmental Protection Agency, through issuance of a final rule, raised the GWP for methane and several classes of hydrofluorocarbons, while lowering the GWP for both nitrous oxide and sulfur hexafluoride.

The indirect effect due to the production of CO₂ is not included.

Color key to calculations in the Entergy GHG Inventory

The colored heading cells in each worksheet of this GHG inventory enable inventory managers and users update and understand the role of each step of the calculation process.

Yellow	Specific fuel or gas calculated	This heading identifies the fuel and emissions being calculated below it.
Red	Annual activity data input	This is an input cell for company activity or usage data related to this emissions source for a given facility, source or even corporate-wide. Examples of input data are gallons of gasoline, lbs of CO ₂ (provided as CEM data), or square footage of building space occupied by the company. This activity data is currently identified in the units provided during the completion of PNM's GHG inventory for years 2001-2003. For some de minimus emissions sources (such as fugitive HFCs from building space
Orange	Calculation constant	This cell contain as constant (coefficient) such as a conversion factor or unit measurement and does not to be changed annually unless there is a change to an emissions factor, input units or facility status.
Green	Calculation conversion subtotal	This figure is calculated automatically and is a subtotal or unit conversion resulting from a spreadsheet calculation such as MMBtu converted from mcf or gallons. This cell contains an emissions or conversion factor in its formula.
Blue	Emissions source total	This figure is calculated automatically and is a total of CO ₂ e (CO ₂ -equivalent) for a given emissions source (e.g. a facility or equipment type) and the sum of individual sources is carried into the annual corporate emissions table. This cell contains an emissions or conversion factor in its formula.
123.45	Emissions source total	Bolded cells contain a figure for total emissions in CO ₂ e for that source and are carried to the corporate emissions totals sheet for emissions source comparison.

Attachment 2

2017 GHG Inventory Verification Statement and Report

ENTERGY 2018 GHG EMISSIONS INVENTORY

Verification Report

March 6, 2019



103 Magnolia Tree Ct
Cary, NC 27518



Statement of Verification

March 4, 2019

Entergy Corporation
Environmental Strategy & Policy Group
Entergy Services, Inc.
639 Loyola Avenue
New Orleans, LA 70113

Scope

Entergy Corporation (“Responsible Party”) engaged Cventure LLC (“Verifier”) to review Entergy Corporation’s 2018 Corporate Greenhouse Gas (GHG) emissions inventory, and supporting evidence including Entergy’s Greenhouse Gas Inventory Management Plan and Reporting Document (IMPRD), detailing the GHG emissions and associated source documents, over the period January 1, 2018 to December 31, 2018 inclusive. These components are collectively referred to as the “GHG Assertion” for the purposes of this statement.

The Responsible Party is responsible for the preparation and presentation of the information within the GHG Assertion. The Verifier’s responsibility is to express a conclusion as to whether anything has come to our attention that the GHG Assertion is not presented fairly in accordance with generally accepted GHG accounting standards (e.g., *The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, WRI/WBCSD, March 2004*).

Independence

Cventure was not involved in the preparation of Entergy’s GHG emissions inventory. It did not participate in any associated GHG emissions data collection, management, and reporting activities, nor the development of associated emissions or usage estimates, and any subsequent assertions made by Entergy. Cventure has not provided any services to Entergy which could compromise Cventure’s independence as a third party verifier. Cventure disclaims any liability for any decision made by third parties based on this Verification Statement.



Methodology

We completed our review in accordance with the ISO 14064-3 international standard *Greenhouse Gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*. We planned and performed our work in order to provide a limited level of assurance with respect to the GHG Assertion, with review criteria based on *The Greenhouse Gas Protocol* and quantification methodologies referenced in Entergy’s IMPRD. We reviewed the GHG Assertion and associated documentation, and believe that our work provides a reasonable basis for our conclusion.

Conclusion

Based on our verification review, nothing has come to our attention that causes us to believe that the GHG Assertion is materially misstated. The GHG emissions estimates were calculated in a consistent and transparent manner, and were found to be a fair and accurate representation of Entergy’s actual conditions, and were free from material misstatement. Cventure has verified a total of **40,907,780** metric tons of CO₂ equivalent (CO₂e) emissions for calendar year 2018.



Kevin L. Johnson
Lead Verifier, Manager Member
Cventure LLC
Cary, NC USA
Email: kevin.johnson@cventurellc.com
Tel.: (919) 607-0654

1. Introduction

Entergy Corporation (“Entergy”) has prepared a voluntary greenhouse gas (“GHG”) inventory for its corporate operations active through the 2018 calendar year. Entergy has engaged Cventure LLC (“Cventure”) to provide a third-party verification of the GHG inventory, including Scope 1, Scope 2, and select Scope 3 emissions, the “GHG Assertion”, for voluntary GHG reporting purposes for the 2018 calendar year.

The quantification of Entergy’s corporate GHG emissions inventory is guided by the World Resources Institute and World Business Council for Sustainable Resource Development’s *The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, March 2004* (“the GHG Protocol”), using an equity share approach to establish the inventory boundary. The 2018 GHG inventory includes the following emissions sources:

Scope 1: Stationary combustion in electric generating units and small sources at company facilities; mobile combustion in company fleet vehicles; fugitive methane from natural gas transmission and distribution (“T&D”) systems; fugitive sulfur hexafluoride (SF₆) from electric power T&D systems; and fugitive hydrofluorocarbons (HFCs) from building HVAC systems and vehicle air conditioning systems.

Scope 2: Indirect emissions associated with grid purchased power for wholesale generation plants (outside of Entergy’s regulated electricity transmission service territory).

Scope 3: Indirect emissions associated with controllable purchased power¹ for resale to end-users; customer consumption of distributed natural gas; and Entergy employee commuting.

The GHG emissions associated with all electricity consumed in the operation of Entergy’s generation facilities and in Entergy’s various administrative and commercial buildings and operations, in the regulated service territory, are accounted for in the Scope 1 direct emissions from stationary combustion. In addition, emissions associated with line losses through electric power T&D systems are also captured in the Scope 1 emissions associated with stationary combustion. The GHG emissions associated with the full life cycle of the various fuel sources consumed through Entergy’s business operations are not included in the inventory. In line with the 2013 through 2017 inventories and Entergy’s utility generation portfolio, as described on the company’s website², emissions associated with Louisiana Station Plant 1 are also not included in the 2018 inventory, as this plant generates electricity for the sole use of ExxonMobil under a long-term lease agreement.

¹ Controllable purchased power is defined as power for which the originating source (generating plant) is known and for which Entergy has made a direct buying decision.

² “Entergy Corporation and Subsidiaries 2017 Annual Report”; and “Entergy Statistical Report and Investor Guide 2017”.

GHG emissions from stationary combustion and controllable purchased power in aggregate comprise approximately 97% of Entergy’s total 2018 corporate GHG emissions.

Product Combustion, comprising approximately 1.8 percent of Entergy’s total 2018 corporate GHG emissions, include emissions associated with the combustion of natural gas distributed to Entergy’s customers (i.e., a Scope 3 GHG emissions source for Entergy, and a Scope 1 GHG emissions source for their gas distribution customers).

Other Small Sources, comprising approximately 1% of the inventory, include emissions associated with: mobile combustion, purchased electricity for business operations outside Entergy service territory, fugitive CH₄ (natural gas T&D), fugitive HFCs (HVAC systems and vehicles), and employee commuting.

This document describes the terms and scope of this verification. It serves to communicate the findings of the verification.

2. Verification Execution

The scope of the verification was defined during the verification planning stage and is detailed in the Verification Plan, which is appended to this document. The Verification Plan also describes Cventure’s verification process that was executed through the course of the verification. The specific verification procedures that were planned and executed through the verification process are described in the appended Plan. The Verification Plan has evolved during the course of the verification exercise; the final version of the Plan is in the Appendix.

The 2018 GHG inventory verification focused primarily on direct emissions associated with fossil fuel consumption at large electric generating facilities using Continuous Emission Monitoring System (“CEMS”) data, and indirect emissions associated with purchased power. Entergy’s 2018 GHG Inventory includes several small emissions sources (small stationary combustion; fugitive emissions of SF₆ associated with electricity T&D; and customer consumption of distributed natural gas), some of which are *de minimus*³ in nature (mobile combustion in company fleet vehicles; employee commuting; fugitive CH₄ associated with natural gas T&D; and HFCs from air conditioning/cooling refrigerant systems). All emissions sources in Entergy’s corporate 2018 GHG inventory have been reviewed with a focus on stationary combustion from electric generating units and purchased power, given the risk-based approach used in this verification.

³ Entergy describes emissions sources that have been estimated to be less than 1 percent of the total corporate inventory as *de minimus* in its IMPRD.

2.1 Site Visits/Interviews

Site visits were conducted during the period of January 28-29, 2019 in Mississippi and Louisiana. The site visits and interviews consisted of two types of meetings. One set of meetings was devoted to better understanding the operations, data gathering process and links to data systems, management controls, and overall Entergy information systems, through telephone interviews with key Entergy personnel in The Woodlands, Texas. The second included visits to Entergy's Baxter Wilson and Little Gypsy Gas Plants as part of our sampling exercise, in an effort to obtain data from plants and to better understand GHG information and data management systems. This included a review of all GHG emissions sources at the facilities, through plant tours which included the power plant control room, and observations of the CEMS equipment and the natural gas fuel flow metering systems. Subsequently, a review of metering and data management processes was discussed with plant operations staff, including a review of meter calibration/validation procedures.

The site visits were an important step in planning and executing the verification. During the course of the telephone interviews, as well as the plant tours, we interviewed key personnel regarding fossil fuel generation plants operations and environmental data management at Entergy. Key Entergy staff interviewed during the teleconference meetings, as well as during the site visits included:

- Tad Chenet, CEMS Information and Small Stationary Combustion Sources, The Woodlands
- David Bruess, Oil & Gas Energy Analytics, The Woodlands
- Jill Siekmeier and Garrett Branner, Coal Supply and Purchasing/Rail Car Management System (RCMS), The Woodlands
- Grady Kaough, Power Trading Operations, The Woodlands
- Charlotte Freeman, Plant Environmental Analyst, Baxter Wilson Gas Plant
- Martha Hester, Senior Environmental Analyst, Mississippi Environmental Support
- Richard Labranch, Plant Environmental Analyst, Little Gypsy Gas Plant
- Richie Corvers, Senior Environmental Analyst, Louisiana Environmental Support
- Walter Ross, Natural Gas Operations, New Orleans
- Kim Fuller and Toby Chu, SF₆ Management & Quantification

2.2 Verification Approach

This section outlines the approach used to review key emissions sources in the 2018 GHG inventory.

Stationary Combustion: Fossil Fuel Usage at Generating Facilities

The entire inventory of Entergy fossil generation units was reviewed at a limited depth, and a significant sample of data from select units was reviewed in greater detail. Generation units were selected for detailed audit trail reviews based primarily on relative contribution to the 2018 corporate GHG emissions inventory, e.g., using the 1% *de minimus* accounting methodology/reporting threshold of Entergy's GHG inventory, as unit selection screening priority. Other considerations in selecting units for detailed review included large, "sister" units at the same selected generation plant, availability of facility fuel usage validation data (for gas-fired facilities, and to account for some overlap with last year's samples (to test for any changes).

The fifteen (15) generation units selected for this more detailed desktop review included the following 5 coal and 10 natural gas units:

Coal

- Independence 1
- Independence 2
- RS Nelson 6
- White Bluff 1
- White Bluff 2

Gas

- Baxter Wilson 1
- Little Gypsy 2
- Little Gypsy 3
- Ninemile Point 4
- Ninemile Point 5
- Ninemile Point 6A & 6B
- Sabine 3
- Sabine 4
- Sabine 5

As part of this detailed verification review of the Entergy CEMS units, site visit verification reviews were conducted at the following gas and coal-fired plants, respectively:

- Baxter Wilson
- Little Gypsy

The following information was requested from Entergy and available data reviewed in relation to the above samples:

- Annual data on CO₂ emissions, electricity generation (MWh), heat input (total MMBtu), and operating time for all fifty-four (54) Entergy electric utility combustion generation units which operated in 2018, from the EPA Clean Air Markets (CAM) Air Monitoring Program Data (AMPD) database;
- EPA emissions collection and monitoring plan system (ECMPS) quarterly feedback reports for fifteen (15) units;
- Annual CO₂ /flue gas flow monitors relative accuracy test audits (RATA's) for the five (5) selected coal units;
- Quarterly CO₂ CEM linearity checks for the five (5) selected coal units;
- Natural gas fuel flow meter CEMS calibration/accuracy checks for the ten (10) natural gas units audited in detail, including documentation provided from the Baxter Wilson and Little Gypsy plant environmental coordinators, and from Fossil Environmental for the balance of the natural gas-fired power plants reviewed;
- Monthly facility-level gas burn data for all natural gas-fired electric generation facilities (from Entergy's Gas Burn Accounting database, maintained by the Natural Gas Supply and Purchasing Department);
- Daily facility-level coal delivery, coal usage, and coal burn testing analytical data for all three coal-fired electric generation facilities owned and operated by Entergy (from Entergy's Rail Car Management System database, maintained by the Coal Supply and Purchasing department);
- Hourly CO₂ CEMS data for 2018 obtained directly from the plant's CEMS Data Acquisition and Handling System (DAHS) for the units at the on-site survey visit facilities (Baxter Wilson 1, and Little Gypsy 2 and 3); and

- Multiple days of third-party coal burn independent sampling and testing data for three (3) coal-fired plants (Independence, RS Nelson and White Bluff).

The fifteen (15) units above that were reviewed in greater detail represented approximately 55% of Entergy's total direct CO₂ emissions from power generation units in 2018.

Organizational boundaries were verified using information contained in Entergy's 2017 Statistical Report and Investor Guide, and Entergy's 2017 Annual Report. As described in Entergy's GHG Inventory Management Planning and Reporting Document, March 2018 (IMPRD), Entergy GHG emissions inventory boundaries are determined on an equity share basis (i.e., the percent equity share of those facilities owned by Entergy) which was used to calculate the GHG emissions in the inventory database for this category. These equity share values in the GHG inventory were cross-checked against the data provided in Entergy's IMPRD, statistical report, and annual report.

CEMS reports supplied by Entergy were checked against both the GHG emissions data in their GHG inventory spreadsheets, and the EPA Clean Air Markets' air monitoring program data (AMPD) database, for the fifteen (15) above selected units. Monthly and annual CO₂ CEMS reports were generated by the Verifier from queries of the AMPD database, and were checked and confirmed against the data for those fifteen (15) sampled units as reported in Entergy's GHG emissions inventory spreadsheets.

Associated CEM system and natural gas flow meter QA/QC supporting documentation (including relative accuracy test audits, linearity checks, and fuel flow meter calibration tests) were reviewed for the Entergy generating units. These documentary evidence verification checks were performed and confirmed that the reported GHG emissions data, and CO₂ emissions/flue gas flow and natural gas flow monitoring measurements and monitoring calibrations, were accurate, and the associated measurements data were reliable, as reported in the Entergy 2018 GHG inventory.

For each of the units sampled, various error checking tests were performed on the Entergy GHG inventory spreadsheets, and the sampled data to assess the information collected, including some examples such as record counts/missing data, re-computation, and other cross-checks. For each of the selected units, some aggregation calculation checks, and source type and equity share checks, were made and compared against database outputs/reports and the Entergy GHG inventory spreadsheets. Also, a sampling of daily CO₂ emissions and fuel MMBtu heat input values were checked using an alternative quantification methodology, based on third-party process monitoring measurements and emission factors.

Through the course of the verification program, the data management systems and controls employed in the quantification of emissions were reviewed, as detailed in the Sampling Plan procedures, included in Section 7 of the final Verification Plan. These systems were found to be effective in the calculation of the GHG Assertion.

Purchased Power (Controllable)

The key emissions factors, sources, and calculations that Entergy used to quantify the emissions associated with its controllable power purchases in the 2018 GHG inventory were checked. This source comprised approximately 8.3% of the total Entergy 2018 GHG Assertion.

Raw data outlining daily (and monthly) purchased power by Entergy operating company and counterparty/long-term contract for 2018 was provided by the Power Trading group and cross-checked against the TRADES database containing controllable purchased power for 2018, as well as the Entergy GHG inventory spreadsheets. They were also checked for correct application of plant-specific emissions factors from EPA's eGRID database (2018 release for year 2016 data).

Other Emissions Sources

Entergy has a number of small sources that collectively comprise approximately 3.6% of the total GHG Assertion. These sources include emissions associated with small stationary combustion sources; mobile combustion (corporate fleet); fugitive CH₄ (natural gas T&D); fugitive SF₆ (electricity T&D); fugitive HFCs (HVAC and vehicle); purchased electricity for business operations outside Entergy service territory; customer consumption of distributed natural gas; and employee commuting. Many of those emissions sources are categorized in the *de minimus* category, as defined in the IMPRD (i.e., sources representing <1% of the total GHG Assertion). Each of these emissions sources, with size relative to total GHG Assertion, was reviewed through this verification as indicated below.

Scope 1 Emissions Sources:

- small stationary combustion sources – 2017 Subpart C submissions reviewed (0.7% of GHG Assertion, *de minimus*)
- mobile combustion, corporate fleet – 2016 fuel consumption data was used to quantify emissions (0.1% of GHG Assertion, *de minimus*)
- fugitive CH₄, natural gas T&D – 2017 Subpart W submissions reviewed as well as Entergy estimate for Spindletop Storage Facility (0.2% of GHG Assertion, *de minimus*)
- fugitive SF₆, electricity T&D – estimate based on 2017 Subpart DD submission (0.6% of GHG Assertion, *de minimus*)
- fugitive HFCs, HVAC and vehicle – quantified from 2016 data, not revised for the 2018 inventory (0.1% of GHG Assertion, *de minimus*)

Scope 2 Emissions Source:

- purchased electricity for business operations outside Entergy service territory – quantified using 2016 data (not revised for 2018 inventory) with updated eGRID 2016 emission factors, published in 2018 (0.1% of GHG Assertion, *de minimus*)

Scope 3 Emissions Sources:

- customer consumption of distributed natural gas – 2017 Subpart NN submissions reviewed (1.8% of GHG Assertion)
- employee commuting– estimates quantified for previous years reviewed (0.1% of GHG Assertion, *de minimus*)

3. Data Management and Control System Review

A critical element of the verification process was for the Verification Team to gain a thorough understanding of the data management systems and controls employed by Entergy. This understanding necessitated a review of:

- The parties involved and their respective responsibilities;
- The facility data collection and automated data measurement and management systems;
- Software system configuration;
- Post-collection data manipulation;
- Quality assurance procedures employed to detect erroneous or missing data;
- Processes for updating historical data in the event that errors are detected;
- Document control and security systems, including access, and tracking of edits; and
- Changes to the data management system over time or opportunities for improvement.

Testing Internal Controls

The Verification Team developed a sufficient understanding of the GHG information system and internal controls to determine whether the overall data management system is sound, examining it for sources of potential errors, omissions, and misrepresentations. This assessment incorporated examining three aspects of the company’s internal controls: (1) the control environment, (2) the data systems, and (3) the control and maintenance procedures.

The testing procedures documented in the Verification Plan included some procedures to test the effectiveness of the internal controls in place. The results of these tests influence the type and amount of activity data being sampled. Sampling procedures are included in Section 7 of the final Verification Plan.

Conducting Substantive Testing

Substantive testing procedures were used to assess the reasonability and validity of the GHG Assertion where further testing was required to assess internal controls based on the observations and preliminary findings of the Verification Team. The specific procedures are summarized in Section 7 of the final Verification Plan as separate tables for each process or activity involved in the quantification and reporting of the GHG Assertion. Materiality was assessed for each specific procedure and aggregate materiality was determined separately. The details of the testing of internal controls and substantive testing undertaken are described in detail in the final Verification Plan.

The Verification Team developed a thorough knowledge of the data management and control systems utilized in the organization through the review of the IMPRD, observations during the site visit, and interviews with key personnel. The following were the key data systems observed:

- CEMS data – for large fossil generating stations (as well as for small stationary sources that have CEMS).
- Gas purchases data – monthly for all gas-fired electric generating plants – from David Bruess.
- Coal purchases data – from Jill Siekmeier.
- TRADES – controllable power purchases tracking system: hourly purchase amounts from 1/1/2018 to 12/31/2018 inclusive were extracted and sent via Excel to the Verification Team by Grady Kaough.

4. Verification Results

4.1 Discrepancies

The table below details discrepancies found during the verification process for each procedure, a discrepancy title (brief description) and final status.

Procedure	Discrepancy Title	Final Status
B1: Organization Boundaries, Infrastructure and Activities	N/A	No discrepancies detected
B2: Review of Operating Conditions	N/A	No discrepancies detected
C1: True-Up and Re-Performance Calculations	N/A	No discrepancies detected
C2: Minor/ <i>De Minimus</i> Emissions - Methodology and Documentation	N/A	No discrepancies detected
D1: Data Collection and Quality Controls	N/A	No discrepancies detected
D2: Data Confirmation against External Sources	N/A	No discrepancies detected
D3: Data Migration into Inventory	N/A	No discrepancies detected
A1: Final Verification Assessment	N/A	No discrepancies detected

4.2 Aggregate Materiality

The sum of the immaterial discrepancies in the GHG Assertion does not result in a breach of materiality (greater than 10% of the total GHG Assertion). This is in line with the uncertainty assessment of Entergy's inventory.

4.3 Other Findings

- As part of the verification review of Entergy's stationary combustion CEMS emissions data spreadsheet, during the 2018 unit-specific CO₂ emissions data crosschecks with the EPA AMPD database query results, two (2) minor, immaterial discrepancies were identified in that part of the verification review process, and were corrected by Entergy at that time.
- As part of the verification review of Entergy's *de minimus* GHG emissions reporting source types, immaterial discrepancies were identified with the SF₆ emissions reporting, and two (2) of the fossil generating plants' small combustion sources, as part of the verification review process, and were corrected by Entergy at that time.
- For the fifteen (15) units identified as targets for more detailed audit sampling, air monitoring program data (AMPD), monthly/annual CO₂ CEMS data from US EPA's Clean Air Markets database system were reviewed. These results were verified against the direct emissions reported in Entergy's GHG emissions inventory spreadsheets. No material discrepancies associated with Entergy's GHG emissions inventory accounting and reporting were identified as part of this EPA CO₂ emissions database and Entergy GHG emissions inventory spreadsheets cross checks.
- Emission factors for CH₄ and N₂O emissions from each of the Entergy fossil generation units were also checked, revealing no discrepancies or omissions.
- Organizational and operational boundary, and equity share, verification checks revealed no discrepancies or omissions.
- For the three (3) Entergy-operated coal-fired electric generation plants, comparisons were made by cross-checking the daily total plant coal burn analytical data on total coal fuel heat input MMBtu, as provided by Entergy's Rail Car Management System's (RCMS) plant-level data, against the daily plant total fuel heat input from the EPA AMPD database, for all of 2018. These plant level RCMS data are based on coal feed rate process monitoring data generated by the coal feeders (which feed coal from the boiler's coal feed hoppers to the pulverizers), and coal analytical data generated by chemical analyses of coal samples taken on a daily basis by the Entergy plant personnel. The EPA data on MMBtu fuel heat input are based on in-stack CEMS measurements on flue gas flow rates, and flue gas constituent concentrations (CO₂ or O₂). The results of these cross-checking comparisons between the two, 2018 annual datasets of daily burn data showed the three (3) plants having an average deviation of less than +/- 0.5%, between the RCMS and AMPD plant heat input daily data for 2018. The results of this cross check provide an

additional degree of confidence in the reliability of Entergy's coal-fired generation GHG emissions inventory reporting, especially when considering the overall accuracy and operational and maintenance characteristics of the coal feed rate measurement process monitoring sensors, and the associated compliance monitoring-based, direct measurement CEMS system data used in this verification check.

- For the six (6) natural gas-fired facilities with generation units audit-sampled under this verification program, augmented by an additional eight (8) gas plants (to increase the sample size), monthly and annual natural gas fuel use/total heat input data were obtained from the Entergy Gas Burn Accounting database. This Entergy gas burn database tracks gas utility purchases and pipeline deliveries to Entergy's electric generating stations, based on the gas utility's invoice/billing data, with the associated gas volume of the amounts delivered being determined by the gas utility pipeline's natural gas flow meter (i.e., a financial meter, operated and maintained by the natural gas utility, outside the Entergy plants' fence lines). These monthly natural gas delivery/burn data from Entergy's gas burn database were then compared to the EPA AMPD database results. The results of these cross-check comparisons showed the facility-wide deviations between the two datasets had an overall average of +2.7% difference for the fourteen (14) facilities. Additionally, Entergy's small, natural gas-fired combustion sources' fuel use at the fossil generation stations is captured in the Gas Burn database data, but not so in the EPA AMPD CEMS units' database.
- For the units with hourly data supplied by the Entergy site visit plants' personnel (at Baxter Wilson and Little Gypsy), from the respective plant's on-site DAHS computer database archive systems, these hourly, "raw" data sets (i.e., those not yet QC'd initially by Entergy Fossil Environmental, and subsequently validated/revised/approved by EPA), were compared to the final EPA-approved AMPD database 2018 annual data. The Baxter Wilson data agreed to within <0.2% for Unit 1, while the Little Gypsy units agreed to within +/- 0.02% and +/- 0.19%, respectively. Such low QA/QC adjustments of raw data throughout the 2018 reporting year is a further indicator of the overall reliability of Entergy's reported CEMS data.
- A re-calculation of CO₂ emissions based on an alternative methodology was made for each of the data-sampled coal-fired generating plants: Independence, RS Nelson, and White Bluff. Daily, third-party test burn measurements data (including coal feed rates and fuel composition analyses) provided an alternative, direct measurement of fuel heat input. This alternative quantification methodology exhibited an average daily CO₂ emissions deviation, over a range of one (1) to twenty-seven (27) days of coal burn tests conducted

at each plant in 2018, of 0.3% in plant-wide CO₂ emissions, as compared to the CEMS totals for the plants during the coal test burn periods. This degree of agreement between two alternative emissions quantification methodologies is deemed to represent an acceptable precision level for alternative quantification methodologies, for an ISO 14064 limited level of assurance verification program. This is further corroborated considering that compliance-based CEMS measurements are generally significantly more accurate than most emission factor-based quantification approaches (especially compared to the use of default emission factors, as opposed to site-specific factors, as well as the accuracy level of solid fuel flow rate process monitoring measurements). Therefore, the alternative quantification methodology comparison results provide additional verification confirmation of the CEM systems measurement approach and results.

Through the course of the verification, the data management systems and controls employed in the quantification of emissions for Entergy were reviewed, as detailed in the Verification Plan procedures. These systems were found to be effective in the calculation of the GHG Assertion.

APPENDIX

Verification Plan

1 Introduction

This document provides details on the verification scope and process that is planned to conduct a limited level verification of the 2018 organization-wide GHG inventory (“GHG Assertion”) for Entergy Corporation (“Entergy”). The GHG Assertion made by Entergy requires the quantification of the emissions produced during calendar year 2018, and is related primarily to stationary combustion of fossil fuels, and from purchased power, as well as from a number of minor sources. An overview of operations for the organization will be provided in the Verification Report (to be prepared at the completion of this verification project).

A Verification Risk Assessment was conducted during the verification planning stage; the results of which are provided in Section 6 of this document. Additionally, the results of the Risk Assessment informed the development of the Sampling Plan (see Section 7).

The verification conclusion will be documented in the Verification Statement and the verification findings will be further described in the Verification Report. The Verification and Sampling Plans will be appended to the Verification Report to provide information related to the verification scope and process.

2 Verification Scope

2.1 Objective

The primary objective of this verification engagement is to provide assurance to Entergy, and any external users of Entergy’s public GHG reporting, that the GHG Assertion is reliable, and of sufficient quality for:

- Internal purposes, namely tracking towards internal reduction targets, as well as the preparation of annual reports, corporate social responsibility (CSR) reports, and other disclosures; and
- Other external voluntary reporting, primarily to the Carbon Disclosure Project (CDP), the Dow Jones Sustainability Index (DJSI), and the American Carbon Registry (ACR).

2.2 Parties and Users

The person or persons responsible for the provision of the GHG Assertion and the supporting information, as defined in Section 2.23 of ISO 14064-1:2006, is the “**Responsible Party**”. For this verification, Entergy is the Responsible Party. Cventure LLC (“Cventure”) has been engaged by Entergy to provide a third-party verification of the GHG Assertion.

The “Intended User” is defined in Section 2.24 of ISO 14064-1:2006 as the individual or organization identified by those reporting GHG-related information that relies on that information to make decisions. Entergy (and the public at large) are the intended users of the information contained within the Verification Statement.

2.3 Scope

The verification will be conducted in accordance with *ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions*. The verification will be designed to provide a limited level of assurance.

The Verification and Sampling Plans were developed based on the relevant criteria described in the following:

- The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard (WRI/WBCSD Revised Edition, 2004)

The following table defines the scope elements specified for the organization.

Scope Element	ISO 14064-1 Definition
Boundary	The organization’s corporate-wide boundary, including legal, financial, operational and geographic boundaries
Infrastructure and Activities	The physical infrastructure, activities, technologies and processes of the organization
GHG Sources	GHG sources to be included
GHG Types	Types of GHGs to be included
Reporting Period	Time period to be covered

Descriptions of how each of the above scope elements applies to Entergy’s GHG Assertion are presented below.

Boundaries

During the initial verification planning, the organizational boundaries and the sources which would be required to be included in the emissions inventory quantification are reviewed. The procedures to review the GHG Assertion will be designed to support a limited level of assurance. These procedures systematically review:

- the emissions sources included in the quantification procedures;
- the methodologies employed in the quantification procedures;
- data handling, information and management system and associated controls, and quality assurance/quality control activities;
- any changes in the quantification methodology, or to organizational boundaries due to acquisitions or divestitures, as compared to previous corporate GHG emissions reports; and
- the GHG Assertion.

Entergy has chosen to include all company-owned assets and those under a capital lease consistent with “equity share” reporting under EPA and WRI/WBCSD GHG reporting protocols.

Infrastructure and Activities

According to Entergy’s website⁴, “Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately

⁴ Accessed on January 1, 2019 at http://www.entergy.com/about_entergy/

30,000 megawatts of electric generating capacity, including nearly 9,000 megawatts of nuclear power, making it one of the nation’s leading nuclear generators. Entergy delivers electricity to 2.9 million utility customers in Arkansas, Louisiana, Mississippi and Texas. Entergy has annual revenues of approximately \$11 billion and more than 13,000 employees.”

GHG Sources

The following key sources comprise the 2018 GHG inventory categorized by Entergy as follows:

Entergy Category	Emissions Source Category	Corporate Emissions Source	GHGs Included
Direct Emissions	Stationary Combustion	Power Generating Units	CO ₂ , CH ₄ , N ₂ O
		Small Stationary Combustion	CO ₂ , CH ₄ , N ₂ O
	Mobile Combustion	Corporate Fleet	CO ₂ , CH ₄ , N ₂ O
	Fugitive Emissions	Natural Gas Trans. & Dist.	CH ₄
		Electricity Trans. & Dist.	SF ₆
		Cooling/Air-Conditioning (buildings, mobile sources)	HFCs
Indirect Emissions	Purchased Electricity	Purchased Power for Business Operations Outside Entergy Service Territory	CO ₂
	T&D Losses	Entergy Purchased Power Consumed on Entergy T&D System	CO ₂ , CH ₄ , N ₂ O
Optional Emissions Sources	Purchased Power (Controllable)	Controllable Purchased Power Sold to Customers	CO ₂ , CH ₄ , N ₂ O
	Product Combustion	Combustion of Natural Gas Distributed to Entergy Customers	CO ₂ , CH ₄ , N ₂ O
	Employee Commuting		CO ₂ , CH ₄ , N ₂ O

GHG Types

The emissions portion of the assertion accounts for the following greenhouse gases:

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Hydrofluorocarbons (HFCs)
- Sulphur Hexafluoride (SF₆)

Perfluorocarbons and nitrogen trifluoride are not included in Entergy's inventory given the nature of its business, and that these classes of chemicals are not used in any of Entergy's operations in any sizeable amount.

The final inventory will be expressed in both short tons of CO₂ equivalent emissions ("CO₂e"), as well as in metric tonnes CO₂e.

Reporting Period

The GHG Assertion covers the 2018 calendar year, from 1 January 2018 through 31 December 2018, inclusive.

2.4 Materiality

During the course of the verification, individual errors, omissions, or misrepresentations (collectively referred to as discrepancies), or the aggregate of these discrepancies, will be evaluated both qualitatively and quantitatively. Materiality defines the level at which discrepancies in the GHG Assertion or any underlying supporting information precludes the issuance of a limited level of assurance.

The Verification Team is responsible for applying professional judgment to determine if discrepancies could adversely affect the GHG Assertion, and subsequently influence the decisions of the Intended User, in which case, the discrepancies are deemed to be material. Quantitative discrepancies will be calculated individually to determine the impact of the discrepancy as a percentage of the GHG Assertion.

All discrepancies that are outstanding at the conclusion of the verification will be documented in the Verification Report and classified on an individual basis as either material or immaterial.

Materiality Threshold

In the framework of a corporate entity-wide GHG inventory, the concept of materiality is defined in the context of the overall uncertainty in the reported data. A quantity, in this case errors and/or uncertainties associated with reported results, is typically considered to be "material" if it would influence any decision or action taken by users of the information. This definition of materiality is consistent with verification guidelines and goals for the reliability of reported data.

Materiality is not the same as a *de minimus* emissions threshold for either the exclusion of specific sources from the inventory, or the use of estimated values without ongoing, annual collection of associated activity data. While a *de minimus* exclusion from the inventory would contribute to overall uncertainty, completeness is only one component contributing to overall uncertainty.

A materiality threshold for this limited level of assurance verification was set at 10% for the corporate GHG inventory. Individual discrepancies and the aggregate of individual discrepancies will be analyzed to determine if the materiality threshold has been breached.

Entergy's current GHG Inventory Management Plan and Reporting Document (IMPRD) states that "...emissions estimated to be less than 1% of the total inventory are considered *de minimus* unless they are anticipated to change dramatically and grow above this threshold." The *de minimus* label for emissions sources <1% of the total inventory

was selected by Entergy to delineate a threshold for inventory quantification. Sources which fall within the *de minimus* category can continue to use the original emissions estimate for up to five years before having to re-calculate the emissions. Note that *de minimus* sources, as defined by Entergy, are included in the total inventory quantification; they are just not re-calculated every year.

2.5 Principles

ISO 14064 defines five principles that should be upheld in the development of the GHG Assertion. These principles are intended to ensure a fair representation and a credible and balanced account of GHG-related information. The verification procedures developed and executed during the course of this verification will present evidence such that each of these principles is satisfied.

Relevance

Appropriate data sources are used to quantify, monitor, or estimate GHG sources. Appropriate minimum thresholds associated with emissions levels, i.e., from *de minimus* sources, are used to justify the exclusion or the aggregation of minor GHG sources or the number and/or frequency of data points monitored.

Completeness

All sources within Entergy's GHG inventory boundary are included within an identified source category.

Consistency

Uniform calculations are employed between the base year (i.e., year 2000 emissions, for establishing Entergy's baseline emissions levels from which past, and current, GHG emissions reduction target commitments have been made), and current accounting/reporting periods (e.g., years 2010-2020, and 3rd period reduction target commitments, also defined in terms of a year 2000 baseline). Emissions calculations for each source are calculated uniformly. If more accurate procedures and methodologies become available, documentation should be provided to justify the changes and show that all other principles are upheld.

Accuracy

Measurements and estimates are presented, without bias as far as is practical. Where sufficient accuracy is not possible or practical, measurements and estimates should be used while maintaining the principle of conservativeness.

Transparency

Information is presented in an open, clear, factual, neutral, and coherent matter that facilitates independent review. All assumptions are stated clearly and explicitly, and all calculation methodologies and background material are clearly referenced.

2.6 Limitation of Liability

Due to the complex nature of the operations within the organization and the inherent limitations of the verification procedures employed, it is possible that fraud, error, or non-compliance with laws, regulations, and relevant criteria may occur and not be detected.

3 Verification Team

Kevin Johnson has over 30 years energy and environmental consulting experience, focusing over the last half of his career on verification, greenhouse gas and CO₂ emissions inventories, and sustainability programs. In 2005, he founded Carbon Solutions, Inc., an independent consulting services firm, and in 2007 with Wiley Barbour he co-founded Cventure

LLC. While a contractor for ERT-Winrock in 2008-9, he served as project manager for several corporate GHG inventory verification projects, and drafted the verification guidelines for the American Carbon Registry. Along with Mr. Barbour he was also a primary author of the ERT Corporate GHG Verification Guidelines. Mr. Johnson has performed several hundred verification projects over the last fifteen plus years. At Cventure, he has also performed CDP reporting benchmarking, and ISO 14064 and GRI sustainability reporting gap analyses, for several commercial clients. Prior to forming Carbon Solutions, Inc., he previously served as the leader of URS Corporation's corporate GHG/climate change practice. Some of his other project management experience includes corporate strategy development, offset project assessments and feasibility studies, GHG emission inventories, protocols, and verification, environmental management information system implementations, and carbon offsets verification and trading support. Some climate change clients include Entergy, Exelon, Eni, El Paso, Bloomberg LP, NewsCorp, 21st Century Fox, T. Rowe Price, Compuware, Kimco Realty, HCP, Broadridge Financial Solutions, FedEx, BlueSource, Albertsons, US Energy Biogas, U.S. DOE, GRI, and several oil producers. While at Radian Corporation during the first half of his career, he had significant field experience with continuous emissions monitoring systems (CEMS). These field testing projects included serving as project manager for on-site field testing task leader on CEMS testing projects at four electric power generation plants, numerous industrial steam plant boilers, and a cement kiln; two of those field testing projects also included CEMS certification relative accuracy test audit (RATA) testing.

Wiley Barbour has over 25 years of experience providing technical and policy support to corporations on issues related to climate policy, greenhouse gas (GHG) emissions, corporate climate change strategy, carbon markets, and sustainability programs. Prior to co-founding Cventure LLC, Mr. Barbour worked as the Executive Director of Environmental Resources Trust (ERT), providing GHG emissions inventory development, carbon market expertise, and verification services to dozens of corporate clients including Wal-Mart, Nike, and Google. During his time at ERT he managed the GHG Registry, the world's first registry for carbon offset projects, as well as the development/launch of the American Carbon Registry for Winrock. Also while at ERT, Mr. Barbour provided program management and sustainability program consulting services to several corporate clients, including Entergy, Nike, NYMEX, AIG, the World Bank, Environmental Defense Fund, the US EPA, and the US DOE. Previously Mr. Barbour served in the U.S. EPA's Policy Office, managing the U.S. GHG Emissions Inventory Program, and serving as the U.S. representative to the Intergovernmental Panel on Climate Change (IPCC) GHG Emission Inventory Task Force.

4 Verification Process

The approach for conducting this verification of Entergy's 2018 GHG Assertion generally follows the activities outlined in the following table. Although these activities are generally completed sequentially, the order may be modified according to circumstances such as scheduling and data availability.

Pre-Engagement	Approach	Execution of Verification	Completion
<ol style="list-style-type: none"> 1. Selection of Lead Verifier 2. Pre-Engagement Planning 3. Contract Execution 	<ol style="list-style-type: none"> 4. Selection of Verification Team 5. Communication with Client/ Responsible Party 6. Kick-off Meeting 7. Draft Verification and Sampling Plan 8. Verification Risk Assessment 	<ol style="list-style-type: none"> 9. Site Visit(s) 10. Conduct Verification Procedures 11. Issue Clarification & Data Request 12. Revise & Finalize Verification and Sampling Plan (if/as needed) 13. Evaluate & Address Outstanding Issues 	<ol style="list-style-type: none"> 14. Evaluate Evidence 15. Draft Verification Report & Statement 16. Issue Verification Report & Statement

4.1 Pre-Engagement

Prior to submitting a proposal to conduct this verification, the pre-engagement planning activities included reviews of previous business engagements/verifications with the Responsible Party, to determine if any previously unresolved conflicts could prevent Cventure from engaging in the verification. Also, the potential for actual or perceived conflicts of interest was reviewed from the perspectives of advocacy, financial interest, familiarity, self-review, and incentives. No threats of conflicts were identified during that review. Following the acceptance of the proposal and signing of a contract for services, the Verification Team was selected, comprised of the individuals as identified in Section 3.

4.2 Approach

An extensive knowledge of the Responsible Party’s business, relevant industry, and details of the Corporation itself are required to conduct a thorough verification that can lead to a conclusion. The initial information collected about the Responsible Party and its facilities formed the basis of the draft Verification Plan. The development of the final Verification Plan is an iterative process through the course of the verification, with the resulting plan being updated as new information becomes available, as applicable. There are three types of risk associated with the GHG Assertion, as defined in ISO 14064-3:

- Inherent Risk
- Control Risk
- Detection Risk

The process of designing the Verification Plan involved the development of Verification Risk Assessment for the Responsible Party. The steps in this process include:

- Reviewing the GHG Assertion, and the methodologies employed by the Responsible Party;

- Assessing the likelihood that a material misstatement might exist in the GHG Assertion, if no controls were used to prevent misstatements in the GHG Assertion (i.e., inherent risk);
- Assessing the control environment and corporate governance process (i.e., control risk); and
- Reviewing each emissions source identified by the Responsible Party, and evaluating the contribution of each source to the GHG Assertion and the associated potential material discrepancy for each.

The results of the Verification Risk Assessment inform the development of the verification procedures, which are documented in Section 7 of the Verification Plan, and a summary of the Verification Risk Assessment is provided in Section 6 of the Verification Plan. The draft Verification Plan will be provided to the Responsible Party for review and comment before proceeding with the verification.

4.3 Execution of Verification

With draft Verification and Sampling Plans in place, the verification procedures will be executed. This process involves collecting evidence, testing internal controls, and conducting substantive testing. Over the course of the verification, the draft Verification and Sampling Plans may change; the final Verification and Sampling Plans to be provided in the Verification Report will reflect the verification parameters and procedures that were actually implemented.

Site Visits

The site visits will be conducted by Kevin Johnson and Wiley Barbour January 28-29, 2019 in Mississippi and Louisiana. The site visits will be a key step in the planning and execution of the verification. During the course of the site tours, Cventure will interview key operations personnel regarding the operations and data management of the Responsible Party.

During the course of the site visits, and telephone interviews, Cventure will:

- a) interview key site operations personnel regarding the operations and data management of two (2) large natural gas-fired generation facilities (Baxter Wilson in Mississippi and Little Gypsy in Louisiana) to cross-check GHG data as well as gain a deeper understanding of GHG information systems and controls at the plant level; and
- b) undertake teleconference discussions with the TRADES, Coal Supply, Gas Supply, CEMS Unit, Gas Operations, and T&D Environmental regarding data which they supply for purposes of the GHG Assertion, as well as related data and information management systems.

Key Entergy personnel to be interviewed on-site or via telephone will include:

- Steve Tullos, Manager, Sustainability and Environmental Policy (based in Jackson but accompanying the Cventure team during this trip)
- Environmental Managers/Analysts: Baxter Wilson and Little Gypsy Gas Plants
- Grady Kaough, Power Trading Operations
- David Bruess, Fuel Supply and Oil & Gas Energy Analytics
- Tad Chenet, CEMS Unit - Corporate Environmental
- Jill Siekmeier, Fuel (Coal) Purchasing/Rail Car Management System (RCMS)
- Walter Ross, Gas Operations
- Toby Chu and Kim Fuller, T&D Environmental (SF₆)

During the site visits, all major GHG emissions sources for the Baxter Wilson and Little Gypsy plants will be reviewed to ensure appropriate identification/categorization. Review of any readily available, overall plant-level process & emission flows/metering diagrams will be followed by physical observation of the facility, collection of relevant data, and confirmatory checks (as possible) on meters and other related measurement equipment.

Collecting Evidence and Review of Documentation

Sufficiency and appropriateness are two interrelated concepts that are fundamental to the collection of verification evidence. The decision as to whether an adequate quantity (sufficiency) of evidence has been obtained is influenced by its quality (appropriateness).

Through the execution of the verification procedures as described in Section 7, the Verification Team will review three key forms of evidence including physical, documentary, and testimonial:

- Management documentation: policies, programs, and procedures related to the collection, safeguarding, and management of the data supporting the GHG Assertion;
- Records: records comprise time-sensitive data, correspondence, and files;
- Interviews: the interviews will provide information regarding operations and data management and will provide evidence to support the sufficiency of data controls; and
- Computer systems: data systems used to capture/manage GHG-related data and calculate the GHG Assertion, will also be assessed by the Verification Team as part of this review.

The following are the key data systems which will be reviewed:

- TRADES – controllable power purchases tracking system: hourly purchase amounts from 1/1/2018 to 12/31/2018 inclusive will be extracted and sent via Excel to Cventure by Grady Kaough (via Steve Tullos).
- CEMS data – for fossil generating stations (and for small stationary sources that have CEMS)
- Gas purchases data – monthly for all gas-fired electric generating stations – from David Bruess: amounts inputted into Accounting.
- Coal purchases/burn data – from Jill Siekmeier (solid fuels): amounts inputted into Accounting.

Testing and Assessment of Internal Controls

The Verification Team will develop a sufficient understanding of the GHG information system and internal controls to determine whether the overall data management system is sound and if it supports the GHG Assertion. This assessment sought to identify any weakness or gaps in the controls that pose a significant risk of not preventing or correcting problems with the quality of the data and examining it for sources of potential errors, omissions, and misrepresentations. It will incorporate an examination of three aspects of the Responsible Party's internal controls: (1) the control environment, (2) the data systems, and (3) the control and maintenance procedures.

Assessment of Data

Substantive testing procedures will be used to assess the reasonability and validity of the GHG Assertion. Both quantitative and qualitative analysis will be performed to achieve the desired level of assurance. The verification procedures are described in Section 7, as separate tables for each process or activity involved in

the quantification and reporting of the GHG Assertion. The verification procedures include verification activities designed to:

- Review the Responsible Party's GHG inventory boundary, including a review of the completeness of emissions sources identified;
- Review the Responsible Party's data sources to ensure the GHG Assertion is calculated based on metered or estimated data;
- Re-calculate the GHG Assertion, which demonstrates transparency and accuracy; and
- Review the GHG Assertion to ensure the emissions calculated by the Responsible Party have been accurately reported.

4.4 Completion

This engagement will be formally closed after the verification has been executed and the Verification Report has been finalized.

Preparing the Verification Report

The purpose of the Verification Report is to document the verification findings. All discrepancies are described and compared to the materiality threshold individually and in aggregate. The Verification Statement, which presents Cventure's verification conclusion, is included in the Verification Report.

Closing the Engagement

The verification engagement will be closed out upon delivery of the final Verification Report.

5 Verification Schedule

The following schedule was planned for the verification project (subject to change with agreement between the Verifier and the Responsible Party).

Description	Scheduled Date
Draft Verification Plan to Responsible Party	January 1, 2019
Verification Project Planning Teleconference	January 4
GHG Supporting Data Owners Conference Calls	week of January 14-18
Data/Documentation Requests Sent: for Site Visits	January 21
Data/Documentation Requests Sent: to GHG Data Owners	January 25
Site Visits (2)	January 28-29
Cventure Receives Draft GHG Inventory from Entergy	February 1
Cventure Receives All Other Supporting Data from Entergy	February 8
Preliminary Verification Review Checks Completed	February 22
Final GHG Assertion Clarification Request (as indicated)	February 25
Draft Verification Statement and Report	March 1
Final Verification Statement and Report	March 5

6 Verification Risk Assessment

There are three types of risk associated with the GHG data management system and the GHG Assertion defined in ISO 14064-3:

- Inherent Risk
- Control Risk
- Detection Risk

The assessed level of risk for this verification dictates the degree of rigor planned for the verification procedures described in the accompanying Sampling Plan. Our established verification procedures ensure a thorough treatment of any risk identified, including determination of magnitude and sensitivity of that risk, during the assessment process. A qualitative risk assessment was completed based on observations made by reviewing and assessing accompanying documentation, as well as assessing available information such as the Q1-Q3 2018 preliminary CO₂ emissions data from Entergy (received in December 2018), and reviewing some other supporting documents.

The *inherent* risk in Entergy's corporate-wide 2018 GHG Assertion emanates from the large and complex nature of the company, the number of parties involved in managing their emissions inventory and developing their assertion, the number of emission sources, a large number of natural gas, oil and coal plants used in the process, and a smaller amount of controllable power purchases occurring throughout the year. Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately 30,000 megawatts of

electric generating capacity, including nearly 9,000 megawatts of nuclear power, making it one of the nation's leading nuclear generators.

For the large CEMS-equipped, fossil generation units, because there are so many of them in Entergy's system (~45 units with significant operations in 2018, i.e., each contributing >0.5-1% of fossil generation direct CO₂ emissions in 2018, with that entire group collectively contributing ~98% of Entergy's power generation GHG emissions), there would have to be multiple, long duration control failures to create errors which could lead to a material misstatement of Entergy's entity-wide, corporate GHG inventory. (Note: For example, in the 2010 case of two highly unusual CEM system failures, which each went undetected for several months, while they affected 2010 GHG emissions of each unit by 5-10%, their collective total impact on Entergy's overall 2010 corporate GHG inventory was less than 1%.)

Due to these reasons, in particular the sheer magnitude of Entergy's overall GHG emissions footprint, and the rigorous EPA regulatory compliance requirements for utility boiler CEMS and associated reporting systems, the *inherent risk* to Entergy's 2018 GHG emissions inventory has been assessed to be low.

Control risk relates to the likelihood that a material misstatement in the 2018 GHG Assertion will not be prevented or detected by Entergy's internal control and data management systems. Control risks are assessed primarily by reviewing data controls and management systems for large fossil generating units and controllable purchased power, both comprising in aggregate approximately 96% of total company-wide GHG emissions as noted in the 2017 GHG Assertion. This percentage has remained largely the same over the last few years. The largest control risk in relation to the 2018 GHG Assertion is likely to be the manual transcription method in which the inventory is prepared (i.e., emissions values are extracted from various sources and manually entered into an Excel workbook). This is true for all emissions sources including the largest ones, namely stationary combustion and controllable purchased power. For purchased power, a number of data systems (such as TRADES) feed into Entergy's accounting system.

The individual data systems which comprise data input into Accounting undergo QA/QC checks numerous times, both on a monthly and on an annualized basis. For all of the large, CEMS-equipped fossil fuel electric generation units, which contributed approximately 87% of Entergy's total 2017 corporate-wide GHG emissions inventory, there are very rigorous measurement, monitoring, and reporting (MMR) requirements established by the U.S. EPA. These CEMS MMR programs, and their robust associated QA/QC activities, serve as the basis for demonstrating regulatory compliance with various federal Clean Air Act and state air permit compliance requirements. Also, the equipment utilized in these CEM systems are well established technologies with demonstrated track records of accuracy, precision, and reliability. In light of the abovementioned reasons, the control risk is assessed to be low.

The *detection risk* is a measure of the risk that the verification evidence collected and reviewed will fail to detect material misstatements, should such misstatements exist. Unlike *inherent* and *control risks*, which are typically attributes of the facility types and technologies employed therein, *detection risk* is variable but can be maintained at a low level by designing an appropriate number of verification tests, and collecting adequate sample sizes to support those tests. Cventure will conduct a number of sampling tests, focused on large fossil electric generation units and controllable purchased power. These tests are outlined in the Sampling Plan in Section 7. Overall, the Verification Team's procedures have been designed to minimize *detection risk*. Our initial assessment is that *detection risk* will likely be low (in line with previous years' verification exercises), given the large number and appropriateness of the verification sampling/checking tests which are focused on

the largest GHG inventory segments, i.e., CEMS units and controllable power purchases (by relative magnitude), of Entergy's 2018 GHG Assertion.

These tests have been designed and targeted at the greatest risk areas within Entergy's overall GHG inventory information management and data quality control system, namely the manual parts of the process.

7 Verification Procedures (Sampling Plan)

Summary of Procedures:

Organization Boundaries and Definition

B1: Organization Boundaries, Infrastructure and Activities

B2: Review of Operating Conditions

Calculation

C1: True Up and Re-Performance Calculation

C2: Minor/*De Minimus* Emissions – Methodology and Documentation

Data Sources and Supporting Data

D1: Data Collection and Quality Controls

D2: Data Confirmation against External Sources

D3: Data Migration into Inventory

Assertion

A1: Final Verification Assessment

B1 – Facility Boundaries, Infrastructure and Activities

Introduction: This procedure evaluates the boundaries defined by the Responsible Party against the GHG Assertion.

Type of Evidence	Documentation, Observation, Inquiries of the Client, Physical Examination
Data Sources	GHG Inventory Management Plan and Reporting Document (IMPRD), GHG Assertion, Previous GHG Assertions, Entergy Personnel, SEC 10-K and 8-Q filings, Annual Reports, Corporate Statistical Report
Objective (specific principles)	<i>Completeness, Consistency</i>
Specific Activities	<ol style="list-style-type: none">1. Compare the GHG emission sources listed for the organization in the GHG Assertion against GHG emission sources listed in previous GHG Assertions.2. Compare the GHG emission sources listed for the organization in the GHG Assertion against relevant Annual Reports, 10-K/8-Q SEC filings, Statistical Report, Entergy’s website regarding operations and assets.3. Compare the GHG emission sources listed for the organization in the GHG Assertion against observations made during site tour for completeness.4. Interview Entergy personnel regarding changes to inventory or changes in operation that have occurred in the current reporting period.5. Interview relevant Entergy personnel regarding completeness of inventory described in the GHG Assertion.6. Compare total GHG emissions for each GHG emissions source in the current period against prior periods.7. Evaluate the appropriateness and quantification of any <i>de minimus</i> emission sources.
Error Conditions	GHG emission sources that are not reported in the GHG Assertion.

B2 – Review of Operating Conditions

Introduction: This procedure utilizes analytical procedures to identify changes in the scope of the GHG Assertion. This procedure is initiated during the verification planning stage.

Type of Evidence	Analytical Procedures, Inquiries of the Client, Documentation (e.g., IMPRD)
Data Sources	GHG Assertion, Entergy personnel, data from major sources such as fossil generation units and purchased power
Objective (specific principles)	<i>Consistency, Completeness</i>
Specific Activities	<ol style="list-style-type: none">1. Interview Entergy personnel regarding any operational issues which may have caused a significant change to the reported emissions (e.g., asset acquisitions/divestitures, change in service/product offering, etc.).2. Compare total emissions for each GHG emissions source in the current period against prior periods.
Error Conditions	Significant changes in emissions (including wide variances between 2018 data vs. earlier years, particularly for fossil units, such as CEMS data, or purchased power amounts, through TRADES) do not constitute an error condition, but do warrant further investigation, and clarifications, as applicable.

C1: True Up and Re-Performance Calculations

Introduction: As part of verification procedures, the calculations for each emissions source type will be checked, with an emphasis on large stationary fossil plants (CEMS units), purchased power, and small stationary units, which together comprised over 97% of total corporate-wide direct GHG emissions for 2017. In order to ensure the accuracy of the GHG Assertion, the objective of this procedure is to re-perform the calculations independent from the calculations performed by Entergy.

Type of Evidence

Documentation, Re-performance

Data Sources	<p>2018 GHG IMPRD and the following:</p> <ol style="list-style-type: none"> 1. Purchased power: <ol style="list-style-type: none"> a. Controllable trades (on daily basis from 1/1/2018 to 12/31/2018 from Grady Kaough) from TRADES (Excel), as well as sorted and purchased totals from Steve Tullos (also in Excel) as double-check. 2. Large stationary fossil plants: <ol style="list-style-type: none"> b. Selected CEMS reports, 14 units in total at 7 plants (out of the 52 total Entergy fossil units with significant operations through Q3 2018), with some select reports to be provided by Tad Chenet, and the plant site visit contacts at Baxter Wilson and Little Gypsy. Sampling is directed at the smallest units selected, corresponding to ~0.5-1+% of total Entergy-wide direct GHG emissions each. Collectively, this sampling plan is expected to represent in total over 50% of Entergy power generation direct GHG emissions. These units to be sampled include the following: <p><u>Coal</u></p> <ul style="list-style-type: none"> • Independence 1 • Independence 2 • RS Nelson 6 • White Bluff 1 • White Bluff 2 <p><u>Gas</u></p> <ul style="list-style-type: none"> • Baxter Wilson 1 • Little Gypsy 2 • Little Gypsy 3 • Ninemile Point 4 • Ninemile Point 5 • Ninemile Point 6A/6B • Sabine 3 • Sabine 4 • Sabine 5 c. Coal purchasing (Rachel Hill) plant daily coal burn data, and six (6) total short-term test burns data from three (3) coal plants. d. Gas purchasing (Dave Bruess) gas burn data – all plants – monthly basis. e. CEMS supporting documentation and QA/QC back-up data for selected audit sample units. 3. Small stationary combustion: 2017 data reported to EPA’s GHG Reporting Program (GHGRP) through Subpart C.
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Objective (specific principles)	<i>Accuracy, Transparency</i>
Specific Activities	<p><u>General</u></p> <ol style="list-style-type: none"> 1. Review documentation for completeness 2. Recalculate emissions numbers 3. Perform checks <p><u>Emissions Factors</u></p> <ol style="list-style-type: none"> 4. Calculate emissions from each emission source category from each sampled Facility 5. Confirm and re-calculate (if applicable) emission factors against independent reference material
Potential Error Conditions	<p><u>General</u></p> <ul style="list-style-type: none"> • Disagreement between calculated and reported values; • Disagreement between allocated values or inconsistent methodology. <p><u>Emissions Factors</u></p> <ul style="list-style-type: none"> • Incorrect or out of date emissions factors

Sample Unit	<p>1. <u>Purchased Power</u>:</p> <p>a. All controllable trades (daily) extract in Excel</p> <p>b. Emissions totals for total purchased power on monthly basis</p> <p>2. <u>Large Stationary Fossil Plants</u>:</p> <p>a. 15 units selected for sampling in relation to EPA CAM AMPD database, and supporting QA/QC documentation review, checks; representing >50% of total Entergy power generation direct GHG emission levels, including CEMS reports for the following coal- and gas-fired units; requests to be made to Tad Chenet at Fossil Environmental, or to the respective Entergy site visit Environmental Manager/Analyst.</p> <p><u>Coal Units</u></p> <ul style="list-style-type: none"> • Independence 1 • Independence 2 • RS Nelson 6 • White Bluff 1 • White Bluff 2 <p><u>Gas Units</u></p> <ul style="list-style-type: none"> • Baxter Wilson 1 • Little Gypsy 2 • Little Gypsy 3 • Ninemile Point 4 • Ninemile Point 5 • Ninemile Point 6A/6B • Sabine 3 • Sabine 4 • Sabine 5 <p><u>Note</u>: EPA AMPD database queries for 2018 total CO₂ emissions data will be made for all Entergy fossil generation units.</p> <p>For each of the above CEMS-equipped gas- or coal-fired units, Cventure will request the following information for calendar year 2018:</p> <ul style="list-style-type: none"> • Gas flow meter accuracy test/CEMS gas flow transmitter calibration analysis, or stack gas CO₂ CEMS if so equipped (gas-fired units) • CO₂ and stack gas flow meter CEMS RATA annual test results (coal-fired units) • CO₂ CEMS quarterly linearity checks (coal-fired units)
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	<ul style="list-style-type: none"> ECMPS (emissions collection and monitoring plan system) feedback reports: Q4 <p>For the gas units at Baxter Wilson and Little Gypsy, Cventure will request similar information as above from the respective Environmental Managers/Analysts on site, including hourly CO₂ data for 2018 from the on-site CEMS data acquisition and handling systems (“DAHS”).</p> <p>3. <u>Small stationary plants</u> – check “fossil fuel generating stations” emissions against EPA GHGRP data for 2017 for confirmatory checks against data and emissions numbers in the 2018 GHG Assertion.</p>
Sample Size	<p>All emissions sources and values for:</p> <ul style="list-style-type: none"> Purchased power (controllable trades) Large stationary fossil plants listed in Sample Unit section (see above) Small stationary combustion sources

C2 – Minor/ <i>De Minimus</i> Emissions - Methodology and Documentation	
Introduction: In order to ensure that all relevant emission sources are included in the GHG Assertion, it is necessary to confirm that any <i>de minimus</i> emission sources have been appropriately excluded.	
Type of Evidence	Documentation, Discussions with Entergy’s Environmental Reporting and Climate Manager
Data Sources	2018 GHG Assertion, IMPRD
Objective (specific principles)	<i>Accuracy, Transparency</i>
Specific Activities	<ol style="list-style-type: none"> Review minor/<i>de minimus</i> sources and discuss with Entergy Environmental Reporting and Climate Manager Compare to earlier year inventories (2011-2017)
Potential Error Conditions	Material emission source(s) improperly excluded from GHG Assertion
Sample Unit	N/A
Sample Size	Minor/ <i>de minimus</i> emission categories and sources

D1 – Data Collection and Quality Controls

Introduction: This procedure is intended to systematically review the Responsible Party’s internal procedures and controls that are used to calculate the GHG Assertion.

Type of Evidence	Documentation, Confirmation, Observation, Inquiries of the Client, Analytical Procedures
Data Sources	Data systems personnel, Entergy personnel, 2018 GHG IMPRD, Standard Operating Procedures and Manuals
Objective (specific principles)	<i>Completeness, Consistency, Accuracy, Transparency</i>
Specific Activities	<ol style="list-style-type: none">1. Observe or interview Entergy personnel regarding the operation of data transfer systems, including manual data entry procedures and associated controls;2. Review or interview Entergy personnel regarding on-site sampling, laboratory and other analytical procedures, etc.;3. Compare original data sources to data in calculation systems for consistency;
Error Conditions	<ul style="list-style-type: none">• Inconsistency between raw data and data supporting the 2018 GHG Assertion• Inconsistency and/or unclear links between information management systems that are of the most relevance to the underlying data for the 2018 GHG Assertion

D2 – Data Confirmation against External Sources	
Introduction: Where possible, this verification procedure is used to gather external evidence to confirm data sources used to quantify reported emissions.	
Type of Evidence	Confirmation, Analytical Procedures
Data Sources	<p>Inventory Report and supporting external data/information:</p> <ol style="list-style-type: none"> 1. <u>Large fossil generating stations</u>: <ol style="list-style-type: none"> a. CEMS data – EPA CAM AMPD emissions database query reports and select ECMPS reports. b. Gas and coal burn data – monthly for all gas plants, and daily data for all coal plants sampled (all 12 months for 2018); two sets of select daily coal burn data for RS Nelson, White Bluff, and Independence coal plants. c. All CEMS-related QA/QC documentation for Baxter Wilson and Little Gypsy units, and hourly CO₂ data for those units. 2. <u>Small Stationary Combustion Sources</u> – 2017 EPA GHG Reporting Program data submitted for all fossil generating stations.
Objective (specific principles)	<i>Accuracy</i>
Specific Activities	<ol style="list-style-type: none"> 1. Review use of external data sources in GHG inventory for Appropriateness. 2. Compare reported/metered values to those provided by secondary source.
Potential Error Conditions	Unexplained, major discrepancy between metered/reported values and secondary source.
Sample Unit	Typically monthly or annual data primarily, with some cross-checks on daily data as relevant/applicable.
Sample Size	<ol style="list-style-type: none"> 1. <u>Large fossil generating stations</u>: <ol style="list-style-type: none"> a. CEMS data and select ECMPS reports – for 15 gas and coal-fired units (representing >50% of Entergy power generation direct emissions). b. Gas and coal burn data – monthly (all 12 months for 2018) – for all gas plants, and daily data for all coal plants; two sets of select daily data for White Bluff and Independence plants, and for RS Nelson 6. c. All CEMS-related QA/QC documentation and hourly DAHS CO₂ emissions data for Baxter Wilson (Unit 1) and Little Gypsy (Units 2 and 3). 2. <u>Small stationary combustion sources</u> – annual 2017 EPA GHG Reporting Program data submitted for all fossil generating stations.

D3 – Data Migration into Inventory	
Introduction: This procedure is intended to review the transfer of data from calculations into the final GHG Assertion, including any summary calculations that were required.	
Type of Evidence	Documentation, Re-Performance
Data Sources	2018 GHG Emissions Inventory Report, IMPRD, and discussions with Entergy’s Environmental Reporting and Climate Manager
Objective (specific principles)	<i>Accuracy, Transparency</i>
Specific Activities	<ol style="list-style-type: none"> 1. Recalculate summary calculations performed by Entergy. 2. Compare calculated values to those in the GHG Assertion for transcription accuracy.
Potential Error Conditions	<ul style="list-style-type: none"> • Discrepancy between summary totals and individual source/emissions type values reported in the 2018 GHG Assertion
Sample Unit	Data reported in the final 2018 GHG Assertion
Sample Size	All relevant information and emissions values

A1 – Final Verification Assessment	
Introduction: This procedure is intended as a final review check of Entergy’s 2018 GHG Assertion to ensure all required information is complete and all relevant documentation is included.	
Type of Evidence	Documentation
Data Sources	GHG Assertion
Objective (specific principles)	<i>Completeness</i>
Specific Activities	<ol style="list-style-type: none"> 1. Review each page of the 2018 GHG Assertion and IMPRD for completeness and current information; and 2. Provide Responsible Party with documentation, namely a verification statement and report for voluntary reporting purposes.
Potential Error Conditions	<ul style="list-style-type: none"> • Incomplete, inaccurate, or missing information in the GHG Assertion
Sample Unit	Data fields in the GHG Assertion
Sample Size	All fields in the GHG Assertion

Attachment 3
IMPRD Revision Log

Entergy GHG IMP and Reporting Document Revision Log

Revision No	Revision Date	Reason for Revision	Additional Comments
1	July 2005	Original DRAFT	
2	8/16/05	Revised Draft	Editorial/technical comments from Fossil Operations, Nuclear Operations, and T&D included
3	9/30/05	FINAL DRAFT	Editorial/technical comments from Platts/E source
4	12/21/05	FINAL VERSION	Changes made to reflect approved GHG reduction goal – 2 nd commitment
5	10/10/06	Revised based on comments from Climate Leaders and E-source	Clarified various data sources and communication requirements in document
6	04/28/09	Revised based on findings during verification of 2006 and 2007 GHG Inventories	Various editorial changes; added Thermal facilities and Spindletop to facilities list
7	08/25/09	Revised based on findings during verification of 2008 GHG Inventory	Revised fugitive emissions methodology for SF ₆ ; other minor editorial changes
8	04/01/10	Revised based on findings during verification of 2009 GHG Inventory	Various editorial changes; noted need to subtract EAM from total purchases (ISB); updated facility list; enhanced QA/QC discussion
9	3/10/11	Revised based on findings during verification of 2010 GHG Inventory	Various editorial changes; updated status of EPA Climate Leaders Program; clarified review requirements, QA/QC measures and training
10	03/09/12	Revised to comply with ISO 14064-3:2006 and based on findings during verification audit of 2011 GHG Inventory	Major revision – expanded document to include aspects necessary to comply with ISO standard. Expanded discussions of data management, quantification methods, targets, actions, base year adjustments and uncertainty.
11	03/08/13	Revised based on findings during verification audit of 2012 GHG Inventory	Various editorial changes; updated plant acquisitions during 2012
12	03/07/14	Revised based on findings during verification audit of 2013 GHG Inventory	Various editorial changes; updated to reflect plant divestitures during 2013, inclusion of off-site power for plants out of utility territory, discussion of transition to MISO, updated internal website address
13	03/09/14	Revised to reflect changes caused by transition to MISO and based on findings during verification audit of 2014 GHG Inventory	Various editorial changes; updated to reflect new plant started up in 2014, described impacts of MISO transition, updated website addresses
14	03/11/15	Revised based on findings during verification audit of	Various editorial changes; updated plant sales

		2012 GHG Inventory	
15	03/02/17	Revised based on findings during verification audit of 2016 GHG Inventory	Various editorial changes; updated to reflect plant acquisition and divestitures closed during 2016.
16	03/09/18	Revised based on findings during verification audit of 2017 GHG Inventory	Various editorial changes; added Attala
17	03/07/2019	Revised based on findings during verification audit of 2018 GHG Inventory	Various editorial changes; clarified inclusion of Attachment 2