# Entergy Corporate Greenhouse Gas Inventory for Calendar Year 2011

# Verification Report

March 9, 2012

ICF International
620 Folsom Street, 2nd Floor
San Francisco, CA 94107
(415) 677-7100

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# Statement of Verification

March 9th, 2012

Entergy Corporation
Environmental Strategy and Policy Group
Entergy Services, Inc.
639 Loyola Ave (L-ENT-13D)
New Orleans, LA 70113

## Scope

Entergy Corporation ("Responsible Party") engaged ICF International in cooperation with Cventure LLC ("ICF") to review Entergy Corporation's *2011 Corporate Greenhouse Gas (GHG) Inventory,* and supporting evidence including Entergy's Inventory Management Planning and Reporting Document (IMPRD), detailing the GHG emissions and associated source documents over the period January 1, 2011 to December 31, 2011. These components are collectively referred to as the "GHG Assertion" for the purposes of this report.

The Responsible Party is responsible for the preparation and presentation of the information within the GHG Assertion. Our responsibility is to express a conclusion as to whether anything has come to our attention to suggest that the GHG Assertion is not presented fairly in accordance with generally accepted greenhouse gas (GHG) accounting standards, in particular *ISO 14064 Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals (ISO, 2006).*

## Methodology

We completed our review in accordance with the ISO 14064 Part 3: *Greenhouse Gases: Specification with guidance for the validation and verification of greenhouse gas assertions* (ISO, 2006). As such, we planned and performed our work in order to provide limited, rather than absolute, assurance with respect to the GHG Assertion. Our review criteria were based on this guidance. We reviewed the GHG Assertion and associated documentation. We believe our work provides a reasonable basis for our conclusion.

## Conclusion

Based on our review, nothing has come to our attention which causes us to believe that the GHG Assertion is not presented fairly in accordance with the relevant criteria. The emission estimates were calculated in a consistent and transparent manner and were found to be a fair and accurate representation of Entergy Corporation's actual emissions and were free from material misstatement. ICF identified several minor, immaterial discrepancies in Entergy's greenhouse gas inventory which were corrected by Entergy during the course of the verification. ICF has verified a total of 49,837,857 metric tons of $CO_2$ equivalent ($CO_2e$) emissions for calendar year 2011.

Craig Ebert
Senior Vice President
14724 Ventura Blvd., Suite 1001
Sherman Oaks, CA 91403, USA
Email: cebert@icfi.com
Tel.: (818) 325-3140

# 1 Verification Summary

| | |
|---|---|
| Verifiers: | Craig Ebert, Khalid Husain (ICF International); Kevin Johnson (Cventure) |
| Internal Peer Reviewer: | Aaron Schroeder, P.Eng. |
| Verification Timeframe: | January 2012 to March 2012 |
| Objective of the verification: | Limited level of assurance on Entergy's Corporate 2011 GHG Inventory |
| Assurance being provided to: | Entergy Corporation |
| Verification standard: | ISO 14064-3:2006 (ISO, 2006) |
| Verification criteria employed: | ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions (V1 - March 1, 2006) |
| Verification scope – Gases: | Carbon Dioxide, Methane, Nitrous Oxide, Sulfur Hexafluoride, Hydrofluorocarbons |
| Organization: | Entergy Corporation |
| Location: | U.S.A. |
| Temporal period: | January 1, 2011 – December 31, 2011 |
| Main Contact | Craig Ebert<br>Senior Vice President<br>14724 Ventura Blvd., Suite 1001,<br>Sherman Oaks, CA 91403, USA<br>cebert@icfi.com<br>(818) 325-3140 |
| Main Contact | Rick N. Johnson<br>Manager, Corporate Environmental Operations<br>Environmental Strategy and Policy Group<br>Entergy Services, Inc.<br>639 Loyola Ave (L-ENT-13D)<br>New Orleans, LA 70113<br>rjohn15@entergy.com<br>(504) 576-5246 (office) |

## 2 Introduction

Entergy has engaged ICF International to provide a third party verification of its corporate-wide GHG emissions for calendar year 2011 for voluntary organization-wide GHG reporting purposes. Cventure LLC serves as a partner to ICF International in the verification exercise.

Entergy's GHG emissions inventory uses an equity share approach to establishing boundaries.

The 2011 GHG inventory includes the following emissions sources:

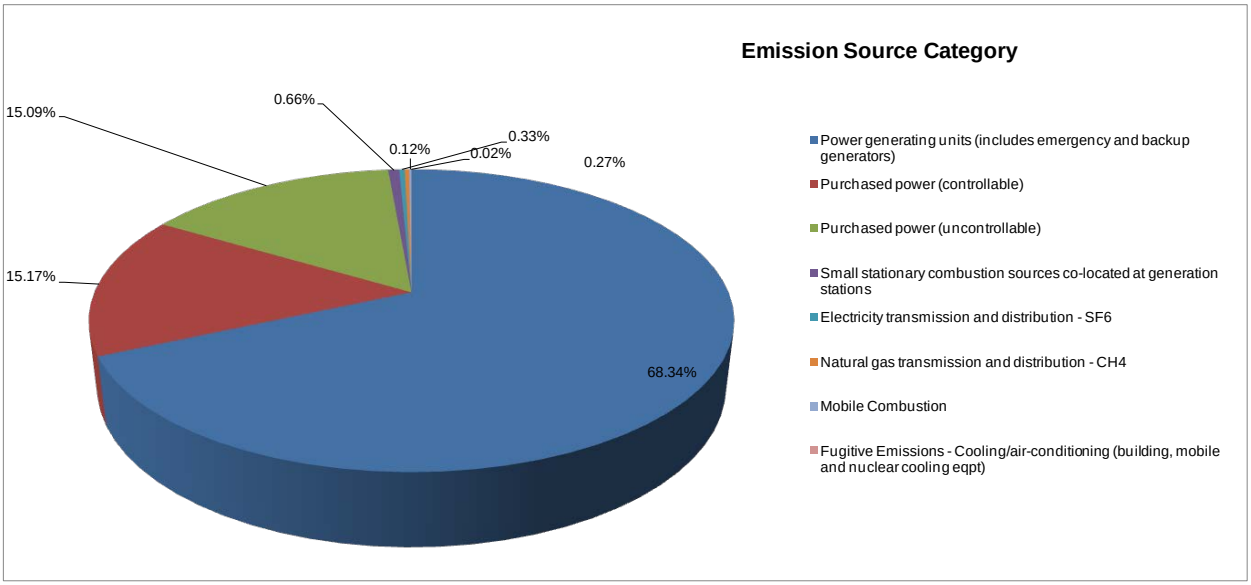
Scope 1**:** Stationary combustion in electric generating units and small sources at company facilities; mobile combustion in company fleet vehicles; fugitive methane from natural gas transmission systems; fugitive sulfur hexafluoride ($SF_6$) from electric power transmission and distribution systems, and; fugitive hydrofluorocarbons (HFCs) from building HVAC systems, district cooling operations, and vehicle air conditioning systems.

Scope 2: Indirect emissions associated with both contract and spot market purchased electricity.

Scope 3: Purchased electricity for resale to end-users.

Emissions associated with electricity used in Entergy facilities are accounted for within stationary combustion emissions. Emissions associated with line losses in electric power transmission and distribution systems are included within the stationary combustion and purchased electricity emissions.

All electricity consumed in the operation of generating plants and consumed in Entergy's various administrative and commercial buildings and operations are accounted for in Entergy's direct emissions from stationary combustion. The GHG emissions resulting from the full life cycle of the various fuel sources are not included in the inventory.



# 3 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 ICF's verification process that was executed through the course of the verification. The specific verification procedures that were planned and executed are described in the attached Sampling Plan.

This is an ISO 14064-3 -based verification program, having been conducted to achieve a limited level of assurance. Given the status of Entergy Corporation's GHG emissions inventory and management system, and that this was the initial verification activity under the ISO 14064 guidelines and specifications, a limited level of assurance verification was appropriate for this project.

The 2011 GHG inventory verification focused primarily on direct emissions from fossil fuel usage at large electric generating facilities using Continuous Emission Monitoring System (CEMS) data; indirect emissions from purchased power facilities; and direct emissions from small stationary combustion sources at Entergy fossil and nuclear generating stations. Entergy noted in its 2011 GHG Inventory Management Planning and Reporting Document (IMPRD) and also indicated to ICF that some category estimates that comprised Entergy's 2011 GHG inventory were estimated in earlier years and would simply be carried forward to 2011 due to their *de minimus* nature (e.g., small stationary non-fossil; nuclear and other generating plants; mobile combustion from company fleets; fugitive emissions; $CH_4$ from natural gas transmission and distribution; $SF_6$ from electricity transmission and distribution; air conditioning/cooling refrigerant HFC emissions). As such, our verification efforts have not focused significantly on these carry-forward emissions from previous years, as they were already reviewed in prior year verifications.

## 3.1 Site Visit

A site visit was conducted on February 15-16, 2012. The first day entailed discussions at Entergy's office in The Woodlands (near Houston, Texas) to better understand purchased power and trades, CEMS operations at fossil fuel generating stations, gas operations, and plant monitoring and diagnostics. The second day involved an on-site tour of Entergy's RS Nelson plant in Lake Charles, Louisiana with a focus on understanding all greenhouse gas emission sources and sinks in the facility through a review of the process flow, metering and data flow diagrams. Subsequently, a review of metering and data management processes was discussed with control room operations staff, including a review of meter calibration/validation procedures.

The site visit was a key step in planning and executing the verification. During the course of the office and site tours, ICF interviewed key site operations personnel regarding power and fossil fuel generation plants operations and environmental data management at Entergy.

Entergy staff interviewed at The Woodlands office included:

- Grady Kaough, Power Trading Operations
- Karen McIlvoy, Gas and Oil Supply
- Gary Hollingsworth and Gary Barnes, Plant Performance Monitoring and Diagnostics
- Tad Chenet and Minh Nguyen, Emissions Monitoring and Markets

Entergy staff interviewed during the RS Nelson plant site visit included:

- Rhonda Kratzer, Environmental Operations
- Control Room Operators

In addition to the site visit, ICF held conference calls with the following personnel to gain a better understanding of Entergy's operations and data management procedures:

- Ryan Trushenski, Solid Fuel Supply – System Planning and Operations
- Scott Celino, Generation and Fuels Accounting
- Charles John, Intra-System Billing (ISB)
- John Zurita, Wholesale Operations

## 3.2 Verification Approach

This ISO limited level of assurance verification effort involved the review of the logic and procedures used to compile the emission estimates, determine completeness and accuracy in calculations, and to assess the validity of the inventory design itself. It also focused on a review of the procedures in place and identified any missing or incorrectly calculated values. Emissions data were reviewed at a high level to detect internal inconsistencies, identify outliers and find potential errors in reporting, and included boundaries' completeness checks. Data in supporting spreadsheets and from the corporate databases were also examined under this verification review.

A detailed technical review of the methodologies, approaches, and calculations used in Entergy Corporation's inventory estimates was conducted in this verification effort. This was combined with a sampling of data sources used during the compilation of the GHG emissions inventory by Entergy. Documentation was examined, including reviews of disaggregated data, and the audit trail followed below the business entity level to raw data sources for several Entergy power generation units and power purchase agreements. The section that follows outlines the approaches used to review the main sources of the 2011 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 was reviewed in greater detail. Generation units were selected for detailed audit trail reviews based primarily on relative contribution to the 2011 corporate GHG emissions inventory, e.g., using the 1% de minimus accounting methodology/reporting threshold of Entergy's GHG inventory, as the unit selection screening priority. Other considerations in selecting units for detailed review included large, "sister" units at the same selected facility, availability of facility fuel usage validation data (for gas-fired facilities), and also to account for some overlap with last year's samples (to test for any changes), as well as a selection of new samples.

The twenty (20) generation units selected for this desktop review included the following 5 coal and 15 gas units:

**Coal**

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

**Gas**

- Baxter Wilson 1
- Baxter Wilson 2

- Gerald Andrus 1
- Lewis Creek 1
- Lewis Creek 2
- Michoud 2
- Michoud 3
- Ninemile Point 3
- Ninemile Point 4
- Ninemile Point 5
- RS Nelson 3
- RS Nelson 4
- Sabine 5
- Willow Glen 1
- Willow Glen 2

The following information was received from Entergy and reviewed in relation to the above samples:

- Annual CO2 /flow monitors relative accuracy test audits (RATAs) for the 5 selected coal units;
- Quarterly CO2 CEM linearity checks for the 5 selected coal units;
- Gas flow meter CEMS calibration/accuracy checks for all fifteen (15) gas units;
- Data acquisition and handling system (DAHS) component computations/formula verification reports, and EPA emissions collection and monitoring plan system (ECMPS) quarterly feedback reports, for all fifteen (15) gas units, and one (1) coal unit at the on-site survey visit facility (RS Nelson 6);
- Annual data on electricity generation (MWh) and heat input (total Btu) for all twenty (20) units (from EPA Clean Air Markets [CAM] database);
- Daily/monthly data on electricity generation (MWh) and heat input (total Btu) for eighteen (18) of the data sampled units (from Entergy's Plant Performance Monitoring and Diagnostics [PM&D] data historian database);
- Monthly facility-level gas burn data for all gas-fired electric generation facilities (from Entergy's Gas Database, maintained by the natural gas purchasing and accounting department); and
- Several days coal burn sampling data for one (1) coal-fired unit (RS Nelson 6).

The twenty (20) units which were reviewed in greater detail represented approximately 70% of Entergy's total direct CO2 emissions from power generation units, and approximately 50% of Entergy's total corporate GHG emissions, in 2011.

Organizational boundaries were verified using information contained in Entergy's SEC 10-K report for 2011, Entergy's 2010 Statistical Report and Investor Guide, and Entergy's inventory list of generation assets. As described in Entergy's GHG Inventory Management Planning and Reporting Document (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 Entergy owns jointly with other companies) which was used to calculate the GHG emissions in the inventory database for this category. These equity share values in the GHG inventory were crosschecked against the data provided in the IMPRD, Entergy's statistical and 10-K reports, and successfully verified.

CEMS reports supplied by Entergy were checked against both the GHG emissions data in their GHG inventory spreadsheet database, and the EPA Clean Air Markets emissions reporting and tracking database, for the twenty (20) above selected units. Monthly and annual $CO_2$ CEMS reports were generated by the ICF team from queries of the EPA Clean Air Markets database, and were checked and confirmed against the data reported in Entergy's GHG emissions inventory spreadsheets.

Associated CEM system and gas flow meter QA/QC supporting documentation (including relative accuracy test audits, and linearity checks) was reviewed for a sample of the twenty (20) generating units. These documentary evidence verification checks were performed and confirmed that the reported emissions data and emissions/flow monitoring measurements and monitoring calibrations were accurate and the associated measurements data reported correctly in the Entergy GHG inventory.

For each of the units sampled, various error checking tests were performed on 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, for each fuel type among select generating units, a sampling of daily $CO_2$ emissions values were checked using an alternative quantification methodology, based on activity data (e.g., fuel heat input values) and emissions factors.

Purchased Power

The key emissions factors, sources, and calculations that Entergy used for its Purchased Power (comprising Controllable Power Purchases and Non-Controllable Power Purchases) in the 2011 inventory database were checked. Together the data from these two sources correspond to approximately 30% of the total Entergy Corporate GHG emissions in 2011.

A monthly breakdown of total purchased power was obtained from Entergy for review purposes and cross-checked against the 2011 SEC 10-K report and the 2010 Statistical Report and Investors Guide document for boundary and equity share purposes.

In addition, raw data showing controllable purchased power for 2011 was received from System Planning and Operations (SPO) and was cross-checked against the inventory spreadsheet database.

Small Stationary Combustion Sources – Fossil Generating Plants

GHG Emissions data for these plants were updated to reflect Entergy's $CO_2$ 2010 estimates submitted to the U.S. Environmental Protection Agency's (EPA) Mandatory Reporting Rule. ICF reviewed both the 2010 data submitted by Entergy to the EPA GHG Reporting Program, and also directly downloaded the 2010 EPA GHG Reporting Program data and cross-checked against Entergy's emissions for these sources.

Other Sources

All other GHG emissions sources were taken to be the same as last year due to their *de minimus* nature and as noted in the GHG IMPRD. These sources include small stationary non-fossil; nuclear and other generating plants; mobile

combustion from company fleets; fugitive emissions; $CH_4$ from natural gas transmission and distribution; $SF_6$ from electricity transmission and distribution; air conditioning/cooling refrigerant emissions.

# 4 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 Sampling Plan included some procedures to test the effectiveness of the internal controls in place. The results of these tests influence what activity data was sampled and at what rate.

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 were summarized in the Sampling Plan as separate tables for each process or activity involved in the quantification and reporting of the GHG Assertion. Materiality was specified for each specific procedure and aggregate materiality was determined separately (see Section 6 of this document). The details of the testing of internal controls and substantive testing undertaken are described in detail in the final Sampling Plan.

The verification team developed a thorough knowledge of the data management and control systems utilized in the organization through the review of the Report (IMPRD), observation during the head office and site visit, and interviews with key personnel. The following were the key data systems observed.

- TRADES – controllable power purchases tracking system: hourly purchase amounts from 1/1/2011 to 12/31/2011 inclusive were extracted and sent via Excel to ICF by Grady Kaough (via Rick Johnson).
- ISB (Intra-system billing) – Monthly purchased power totals for 2011 (12 months for 2011) in PDF form were sent to ICF by Scott Celino (via Rick Johnson)
- PM&D data – for large fossil generating stations
- 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 units – from Karen McIlvoy: purchase amounts inputed into ISB.
- Coal purchases data – from Ryan Trushenski (solid fuels): purchase amounts inputted into ISB.

# 5 Verification Results

## 5.1 Discrepancies

The table below details discrepancies found during the verification process for each procedure, a discrepancy title (brief description) and final status. Further explanations of the discrepancies are shown below in the subsequent table.

| Procedure | Discrepancy Title | Final Status |
|---|---|---|
| B1: Established Organizational Boundaries | None detected | |
| B2: Review of Operating Conditions | None detected | |
| C1: True-Up and Re-performance Calculations | None detected | |
| C2: Minor/Negligible Emissions - Methodology and Documentation | None detected | |
| D1: Data Gathering and Quality Controls | None detected | |
| D2: Data Confirmation against External Sources | 1. Discrepancy in gas burn data in cross-check with Entergy's Gas Burn database | Immaterial discrepancy |
| D3: Data Migration into Inventory | None detected | |
| A1: Final Verification Assessment | None detected | |

| Discrepancy Title | Discrepancy Description |
|---|---|
| 1. Discrepancy in gas burn data in cross-check with Entergy's Gas Burn database | As part of the cross-checking analysis with the gas burn data from the Entergy Gas Database, an immaterial discrepancy (totaling ~0.1% of the Entergy GHG inventory) was identified for two (2) of the smaller, peaking/reserve gas-fired generation facilities. This discrepancy will be investigated further as part of the 2012 GHG inventory development and verification programs. |

## 5.2 Aggregate Materiality

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

## 5.3 Other Findings

- For the twenty (20) large stationary fossil units identified as targets for audit sampling, monthly/annual CEMS data from US EPA's Clean Air Markets (CAM) emissions reporting database were reviewed. These results were verified against the direct emissions reported in Entergy's GHG emissions inventory spreadsheets. No material errors or omissions associated with Entergy's GHG emissions inventory accounting and reporting were identified, as part of this US EPA CO2 emissions database and Entergy GHG emissions inventory spreadsheets/supporting documentation comparisons and data checks.

- Emission factors for $CH_4$ and $N_2O$ emissions from electric generation units were also checked. No material errors or omissions were identified in those checks.

- A re-calculation of $CO_2$ emissions was made for two (2) of the on-site survey visit data-sampled generating units (RS Nelson 3 and 6), based on fuel heat input data. The results of this alternative quantification methodology comparison showed a calculated total $CO_2$ output within +/- 2% of the reported value from the CEMS units for the gas-fired unit, and within +/- 4% of the CEMS values for the coal-fired unit. This degree of agreement between two alternative emissions quantification methodologies represents an acceptable margin of error for a limited level of assurance verification. 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). Therefore, the alternative quantification methodology provides additional verification confirmation of the CEM systems measurement approach and results.

- For the seven (7) gas-fired facilities with generation units sampled under this program (and equipped with dedicated gas pipelines/supply header), monthly and annual gas fuel use/total heat input data from the Gas Database (which tracks gas utility purchases and pipeline deliveries to Entergy generating stations) were compared to the EPA CAM database results. (Note: Total heat input comparisons for gas-fired generation units were deemed appropriate here as the CEMS emissions reported are based on gas fuel flow rate measurements.) The results of these cross-check comparisons showed facility wide deviation between the two datasets of less than +/- 4% difference for five of the seven facilities, and only one facility greater than +/- 10% (it was less than +/- 20%). (Note: A 2010 Entergy study of eleven (11) gas-fired facilities showed similar results, with an average agreement within approximately +/- 6%; six (6) facilities within +/- 3%; and only three (3) facilities greater than +/- 10%.) Given the distinct differences between metering characteristics, as well as the gas flow measurements aggregated across a total of 2-5 units (except for Gerald Andrus 1), this level of agreement provides an additional degree of confidence in the reliability of reported results for Entergy's gas-fired generation, and reduction in the associated residual risk of misstatement.

- For Independence 2 and RS Nelson 6, the GHG emissions verified in the 2010 verification effort are still currently conditional, based on petitions to US EPA for proposed alternative monitoring of carbon dioxide mass emissions and heat input (to which EPA has yet to respond). The changes being proposed by Entergy involve several hundred thousand tons $CO_2e$ emissions for each unit in 2010: on the order of a 6-7% adjustment to each unit's annual emissions, and collectively representing approximately a 1% change to the

overall 2010 inventory. These changes have not yet been approved by US EPA and data adjustments made in the Clean Air Markets database. These data adjustments should be re-checked as part of the 2012 inventory verification activities.

- For the five (5) coal-fired units and thirteen (13) of the gas-fired units selected for data sampling, comparisons on unit-specific fuel heat input from the EPA CAM emissions database were made by cross-checking MMBTU values from Entergy's Plant Performance Monitoring & Diagnostics (PM&D) section. This database contains unit operational data recorded by each unit's Pi historian (the data monitoring component of Entergy's supervisory control and data acquisition [SCADA] system). Unit-specific data were supplied on a monthly basis, for fuel flow, heat input (MMBtu), and power generation (MW-hr), for eighteen (18) of the twenty (20) audit sampled units. The results of these cross-check comparisons showed individual unit deviations between the two datasets of less than +/- 5% difference for three (3) of the five (5) coal-fired units, with the other two (2) units agreeing within less than +/- 10%. For the thirteen (13) gas units with PM&D data, seven (7) of the units showed agreement within +/- 2%, and three (3) other units within approximately +/- 5%. The remaining three (3) units had differences on the order of +/- 15-30%. (Note: For those three [3] high deviation units, it appears that one had consistently low readings over multiple months, and then very close resolution [possibly from a PM&D sensor repair], while a second unit showed a consistently low bias over the entire year. The third unit showed consistently high readings, including several months with no CEMS system operation/emissions data; as such, that unit, and others identified in the 2010 Entergy internal study, could be targets of further investigation as part of the 2012 GHG inventory verification program.) As in the case of the Gas Database comparison above, the results of this cross-check for a very large majority of the units sampled add further credibility to Entergy's coal- and gas-fired generation GHG emissions inventory reporting.

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

# 6 Verification Team

Since 1969, ICF International has been serving major corporations, all levels of government, and multilateral institutions. Globally, approximately 400 of our approximately 4,500 employees are dedicated climate change specialists, with experience advising public and private-sector clients. ICF International has earned an international reputation in the field of climate change consulting for its analytical rigor, in-depth expertise, and technical integrity through scores of GHG emissions-related assignments over the past two decades.

ICF International has carried out numerous facility-level GHG verifications and verifications of emission reduction projects. ICF has developed the necessary internal controls to ensure qualified and competent staffing uphold the principles of the relevant standard while quality control processes are utilized to assure data integrity is maintained and safeguarded. ICF's clients choose ICF for its strong brand, technical expertise, and rigorous methodological approach.

For this verification, ICF assembled a Verification Team consisting of experienced greenhouse gas verifiers and relevant technical experts.

## Verifiers

Craig Ebert is a Managing Director in ICF's Los Angeles Office, and supports commercial and public clients internationally on strategic management of the risks and opportunities posed by climate change and attendant impacts on shareholder value. He has worked for a wide variety of public and private clients, including most recently Yahoo!, News Corporation, eBay, Time Warner, Exelon, Duke, Fidelity, TransCanada, El Paso, World Bank, Lafarge, Repsol, Aracruz, and Petrobras. He has directed ICF's support to the US EPA as its primary climate change contractor, including support to about 50 countries under the US Country Studies Program, compilation of the official US greenhouse gas inventory to meet international commitments under the United Nations Framework Convention on Climate Change, and analysis of the cost and availability of options to reduce US emissions in support of international climate negotiations. His support includes assessing the cost and availability of various offset classes for different public and private sector clients and helping clients unlock the financial value of potential emission reduction projects in both voluntary and compliance markets.

Khalid Husain is a Senior Associate in the Climate Change Mitigation and Sustainability group of ICF's Energy, Environment and Transportation (EET) Practice. A LEED-EB accredited professional, he has approximately 11 years of experience in climate change, energy and environmental issues in both public and private sector capacities. His current work involves a range of technical assistance on greenhouse gas management issues. Mr. Husain brings strong knowledge and experience in GHG inventory development and verification, as well as in corporate sustainability at large through work with diverse clients. He has carried out, or is in the process of conducting, verification of GHG inventories against the Alberta's Specified Gas Emitters Regulation, California Climate Change Registry (CCAR), EPA Climate Leaders Protocol and the Carbon Disclosure Project. He has also worked on EPA's Task Order 70 and is knowledgeable of international GHG protocols for the EU ETS, CDM and JI. His experience also includes advisory and analytical services on carbon offsets, on both the buy and sell sides, for both voluntary and CDM projects. Services include undertaking feasibility studies, conducting risk assessments and due diligence, drafting and revising project design documents (PDDs), and reviewing methodologies for offsets. Mr. Husain holds a Masters degree in International Affairs, joint focus in Economic & Political Development & Environmental Studies from Columbia University and a B.Sc. (Honors) in Earth and Planetary Sciences from McGill University.

Kevin Johnson (Cventure LLC) has over 25 years energy and environmental consulting experience, focusing over the last decade on climate change, greenhouse gas (GHG) and $CO_2$ emissions, and carbon offset projects. In 2005, he founded Carbon Solutions, Inc., an independent consulting services firm, and in 2007 co-founded Cventure LLC. While a contractor for ERT-Winrock in 2008-9, he served as project manager for several GHG emissions reduction credit (ERC) protocol development and verification projects, as well as corporate GHG inventory verification projects, and drafted the verification guidelines for the American Carbon Registry (ACR). Mr. Johnson has also led the development of a carbon offset project evaluation and quality rating software tool. 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 (EMIS) implementations, and ERC verification and trading support. Mr. Johnson has been a member of the Emissions Marketing Association and served as a delegate to the UNFCCC technical subsidiary meetings. Some climate change clients include Entergy, Exelon, Eni, El Paso, Google, Wal-Mart, Bloomberg LP, NewsCorp, Marathon, Unocal, Conoco, PetroSource, BlueSource, EDF, U.S. DOE, GRI, U.S. EPA, and several independent oil producers.

### Internal Peer Reviewer

Aaron Schroeder is a Professional Engineer in the Province of Alberta and holds a BSc. in Engineering from the University of Saskatchewan. He has completed supplementary training in ISO 14064 as well as Auditing and Assurance Engagements through the University of Toronto, School of Continuing Studies. Aaron has acted as lead verifier on third-party assurance assignments for multiple compliance periods under Alberta's Specified Gas Emitters Regulation. These projects included work at SAGD facilities in Alberta's oil sands, a complex sour gas processing facility, two of Alberta's largest natural gas pipelines and combined-cycle electric generating facilities. Additionally, Aaron has completed numerous verifications as lead verifier for emission reduction (offset) projects in agricultural tillage management, wind electricity generation, and acid gas injection projects.

## Conflict of Interest

ICF has conducted a review of any real or perceived conflicts of interest resulting from advocacy, intimidation, self-review, self-interest or familiarity. No threats to independence, either real or perceived, have been identified.

## Statement of Qualifications

The information contained within this document and this statement of qualifications is complete and correctly represents the qualifications of ICF and the members of the Verification Team described herein. Dated this ninth day of March, 2012.

Craig Ebert
Senior Vice President
14724 Ventura Blvd., Suite 1001
Sherman Oaks, CA 91403, USA
Email**:** cebert@icfi.com
Tel.: (818) 325-3140

# Appendices

Verification Plan

Sampling Plan

# Verification Plan

Entergy

# 1 Introduction

Entergy Corporation ("the Client") has engaged ICF International ("ICF") to provide a third party verification of its organizational-wide greenhouse gas (GHG) inventory for the year 2011.

The quantification of the emissions will be carried out through *ISO 14064-1* which provides guidance on the quantification of Greenhouse Gases ("GHG"). The GHG Assertion made by Entergy requires the quantification of the emissions produced during, and related primarily to stationary combustion of fossil fuels and purchased power, as well as a number of minor sources. The verification of the emissions will be carried out through the *ISO 14064-3* guidance document.

This document describes the terms and scope of this verification. It serves to guide the verification, communicating the parameters of the verification to the Intended Users of its findings, and informing the development of the verification procedures described in the Sampling Plan.

# 2 Objective

The primary objective of this verification engagement is to provide assurance to Entergy that the GHG Assertion is reliable, and of sufficient quality for:

- Internal purposes, namely tracking towards internal reduction targets as well as CSR reports;
- External voluntary reporting, primarily to the American Carbon Registry (ACR) and the Carbon Disclosure Project (CDP).

# 3 Parties and Users

As defined in Section 2.23 of ISO 14064-1:2006 the person or persons responsible for the provision of the GHG Assertion and the supporting GHG information is the "Responsible Party". For this verification, Entergy is the Responsible Party.

ICF, the "Verifier," has been engaged by the Client, to provide a third party verification of the emissions inventory.

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 in this verification.

# 4 Scope

**Boundaries**

During the initial verification planning, the organizational boundaries and the sources, sinks and reservoirs ("SSRs") which would be required to be included in the emissions inventory quantification will be explored. The procedures utilized to review the GHG Assertion were designed to support a *limited level* of assurance. These procedures systematically review:

- the emissions sources included in the quantification procedures;
- the methodology 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;
- 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 reporting protocols.

### Verification Criteria

The verification will be conducted in accordance with ISO 14064-3:2006. Entergy's Inventory Management Planning and Reporting Document (IMPRD) contains the methodological references for GHG quantification.

### Gases

The GHG emission portion of the assertion accounts for the following greenhouse gases:

- Carbon Dioxide
- Methane
- Nitrous Oxide
- Hydrofluorocarbons
- Sulphur Hexafluoride.

Perfluorocarbons 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.

### Key Sources

The following sources comprise the 2011 GHG inventory categorized by Entergy as follows:

| Entergy Category | Emissions Source Category | Corporate Emissions Source | GHGs Included |
|---|---|---|---|
| Direct Emissions | Stationary Combustion | Power Generating Units | $CO_2$, $CH_4$, $N_2O$ |
| | | Small Stationary Combustion | $CO_2$ |
| | | | |
| | Mobile Combustion | Corporate Fleet | $CO_2$, $CH_4$, $N_2O$ |
| | | | |
| | Fugitive Emissions | Natural Gas Trans. & Dist. | $CH_4$ |
| | | Electricity Trans. & Dist. | $SF_6$ |
| | | Cooling/Air-Conditioning | HFCs |
| Indirect Emissions | Purchased Electricity | | |
| | T&D Losses | Entergy Purchased Power Consumed on Entergy T&D Losses | $CO_2$, $CH_4$, $N_2O$ |
| Optional Emissions Sources | Purchased Power (Controllable) | Controllable Purchased Power Sold to Customers | $CO_2$, $CH_4$, $N_2O$ |
| | Purchased Power (Uncontrollable) | Uncontrollable Purchased Power Sold to Customers | $CO_2$, $CH_4$, $N_2O$ |

### Reporting Period

The GHG Assertion covers the 2011 calendar year, namely 1 January 2011 to 31 December 2011 inclusive.

# 5 Materiality

During the course of the verification procedures, individual errors, omissions or misrepresentations or the aggregate of these discrepancies will be evaluated 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 determining if *qualitative* discrepancies could adversely affect the GHG Assertion and subsequently influence the decision(s) of the Intended User, in which case the discrepancy(ies) are deemed to be material.

*Quantitative* discrepancies will be calculated individually for any errors, omissions, or misreporting, and in aggregate to determine the percentage of the GHG Assertion that is affected.

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.

Entergy's current GHG inventory management planning 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." Given the nature and relative magnitude of the various types of emissions sources in Entergy's GHG inventory, such a *de minimus* size threshold for Entergy's quantification methodology approach is reasonable. However, for its GHG inventory verification program, an appropriate materiality threshold needs to be devised in line with uncertainty and risk estimates. Based on those assessments, we suggest that such a materiality threshold for an initial ISO verification program, conducted to achieve a limited level of assurance, be established as 10%. Note that this materiality threshold may be breached by individual errors, or the sum of multiple errors detected in the various SSRs.

# 6 Principles

ISO 14064-3:2006 defines six 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 emissions. 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 boundaries (as defined earlier) are included within an identified source category.

***Consistency***

Uniform calculations are employed between the base year and current accounting/reporting periods. Emission 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.

***Conservativeness***

Appropriate parameters affecting the sources are utilized in the calculation of the GHG Assertion. When parameters or data sources are highly uncertain, the choice of a specific parameter, data source, or estimated or default value to be utilized, results in an overestimation of the GHG Assertion (i.e., total annual emissions would be overstated for the sake of conservativeness, and to avoid the risks associated with understating reported emissions).

# 7 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 audit procedures and documentation systems 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 will be completed based on observations made by reviewing and assessing accompanying documentation, as well as assessing available information such as the GHG inventory file, interviewing key personnel, and reviewing supporting documents.

The *inherent* risk in Entergy's corporate-wide 2011 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 large number of power purchases occurring throughout the year. According to its 2010 Annual and Statistical Reports,

Entergy is a large Fortune 500 integrated energy company with over 30,000 MW of electric generating capacity. It has nearly 80 fossil fuel power plants and purchased nearly 33 million MWh of electricity in addition to its own generation. It is the 2nd largest nuclear plant operator in the country and also holds wind plants in its portfolio. Because of these reasons, in particular the sheer magnitude of Entergy's GHG footprint, the inherent risk is likely to be medium.

*Control risk* relates to the likelihood that a material misstatement in the 2011 GHG Assertion will not be prevented or detected by Entergy's internal control and data management systems. Control risks were assessed primarily by reviewing data controls and management systems for large fossil generating units and purchased power, both comprising in aggregate nearly 99% of total company-wide emission as noted in the 2011 GHG Assertion. This percentage has remained largely the same over the last three years. The largest control risk in relation to the 2011 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 spreadsheet), although this manual transcription appears to be checked and then double-checked by various Entergy personnel. For purchased power, a number of data systems (such as TRADES and non-controllable oil/gas and coal purchases) feed into ISB (intra-system billing system). Both the individual data systems that comprise data input into ISB as well as ISB itself undergo QA/QC checks several times on an annualized basis. For all of the large, CEMS-equipped fossil fuel electric generation units, which contribute approximately 70% of Entergy's total 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 based upon well established technologies, with demonstrated track records of accuracy, precision, and reliability. Because of all of these reasons, the control risk is likely 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* risk, 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 tests, and collecting an adequate sample size. ICF conducted a number of sampling tests, focused on large fossil electric generation units and purchased power facilities. These tests are outlined in the sampling plan. Our assessment is that detection risk is likely low, given the large number and appropriateness of the tests which have focused on the largest sector (by relative magnitude) of Entergy's 2011 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. Also, for the large CEMS-equipped generation units, because there are so many of them in Entergy's system (approximately 70), there would have to be multiple, long duration control failures to create errors which would lead to material misstatement of Entergy's entity-wide inventory. (For example, in the 2010 case of two highly unusual CEM system failures, which went undetected for several months, while they affected GHG emissions of each unit by 5-10%, their collective impact on Entergy's overall corporate GHG inventory was less than 1%.)

# 8 Verification Schedule

The verification activities for this GHG Assertion were carried out between February 1, 2012 to March 9, 2012 inclusive. A site visit to The Woodlands office near Houston, Texas (where power purchases, plant monitoring and diagnostics, and CEMS management occurs), as well as a visit to the R.S. Nelson fossil electric generation plant (Lake Charles, Louisiana) was conducted between February 15-16, 2012. This visit included interviews with key

staff, a review of information management and security, and a desktop review of key documentation required to complete this verification.

# 9 Verification Procedures

The specific procedures utilized to gather evidence in the review of the GHG Assertion are described in the Sampling Plan.


Sampling Plan

# Entergy's 2011 GHG Inventory Verification

### Objective:

The Sampling Plan describes the procedures that will be conducted within the verification to review Entergy's 2011 GHG Inventory, specifically the GHG Assertion. These procedures have been developed in accordance with the verification principles described in the Verification Plan and customized for Entergy.

### Testing Procedures:

The specific verification activities are summarized in separate tables for each procedure that has been designed to review the evidence supporting the GHG Assertion. As relevant, materiality is specified for each specific procedure. Aggregate materiality is determined separately.

### Summary of Procedures:

Note that the following procedures are not necessarily performed in a sequential manner and may be dictated by the receipt of appropriate data sources. These procedures may also be conducted in an iterative manner as required. While it is appropriate to correct any errors or omissions as identified by the Verification Team, the Responsible Party must perform any required corrections to avoid the threat of self-review to the Verification Team.

**Organizational Boundaries and Definition**

- B1: Established Organizational Boundaries
- B2: Review of Operating Conditions

**Calculation**

- C1: True-up and Re-Performance Calculations
- C2: Minor / Negligible Emissions - Methodology and Documentation

**Data Sources and Supporting Data**

- D1: Data Gathering and Quality Controls
- D2: Data Confirmation against External Sources
- D3: Data Migration into Inventory

**Assertion**

- A1: Verification Assessment

## Procedure Definition Table Explained

| **SAMPLE: Z1 – Example Procedure Category – Example Procedure Title** | |
|---|---|
| Introduction: This introduction serves to explain the reason the Verification Team has interest in the procedure described below. | |
| Type of Evidence | The Type of Evidence can usually be grouped as: Physical Examination, Confirmation, Documentation, Observation, Inquiries of the Client, Re-performance, or Analytical Procedures |
| Data Sources | The *Data Sources* describes the form in which the evidence is presumed to be available to the Verification Team. Specific Documents or Assigned Positions, for example. |
| Objective (specific principles) | The objective serves to focus the procedure as pursuant to one of the audit principles of: *Relevance, Completeness, Consistency, Accuracy, Transparency, or Conservativeness* |
| Specific Activities | 1. In bullet form;<br>2. The Specific Activities are outlined here. |
| Potential Error Conditions | • Again in bullet form;<br>• The anticipated *Error Conditions* are listed here to aid the Verification Team;<br>• As the sampling plan is a living document until the end of the verification process, additional error conditions may be identified during the execution of the procedures. |
| Sample Unit | The *Sample Unit* describes the individual record unit required to define the *Sample Size*.<br>e.g., monthly natural gas consumption. |
| Sample Size | The *Sample Size* represents the original planned depth of the sampling, as a percent.<br>e.g., 15% of the monthly natural gas consumption records. |
| Materiality Threshold | Two options exist for the definition of the *Materiality Threshold*;<br>• A Quantitative description describing the threshold as a percentage of total, e.g., 5 or 10%.<br>• A Qualitative statement where the nature of the error is not a quantitative one.<br>• Note: Qualitative errors will be reviewed on a case by case basis for materiality.<br>Any persisting error which breaches the *Materiality Threshold* would preclude the issuance of an unqualified limited assurance statement by the Verification Team. |

## Organizational Boundaries and Definition

| **B1 – Established Organizational Boundaries** | |
|---|---|
| Introduction: In order to ensure that all relevant emission sources are included in the GHG Assertion, it is necessary to ensure that Entergy's boundaries reflect the current ownership and operations of the Reporting Entity and its assets. | |
| Type of Evidence | Documentation, Observation, Inquiries of the Client |
| Data Sources | Entergy's GHG Inventory Management Planning and Reporting Document (IMPRD), SEC 10-K reports, Entergy's 2010 Annual Investor Guide and Statistical Report, data collection/storage systems, site personnel, observation/site visits. |
| Objective (specific principles) | *Completeness*, *Consistency* |
| Specific Activities | 1. Review and confirm inclusion or exclusion of emission sources as compared to inventory files, IMPRD, 10-K and 2010 Annual Investor Guide and Statistical Report.<br>2. Conduct site visit to confirm information provided verbally and electronically in regards to equipment and operations at a minimum of one (1) key production site. |
| Potential Error Conditions | • Missing emission sources in GHG Assertion;<br>• New and undocumented equipment present at the organization.<br>• Out-dated Entergy organizational diagrams. |
| Sample Unit | N/A |
| Sample Size | N/A |
| Materiality Threshold | Qualitative errors will be reviewed on a case by case basis for materiality |

| **B2 – Review of Operating Conditions** | |
|---|---|
| Introduction: Situations may occur from time to time which cause major changes in the operation of the Reporting Entity. These situations may result from physical changes including: upset conditions, weather events, maintenance turnarounds, capital stock turnover, facility expansions and/or changes in production. | |
| Type of Evidence | Documentation, Observation, Inquiries of the Client, Analytical Procedures |
| Data Sources | Site personnel, Comparison of 2011 vs. 2010 inventory, IMPRD, 10-K |
| Objective (specific principles) | *Consistency, Accuracy, Transparency, Conservativeness* |
| Specific Activities | 1. Evaluate and compare emission sources over the 2011 period with earlier years.<br>2. Review IMPRD for any changes.<br>3. Conduct interviews with the following to assess<br>a. Environmental manager (Rick Johnson, based in New Orleans, LA)<br>b. Fossil Environmental CEMS staff (Tad Chenet and Minh Nguyen at The Woodlands in Houston, TX)<br>c. Plant performance monitoring and diagnostics (PM&D) staff (Gary Hollingsworth, Gary Barnes, Stan Jaskot, and K.T. Huang at The Woodlands in Houston, TX)<br>d. Coal and oil/gas supply purchasing personnel<br>e. Power trading (Grady Kaough based in The Woodlands in Houston, TX)<br>f. Total purchased power records (Scott Celino based in New Orleans, LA).<br>g. Intra-system billing (ISB;Charles John based in The Woodlands in Houston, TX).<br>4. Conduct one site visit – RS Nelson Plant (Louisiana) containing gas and coal units on February 16, 2011. Point of contact on-site: Rhonda Kratzer (Environmental Manager at the plant). |
| Potential Error Conditions | • Unaccounted changes at Entergy facilities in 2011 causing dramatic shift from 2010;<br>• Unexplained changes in key flows or emission sources at Entergy facilities. |
| Sample Unit | • Total annual direct and indirect emissions by source category |
| Sample Size | • All source categories. |
| Materiality Threshold | The procedure is both quantitative and qualitative in nature; the findings will be reviewed on a case by case basis for materiality. |

## Calculation

| **C1: True Up and Re-Performance Calculations** | |
|---|---|
| Introduction: As part of verification procedures, ICF is checking calculations for each emissions source, with an emphasis on purchased power, large stationary fossil plants (CEMS units), and small stationary units which together comprise over 99% % of total corporate-wide GHG emissions for 2011. In order to ensure the accuracy of the GHG Assertion, the objective of this procedure is re-perform the calculations independent from the calculations performed by Entergy. | |
| Type of Evidence | Documentation, Re-performance |
| Data Sources | 2011 GHG inventory and Report (IMPRD)<br><br>In addition:<br>1. Purchased power:<br>a. Controllable trades (on daily basis from 1/1/2011 to 12/31/2011 from Grady Kaough) from TRADES (Excel extracts), as well as sorted and purchased totals from Rick Johnson (also in Excel) as double-check.<br>b. Total purchased power (monthly basis from January to December 2011) in the form of ISB extracts (12 PDFs) from Scott Celino<br>2. Large stationary fossil plants:<br>c. Selected CEMS reports (from Tad Chenet/Minh Nguyen) as well as direct CEMS direct from RS Nelson 6.<br>d. Coal purchasing (Ryan Trushenski) and two (2) short-term test burns data for one plant<br>e. Gas purchasing (Karen McIlvoy) burns data – all plants – monthly basis.<br>f. Plant performance monitoring and diagnostics (PM&D) data: monthly fuel use boiler heat input for most of the auditing sample selected units.<br>g. CEMS supporting documentation and QA/QC back-up data for all twenty (20) auditing sample units<br>3. Small stationary combustion: Data reported to EPA's GHG Reporting Program. |
| Objective (specific principles) | *Accuracy, Transparency* |
| Specific Activities | 1. Review documentation for completeness;<br>2. Recalculate emissions numbers.<br>3. Perform checks |
| Potential Error Conditions | • Disagreement between calculated and reported values;<br>• Incorrect application of significant figures in calculation;<br>• Disagreement between allocated values or inconsistent methodology. |
| Sample Unit | 1. Purchased Power:<br>a. All controllable trades (daily) extract in Excel<br>b. Emissions totals for total purchased power on monthly basis |

| | |
|---|---|
| | <u>2. Large stationary fossil plants:</u><br>a. 20 units selected for sampling in relation to PM&D data (request sent to Gary Hollingworth and Gary Barnes) and EPA CAM checks representing ~50% of total Entergy emissions<br>• Baxter Wilson 1<br>• Baxter Wilson 2<br>• Gerald Andrus 1<br>• Independence 1 (coal)<br>• Independence 2 (coal)<br>• Lewis Creek 1<br>• Lewis Creek 2<br>• Michoud 2<br>• Michoud 3<br>• Ninemile Point 3<br>• Ninemile Point 4<br>• Ninemile Point 5<br>• RS Nelson 3<br>• RS Nelson 4<br>• RS Nelson 6 (coal)<br>• Sabine 4<br>• White Bluff 1 (coal)<br>• White Bluff 2 (coal)<br>• Willow Glen 1<br>• Willow Glen 4<br><br>For the above units ICF would like to receive the following unit-specific, reported data from a query of the PM&D database of historical data, for calendar year 2011:<br>• Fuel flow: MCF for gas or tons for coal<br>• Heat input: MMbtu<br>• Power generation: MW-hr<br>• Average heat rate for aggregation period: Btu/kw-hr<br>• Aggregation period for reporting totalized activity data on fuel flow, heat input, and power generation: daily or monthly, whichever is more readily available from PM&D database<br><br>b. CEMS reports – for 13 gas-fired units and 5 coal-fired units– request made to Tad Chenet/Minh Nguyen at Fossil Environmental:<br>• Baxter Wilson 1<br>• Baxter Wilson 2<br>• Gerald Andrus 1<br>• Independence 1 (coal)<br>• Independence 2 (coal)<br>• Lewis Creek 1<br>• Lewis Creek 2<br>• Michoud 2<br>• Michoud 3<br>• Ninemile Point 3<br>• Ninemile Point 4 |

| | |
|---|---|
| | • Ninemile Point 5<br>• RS Nelson 6 (coal)<br>• Sabine 4<br>• White Bluff 1 (coal)<br>• White Bluff 2 (coal)<br>• Willow Glen 1<br>• Willow Glen 4<br><br>For each of the above CEMS-equipped gas or coal-fired units, ICF has requested the following information for calendar year 2011:<br><br>• Gas flow meter accuracy test/CEMS gas flow transmitter calibration analysis (gas-fired units)<br>• CO2 and stack gas flow meter CEMS relative accuracy test audit (RATA) annual test results (coal-fired units)<br>• CO2 CEMS quarterly linearity checks (coal-fired units)<br>• CEMS formula verification<br>• ECPMS feedback reports: Q1 – Q4<br><br>For two gas-fired boilers at RS Nelson (Units 3 and 4), ICF requested similar information as above from Rhonda Kratzer, Plant Environmental Manager.<br><br><u>3. Small stationary plants</u> – check "fossil fuel generating stations" emissions against EPA GHG Reporting Program data for 2010. "Nuclear generating stations" and "other small plants" emissions are carryovers from 2005. |
| Sample Size | All emissions sources and values for:<br>- Purchased power, broken out by controllable trades and total purchased power (to account for non-controllable trades).<br>- Large stationary fossil plants:<br>- Small stationary combustion (fossil generating plants only). |
| Materiality Threshold | 10% of the GHG Assertion; qualitative errors will be reviewed on a case by case basis for materiality. |

| **C2 – Minor/Negligible 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 negligible emission sources have been appropriately excluded. | |
| Type of Evidence | Documentation, Discussions with Entergy's Environmental Manager |
| Data Sources | 2011 GHG Inventory, IMPRD |
| Objective (specific principles) | *Accuracy, Transparency* |
| Specific Activities | 1. Review minor/negligible sources and discuss with Entergy environmental manager<br>2. Compare to earlier year inventories (2009 and 2010) |
| Potential Error Conditions | Material emission source(s) improperly excluded from GHG Assertion |
| Sample Unit | N/A |
| Sample Size | Minor/negligible emission categories and sources |
| Materiality Threshold | Qualitative and quantitative errors will be reviewed on a case by case basis for materiality |

## Data Sources and Supporting Data

| **D1 – Data Gathering and Quality Controls** | |
|---|---|
| Introduction: This procedure is intended to systematically review the Responsible Party's internal procedures and controls that are used to calculate emission and production summaries. | |
| Type of Evidence | Documentation, Observation, Inquiries of the Client |
| Data Sources | 1. Relevant personnel (see list below in "Specific Activities)<br>2. GHG Inventory, IMPRD<br>3. Data capture and storage systems<br>a. TRADES – controllable power purchases tracking system: hourly purchase amounts from 1/1/2011 to 12/31/2011 inclusive were extracted and sent via Excel to ICF by Grady Kaough (via Rick Johnson).<br>b. ISB (Intra-system billing) – Monthly purchased power totals for 2011 (12 months for 2011) in PDF form were sent to ICF by Scott Celino (via Rick Johnson)<br>c. PM&D data – for large fossil generating stations<br>d. CEMS data – for large fossil generating stations (as well as for smaller fossil fuel-fired electric generation stations which have CEMS)<br>e. Gas burn data – monthly for all gas units – from Karen McIlvoy<br>f. Coal burn data – two (2) test burns at one plant from Ryan Trushenski (solid fuels)<br>4. RS Nelson plant – control operations data; CEMS QA/QC plans; CEMS monitoring and QA/QC results |
| Objective (specific principles) | *Completeness, Consistency, Accuracy, Transparency, Conservativeness* |
| Specific Activities | 1. Review and observe the operation of data systems (noted above) and manual data transfer procedures;<br>2. Review operation and maintenance of relevant measurement equipment (including CEMS-related systems) and procedures;<br>3. Review IMPRD for any changes.<br>4. Conduct interviews with the following and obtain data (as described below)<br>a. Environmental manager (Rick Johnson, based in New Orleans, LA)<br>b. CEMS staff (Tad Chenet and Minh Nguyen at The Woodlands in Houston, TX)<br>c. Plant monitoring and diagnostics (PM&D) staff (Gary Hollingsworth and Gary Barnes at The Woodlands in Houston, TX)<br>d. Coal and oil/gas supply personnel<br>e. Power trading (Grady Kaough based at The Woodlands in Houston, TX)<br>f. Total purchased power records (Scott Celino based in New Orleans, LA).<br>g. Intra-system billing (ISB) (John Charles based at The Woodlands in Houston, TX).<br>5. Conduct one site visit – RS Nelson Plant (Louisiana) containing gas and coal units on February 16, 2011. Point of contact on-site: Rhonda Kratzer (Environmental Manager at the plant). |

| | |
|---|---|
| Error Conditions | • Unexplained inconsistencies between raw data and data supporting GHG Assertion<br>• Inappropriate or inaccurate measurement systems;<br>• CEMS Measurement equipment inappropriately maintained or calibrated.<br>• Inconsistent or incomplete supporting documentation particularly for RS Nelson (site visit) |
| Sample Unit | 1. Purchased power:<br>a. Total purchased power – all monthly data extracts from ISB<br>b. Controllables purchases – all daily extracts from TRADES<br><br>2. Large fossil generating stations:<br>a. PM&D data – monthly (all 12 months for 2011)<br>b. CEMS data - quarterly<br>c. Gas burn data – monthly (all 12 months for 2011)<br>d. Coal burn data or RS Nelson 6 (2 periods).<br>d. All CEMS-related data for RS Nelson<br><br>3. Small stationary combustion sources – 2010 EPA GHG Reporting Program submitted for all fossil generating stations - annual |
| Sample Size | 1. Purchased power<br>a. Total purchased power – all monthly records<br>b. Controllables purchase – all daily records<br><br>2. Large fossil generating stations<br>a. PM&D – 20 units representing ~50% of total emissions<br>b. CEMS data – 20 units representing ~ 50% of total emissions<br>c. Gas burn data – all monthly records for all gas-fired plants<br>d. Coal burn data – two monthly records for Nelson 6 unit (from Mikon)<br>e. All CEMS-related data for RS Nelson<br><br>3. Small stationary combustion sources – 2010 EPA GHG Reporting Program data for all fossil generating stations |
| Materiality Threshold | Qualitative errors will be reviewed on a case by case basis for materiality.<br>A materiality threshold of 10%of the total direct annual emissions reported will be applied to transcription or data management discrepancies. |

| **D2 – Data Confirmation against External Sources** | |
|---|---|
| Introduction: Where possible, this verification procedure is used to provide further evidence to the data used to calculate emissions and production quantities reported. | |
| Type of Evidence | Confirmation, Analytical Procedures |
| Data Sources | Inventory Report and supporting external data/information:<br><br>1. Large fossil generating stations:<br>a. PM&D data – monthly (all 12 months for 2011)<br>b. CEMS data – ECMPS reports, and EPA CAM emissions database query reports<br>c. Gas and coal burn data – monthly for all gas units (all 12 months for 2011); two sets of select daily burns for RS Nelson 6<br>d. All CEMS-related data for RS Nelson 3, 4, and 6<br><br>2. Small stationary combustion sources – 2010 EPA GHG Reporting Program data submitted for all fossil generating stations - annual |
| Objective (specific principles) | *Accuracy, Conservativeness* |
| Specific Activities | 1. Review use of external data sources in GHG inventory for appropriateness;<br>2. Compare reported/metered values to those provided by secondary sources |
| 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 |
| Sample Size | 1. Large fossil generating stations:<br>a. PM&D data – for 20 units (representing ~50% of total Entergy emissions)<br>b. CEMS data – ECMPS reports – for 15 gas-fired units (representing ~25% of total Entergy emissions)<br>c. Gas and coal burn data – monthly (all 12 months for 2011) – for all gas units, and two sets of select daily data for RS Nelson 6 coal burns<br>d. All CEMS-related data for RS Nelson 3, 4, and 6<br><br>2. Small stationary combustion sources – 2010 EPA GHG Reporting Program data submitted for all fossil generating stations - annual |
| Materiality Threshold | Quantitative errors will be reviewed on a case by case basis for materiality. |

| **D3 – Data Migration into Inventory** | |
|---|---|
| Introduction: This procedure is intended to review the transfer of data from the electronic calculator into the Compliance Report, including any summary calculations that were required. | |
| Type of Evidence | Documentation, Re-Performance |
| Data Sources | Inventory Report, IMPRD, discussions with Entergy's Environmental Manager |
| Objective (specific principles) | *Accuracy, Transparency* |
| Specific Activities | 1. Recalculate summary calculations performed by Entergy;<br>2. Compare calculated values to those in the Inventory Report for transcription accuracy; |
| Potential Error Conditions | • Discrepancy between summary totals and individual sector values reported in Inventory Report |
| Sample Unit | Data reported in the GHG Inventory Report |
| Sample Size | All relevant information and emissions values |
| Materiality Threshold | Any discrepancies |

## Assertion

| **A1 – Final Verification Assessment** | |
|---|---|
| Introduction: This procedure is intended as a final review of Entergy's 2011 GHG Assertion to ensure all required information is complete and all required documentation is attached. | |
| Type of Evidence | Documentation |
| Data Sources | GHG Assertion |
| Objective (specific principles) | *Completeness* |
| Specific Activities | 1. Review each page of the GHG Assertion and IMPRD for completeness;<br>2. Provide Responsible Party with documentation, namely a verification statement and report, required for submission to voluntary reporting protocols |
| Potential Error Conditions | • 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 |
| Materiality Threshold | Any incomplete, inaccurate, or missing information |