Sectoral Guidance for Consistent and Accurate Greenhouse Gas Emission Assessments

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API Greenhouse Gas (GHG) Working Group

MISSION
Develop a set of voluntary guidelines and tools for the oil and natural gas industry to account for, calculate and report GHG emissions

- Established a decade ago
- Collaborated with global and regional oil and natural gas industry associations
- Focused on publishing publicly available documents and tools
Greenhouse Gas Inventory Evolution

**Industry Trends**
- Moving from internal inventory development to external Carbon disclosure reports
- Ongoing refinements of methods to improve accuracy and completeness

**Regulatory Trends**
- Movement towards stricter voluntary reporting
- Emerging mandatory reporting programs to support policy development

**Increased stakeholder interest**
New and Updated Guidelines

- **API Methodology Compendium Version 3.0**
  - Compilation of GHG estimation methodologies for the Oil & Gas Industry

- **Uncertainty Document**
  - Technical considerations and calculation methods

- **GHG Project Guidelines**
  - A series of guidelines for GHG emission reduction projects
API Methodology Compendium
Oil & Natural Gas
Greenhouse Gas Inventories

Key questions:

- Which company facilities and emission sources are to be included?
- How will the inventory account, if at all, for indirect emissions from operations outside the company’s facilities but created in support of its operations?
- What methods are available to calculate GHG emissions from a wide variety of sources?

Overarching Goal:

- Reliable, efficient and cost-effective industry-endorsed methods for estimating and reporting GHG emissions.
Oil and Natural Gas Industry Schematic of GHG Emissions
Establishing a GHG Inventory

Categories of emissions sources:

- **Combustion**: stationary sources and portable devices;
- **Vents**: both normal venting from processing, storage, and product loading or off-loading as well as emergency releases;
- **Fugitives**: unintentional leakages from piping components and seals as well as wastewater and other waste handling

Special challenges

- Complexity of facility designs and operations
- Heavy reliance on self-generated fuels
- Integrated systems on a continental level
- Resources needed for data collection
Compendium Organization

**Section 1** - Introduction
**Section 2** – Industry Description
**Section 3** – Technical Considerations
**Section 4** – Combustion Devices
**Section 5** – Process and Vented Emissions
**Section 6** – Fugitive Emissions
**Section 7** – Indirect Emissions
**Section 8** – Emission Inventory Examples
Compendium Organization

Appendix A – Additional Combustion Calculation Approaches
Appendix B – Additional Vented Calculation Approaches
Appendix C – Additional Fugitive Calculation Approaches
Appendix D – Supporting Material for Indirect Emission Factors
Appendix E – Other Background Information
Appendix F – Summary of Refinery Fugitive Emissions Study
Key Compendium Revisions

- Decision trees revamped to address materiality, data availability, and accuracy;
- Emission factors updated to reflect changes in referenced documents;
- Emission calculation approaches expanded:
  - Dehydration, acid gas removal, tank flashing, pneumatic devices, H2 plants, catalytic cracking units, asphalt blowing, and wastewater treatment;
- Inventory uncertainty considerations introduced to reflect concepts from the Uncertainty Document;
- Referenced uncertainty ranges recalculated to reflect 95% confidence intervals;
- Case studies updated.
Uncertainty Document
Rationale for Developing the Uncertainty Document

- Provide companion document for API Compendium and Industry Guidelines
- Improve GHG Assessments
- Enhance confidence of attaining compliance
- Focus data collection resources
- Assess applicability of existing emission factors
- Simplify statistical calculation approach
About the Uncertainty Document

- Technical considerations for uncertainty analysis at the facility and entity level
- Sources of GHG inventory uncertainty
- Role of industry practices and standards
- Approaches for calculating uncertainty
- Methods for error propagation
- Example applications for Oil & Natural Gas inventories
Uncertainty Document Organization

Section 1 - Introduction
Section 2 – Sources of Uncertainty
Section 3 – Overview of Measurement Practices
Section 4 – Statistical Calculation Methods
Section 5 – Calculation Examples

Appendices

A – Glossary of Statistical and GHG Inventory Terms
B – Flow Meters Inspection & Maintenance
C – Measurement Methods Summaries
D – Units Conversion
E – Calculation details for example inventory
Quantifying Uncertainty

General Steps

- Determine the uncertainty for measured data;
- Determine the uncertainty for emission factors data;
- Aggregate uncertainties.

Statistical calculation methods provided with guidance to applicability

Decision trees used to help navigate

Pertinent examples embedded in text
**Example:**

**Use of Decision Trees**

### B. Emission Factor Uncertainty

- **Are you applying a default emission factor or are you using site specific data?**
  - **Site specific emission data**
    - Refer to Measurement Decision Tree
  - **Default emission factor**
    - Do the default emission factors have uncertainty specified or quantified?
      - **Yes**
        - Apply reported uncertainty and progress to Uncertainty Aggregation
      - **No**
        - Assign uncertainty based on expert judgment and document reasons supporting the assignment.
          - Progress to Uncertainty Aggregation
Use of Uncertainty Analysis

- Uncertainty analysis is a tool to assess the confidence range for reported GHG emissions.
- The analysis is usually a blend of statistical calculations aided by expert judgment.
- It is an excellent tool for:
  - Understanding the main contributors to errors.
  - Enable targeting large contributing sources for more intense data collection.
  - Devising strategies to improve GHG inventories.
GHG Projects Guidelines
Accounting for GHG Reductions

Guiding principle:
– Reported information should provide a faithful, true, and fair account of the reductions achieved;

For existing operations
– Historical activity levels and operating practices, often provide the most realistic baseline scenario;

For new operations
– Objective and credible prediction of what would have happened in the absence of the project;

Methods used for estimating and monitoring project reductions should be fit for purpose
Project Guidelines Organizations

Section 1 - Introduction
Section 2 – GHG Reduction Project Concepts and Principles
Section 3 - Policy Considerations
Section 4 - Overview of GHG Project Families
Section 5 - Cogeneration Project Family

Appendices
A-1 - Summary of GHG Project-Based Emission Reduction Registries
A-2 - Summary of GHG Project-Based Emission Reduction Inventories
B-1 - Cogeneration Project Case Studies
B-2 - Baseline Methodologies for Grid-displacement Reduction Projects
GHG Reduction Calculation Steps

- **Baseline Considerations**
  - Plausible situations or conditions that would have occurred in the absence of the GHG reduction project

- **CHP Projects Characteristics**
  - Net change in GHG emissions from the imported energy streams in the baseline scenario relative to the emission sources created by the project

- **GHG Emission Reduction Calculations**
  - Difference between baseline emissions and GHG reduction project emissions for a given time period, typically on a recurring annual basis
Example:
GHG Reduction via Cogeneration

Scenario 1: New Cogeneration Unit
- A facility CHP system consisting of NG fired combustion and steam turbines;
- The fuel source used may replace or displace more carbon intensive fuel sources used off-site.

Scenario 2: Increased on-site energy use
- The CHP system provides an improvement to overall energy efficiency as compared to the separate generation of electricity and steam
- Previously imported energy is replaced with on-site generation and excess electricity is exported to grid.
# GHG Reduction from CHP Scenarios

<table>
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<tr>
<th>Scenario Description</th>
<th>ANNUAL CO$_2$-E (Tonnes/year)</th>
<th>CASE # 1</th>
<th>CASE # 2</th>
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<tbody>
<tr>
<td><strong>BASELINE SCENARIO</strong></td>
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<tr>
<td>Electricity Equivalent Emissions</td>
<td>162,315</td>
<td>161,959</td>
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<tr>
<td>Electricity Grid Displacement</td>
<td>801,496</td>
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<tr>
<td>Steam Equivalent Emissions</td>
<td>153,678</td>
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<tr>
<td>Total Baseline Emissions</td>
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<td><strong>CHP PROJECT</strong></td>
<td>Total Direct Emissions</td>
<td>840,773</td>
<td>463,373</td>
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<tr>
<td><strong>NET GHG EMISSION REDUCTIONS</strong></td>
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<td>276,716</td>
<td>458,491</td>
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Next Steps

▶ Version 3.0 of API Compendium is in last stages of technical review
  – Expect to be released by May 2009

▶ Companion Uncertainty Document undergoing industry experts review
  – To be released as a Pilot Version by June 2009
  – Stay open for comments and ‘road-testing’ for one year

▶ GHG Reduction Projects Guidelines on Flaring is being reviewed
  – Expect to be published by May/June 2009
Summary

- Decade-long effort by the Oil & Natural Gas industry resulted in credible and consistent methodology guidelines.
- The revised API Compendium - in conjunction with the Uncertainty Document - are now at the forefront of emission estimation methods.
- The Project Guidelines provide a consistent framework for assessing the GHG emission reductions projects.
- The Oil & Natural Gas industry will continue outreach, dissemination, and development of additional relevant guidelines.
Thanks for your attention

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