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Raleigh, NC
Outline

- GHG Emissions Inventory Development Process
  - Reporting principles
  - Organizational and operational boundaries
  - Data collection and validation
  - Quantification of emissions
  - Baseline setting
  - Performance metrics
  - Emission reductions
  - Tracking developments
- Case Study and Lessons Learned
- Questions
## Introduction: The “Greenhouse Gases”

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>100-Year Global Warming Potential</th>
<th>Source (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>1</td>
<td>Combustion</td>
</tr>
<tr>
<td>CH₄</td>
<td>21</td>
<td>Landfills, coal mines, oil and gas production, agriculture</td>
</tr>
<tr>
<td>N₂O</td>
<td>310</td>
<td>Combustion, fertilizers, nitric/adipic acid plants</td>
</tr>
<tr>
<td>Hydrofluorocarbons</td>
<td>140-11,700</td>
<td>Semiconductor, refrigeration, fire protection</td>
</tr>
<tr>
<td>Perfluorocarbons</td>
<td>6,500-9,200</td>
<td>Semiconductor, refrigeration, fire protection</td>
</tr>
<tr>
<td>Sulfur Hexafluoride</td>
<td>23,900</td>
<td>Electric power - circuit breakers, gas-insulated substations, and switchgear</td>
</tr>
</tbody>
</table>

*Source: Global Warming Potential from IPCC’s Second Assessment Report (1996)*
Principles of Reporting

- Relevance – Identification of sources
- Completeness – Comprehensive list of units
- Consistency – Documentation of changes and baseline tracking
- Transparency – Assumption details
- Accuracy – Data validation and integrity of reported data
Establishing Boundaries

- Organizational Boundaries
  - Control approach – Financial or Operational Criterion
  - Equity share approach

- Operational Boundaries
  - Scope 1 – Direct GHG emissions from owned sources
  - Scope 2 – Indirect GHG emissions from purchased electricity, heat, or steam
  - Scope 3 – Indirect GHG emissions from sources not owned or controlled by company

Guides:  
California Climate Action Registry (CCAR) General Reporting Protocol, April 2007 
The GHG Protocol, A Corporate Accounting and Reporting Standard (Revised Edition), 
World Resources Institute/ World Business Council for Sustainable Development 2004
Data Collection/Validation and Emissions Quantification

- Identification of relevant emission sources within organizational boundaries
- Definition of input parameters based on calculation methodology
- Development of tools for on-site personnel to collect relevant data
- Creation of excel templates or Environmental Management Information System (EMIS) tool
- Performance of a quality review to identify missing and invalid data
- Preparation of well-documented emissions inventory (for potential 3rd party verification)
Identification of Significant Emitters

- Comprehensive emissions inventory helps identify significant emitting facilities and gases
- CO2e emissions may be categorized as follows:
  - Source type, direct stationary, direct mobile,...
  - Geographic region, North America, Asia,...
  - Individual facilities
  - Countries
  - Business units
De Minimis Emissions

What is a de minimis emission source?
- Emissions less than 5% of total emissions
- Goal is to include majority of material emissions in inventory
- Can be based on emissions source type or one or more GHG

Why/how to utilize a de minimis threshold?
- Annual tracking of small sources may be cost ineffective
- Streamline data gathering efforts for future years
- Reevaluate de minimis if underlying assumptions to calculate emissions change significantly
Post-Emissions Inventory Development

- Baseline Tracking – Datum used to measure GHG emissions performance
- Performance Metrics – Normalized emissions based on production or economic output
- Future Reduction Goals – Process improvements, conservation, use of renewables
- Communication – Results to stakeholders
- Developments – Regulatory and non-regulatory
General Manufacturing Company Case Study
Greenhouse Gas Initiative

Start

1. Educate Decision Makers & Establish Infrastructure

2. Determine Organizational & Operational Boundaries

3. Identify facilities & sources

4. Establish guidance & protocols

5. Implement EMIS or use other tools

6. Quantify emissions

7. Make & register emission reductions

8. Track Developments

Make & register emission reductions
General Manufacturing Company Case Study
Greenhouse Gas Initiative

- Educating the Decision-Makers
- Designing the Inventory
- Establishing a Reporting Basis
- Identifying Emission Sources
- Quantifying Emissions (Including EMIS)
- Prioritizing Emission Reduction Opportunities
Why prepare a corporate GHG emissions inventory?

- Shareholder resolution to prepare a corporate emissions inventory
- Carbon Disclosure Project (CDP)
- Company’s increasing sustainability focus
- Need to consolidate and establish a basis for responses to numerous stakeholders on GHG
General Manufacturing Company Case Study
Establishing a Reporting Basis

- Draw organizational boundaries
- Align reporting principles: Operational Scope and Emissions
- Reporting Basis
  - Management Control w/operational control criterion
  - Scope 1 and 2
- Define geographic scope
  - Regional
  - U.S. domestic operations only
  - Globally - International operations
General Manufacturing Company Case Study: Identifying Emission Sources

- **Direct Emissions (Scope 1)**
  - Combustion – Boilers, Engines,…
  - Process – Combustion in thermal oxidizers and incinerators
  - Mobile Sources – Transportation
  - Fugitive – Refrigeration, AC, Chillers,…

- **Indirect Emissions (Scope 2)**
  - Imported/Purchased Utilities
    - Electricity
    - Heat
    - Steam
Numerous guidance protocols
Develop internal GHG protocol
Allow flexibility for future changes – EMIS helps
General Manufacturing Company Case Study: Emissions Inventory, Not as Easy as it Looks

- Various Calculation Methodologies
  - Guidance Protocol Emission Factors
  - Industry Specific Emission Factors
- Large number of individual emission-generating activities -- which ones do you omit? Operational Boundaries
- Categorize de minimis emission sources by:
  - Conservative estimate of emission rates
- International facilities – Email database and training
General Manufacturing Company Case Study: Quantifying Emissions

- Data Collection – EMIS Design and Implementation
  - Central web-based tool with access to all responsible parties
  - List all facilities and emission sources
  - Prepare spreadsheet templates and data entry forms
  - Establish means of generating reports
  - Identify responsible parties for data population
  - Customized training on use of tool

- Performing Calculations
  - Spreadsheets
  - EMIS
  - Customized – Built custom report templates in EMIS

- Answer facility specific questions and assist in data collection
General Manufacturing Company Case Study: Quantifying Emissions

- **Data Validation – Two Step Process**
  - **Step 1**
    - Analyze initial reports while collecting data
    - Assists in identifying missing and incorrect data (figures and units)
  - **Step 2**
    - Analyze reports while performing calculations
    - Assists in comparing emissions footprint with similar emission units and facilities
- **Follow-up Action – Seek revised/missing data and enhance emission calculations**
General Manufacturing Company Case Study: Take Home Lessons (1 of 2)

- **Internal ambassador for GHG initiative** – Corporate environmental manager
- **Responsible officials at individual sites** – Having technical/environmental background
- **Custom GHG protocol** – Guidance protocols to follow, use of online tools (CARROT), management control of operations, and scope of sources covered
- **Necessity of EMIS tool** – How many entities, global or local, future enhancements, archiving...
- **Data accuracy** – Data verification at multiple stages, comparison of emissions with emissions from similar entities
General Manufacturing Company Case Study: Take Home Lessons (2 of 2)

- **Emissions documentation** – Assumptions, source of emission factors, and methodology
- **Energy management system** – Integration of GHG with energy management system data
- **Emissions inventory enhancement** – Annual evaluation, third party verification
- **Emissions reduction targets** – Future projections and firm targets, process improvements, conservation
- **Tracking developments** – Detailed research on GHG initiatives in operating states
Questions?