

Bath Iron Works

A GENERAL DYNAMICS COMPANY

Conducting a Greenhouse Gas Inventory – Lessons Learned

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Agenda

- GHG Inventory Basics
- Typical Data Requirements
- BIW Results

Six Major Greenhouse Gases

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Hydroflourocarbons (HFC's)
- Perflourocarbons (PFC's)
- Sulfur Hexaflouride (SF₆)

Common Principles

- **Relevance**
 - ↗ Ensure GHG inventory reflects the emissions of the company and serves decision making needs
- **Completeness**
 - ↗ Account and report on all GHG emission sources within the chosen boundary
- **Consistency**
 - ↗ Use consistent methodologies to allow meaningful comparisons over time
- **Transparency**
 - ↗ Clear audit trail, disclose any relevant assumptions
- **Accuracy**
 - ↗ Ensure quantification is systematically neither over or under actual emissions

Common Approach

- Establish Organizational Boundaries
- Setting Operational Boundaries
- Tracking emissions over time
- Identifying and Calculating GHG Emissions
- Managing inventory quality
- Reporting

Organizational Boundaries

- Defines boundaries for which emission sources are tracked for accounting and reporting
- Two basic approaches
 - Equity Share Approach
 - Control Approach

Organizational Boundaries Equity Share Approach

- Account for GHG emissions from operations according to its share of equity in the operation
- Reflects economic interests, typically the company's percentage ownership of that operation
- Typically equity share = % ownership

Organizational Boundaries Control Approach

- A company accounts for 100% of GHG emissions from operations over which it has control
- 2 Types of Control Approaches may be used
 - ↗ Financial Control
 - defined as the ability to direct the financial and operating policies of the operations
 - ↗ Operational Control
 - If Company or subsidiary has the full authority to introduce and implement its operating policies at the operation
 - This was BIW's approach

Operational Boundaries

- Categorizing identified emissions into 3 basic categories (depending on Organizational Boundary):
 - ↗ Core Direct Emissions
 - On site fuel use
 - ↗ Generation of electricity, heat or steam
 - ↗ Mobile sources
 - GHG process-related emissions
 - Fugitive Emissions (e.g. refrigeration and air conditioning)
 - ↗ Core Indirect Emissions
 - Imported/purchased electricity, heating or cooling
 - Others (applicable to energy providers)
 - ↗ Optional Emissions
 - Transportation-related (commuting miles, business travel)
 - Waste disposal activities
 - Leased assets or out-sourced activities

Tracking Emissions Over Time

- Choosing a Base Year
 - Becomes the benchmark for all future activity
- Recalculating base year emissions
 - Required to have a recalculation policy to address changes within the company, for example:
 - mergers, acquisitions, divestitures;
 - Outsourcing and insourcing of emitting activities
 - Policy to address timing of recalculations

Managing Inventory Quality

- Some form of Inventory Management Plan is generally required.
 - Outlines how data is collected, preparation of the inventory, and steps to manage the quality of the inventory.



Data Requirements

Required Emission Sources

- Purchases of Electricity, Steam, Hot Water, Chilled Water
- Stationary Combustion
- Mobile Combustion Sources
- Refrigerant Emissions
- Industrial Process Emissions

Purchases of Electricity, Steam, Hot Water, Chilled Water

- Amount of electricity purchased
 - Fuel source for purchased electricity, if supplier is an independent power producer
 - Amount of renewable electricity purchased and location(s) of renewable energy projects from which it is purchased
- Amount of steam/hot water purchased
 - Fuel source for the purchased steam/hot water.
- Amount of chilled water purchased
 - Fuel source for the purchased chilled water.

Stationary Combustion

- What fuels are burned on-site?
 - e.g. natural gas, propane, fuel oil for heating, diesel fuel for backup generators
- Quantity of fuel consumed by fuel type
 - e.g. therms of natural gas, gallons of diesel fuel
 - For backup generators, number of operating hours can also be used.
- Includes combustion of VOCs in thermal oxidizers

Mobile Combustion Sources

- Includes all vehicles: cars, trucks, non-electric forklifts, aircraft, watercraft, and rail vehicles
- Ideal level of data is list of vehicles, with the following for each:
 - ↗ Make, model, and year
 - ↗ Fuel consumed
 - ↗ Miles traveled for on-road vehicles, if available
 - ↗ Miles per gallon fuel economy (to estimate miles traveled if that is unavailable)
- Minimum level of data:
 - ↗ Total vehicle miles traveled and/or fuel consumed (by fuel type)
 - ↗ A description of the age and type of vehicles in use

Refrigerant Emissions

- Must include HFCs
 - ↗ such as R-134a, R-407C, R-410A) and PFCs
- Can exclude CFCs
 - ↗ such as R-11 and R-12 and HCFCs such as R-22 and R-123
- Identify which refrigerants or fire suppressants are used in each facility
- Determine the square feet of air conditioned space or
- Determine if the use of refrigerants is tracked
 - ↗ Through records of refrigerant purchases
 - ↗ Through identifying the refrigeration and air conditioning equipment in use and its refrigerant charge

Industrial Process Emissions

- Process-related emissions of the six major GHGs: CO₂, CH₄, N₂O, PFCs, HFCs, and SF₆
- Can be emitted as byproduct of industrial processes (e.g. cement production)
- Can be emitted through use of purchased industrial gases
 - For example, CO₂ use for welding
 - Gather data on purchases of gases



BIW's Experience

Why Do It?

- State pressures:
 - Governor's Carbon Challenge
- EPA Performance Track Goal
- Corporate Parent beginning to look at determining GHG footprint.
 - Started with 2 pilot sites to determine actual level of effort required
 - BIW volunteered to be one of the site.
- The “writing was on the wall” that some form of tracking and/or reduction requirements will be coming
 - Having a well documented and defensible base line as early as possible a good strategy

How We Did It

- Corporate interviewed and hired a consultant to assist the Pilot Sites with development of a GHG Inventory and Inventory Management Plan
 - Consultant works with EPA Climate leader companies and very familiar with putting inventories together.
- Followed the EPA Climate leaders protocol and the WRI protocol.

BIW Process

- All sites directly under BIW's control
- Electrical and fuel was already being tracked in spread sheets
 - ↗ E-mailed existing spreadsheets directly to Vendor
- Additional Data (HFC's, Vehicle Info, CO₂ Welding Gas) was sent via e-mail
- Vendor entered all the data into their own Workbook
- Consultant conducted a site visit to validate data processes and documents for development of the Inventory Management Plan

Things you may not have thought of

- Corporate Jet fuel usage
- Ship's fuel usage during Sea Trials and Dock Trials
 - New process to track had to be developed
- Leased Sites, Customer Owned Sites
- CO₂ Fire extinguishers

Final Thoughts

- Determine your Organizational Boundaries and Operational Boundaries upfront
- . . . But be flexible as you start collecting data
- Using emission factors are okay when actual data is not available
- Establish a process to collect data moving forward and document it in an IMP
- Remember: it needs to be Relevant, Complete, Consistent Transparent, and Accurate

● Questions?