Greenhouse Gas Emissions: A Case Study of Development of Data Collection Tool and Calculation of Emissions

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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"

Greenhouse Gas	100-Year Global Warming Potential	Source (s)
CO_2	1	Combustion
CH_4	21	Landfills, coal mines, oil and gas production, agriculture
N_2O	310	Combustion, fertilizers, nitric/adipic acid plants
Hydrofluorocarbons	140-11,700	Semiconductor, refrigeration, fire protection
Perfluorocarbons	6,500-9,200	Semiconductor, refrigeration, fire protection
Sulfur Hexafluoride	23,900	Electric power - circuit breakers, gas-insulated substations, and switchgear

Source: Global Warming Potential from IPCC's Second Assessment Report (1996)

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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

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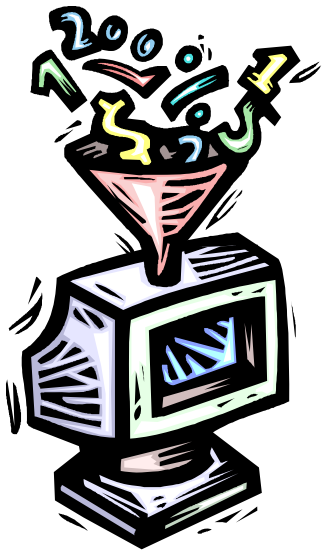
Data Collection/Validation and Emissions Quantification

- 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)



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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

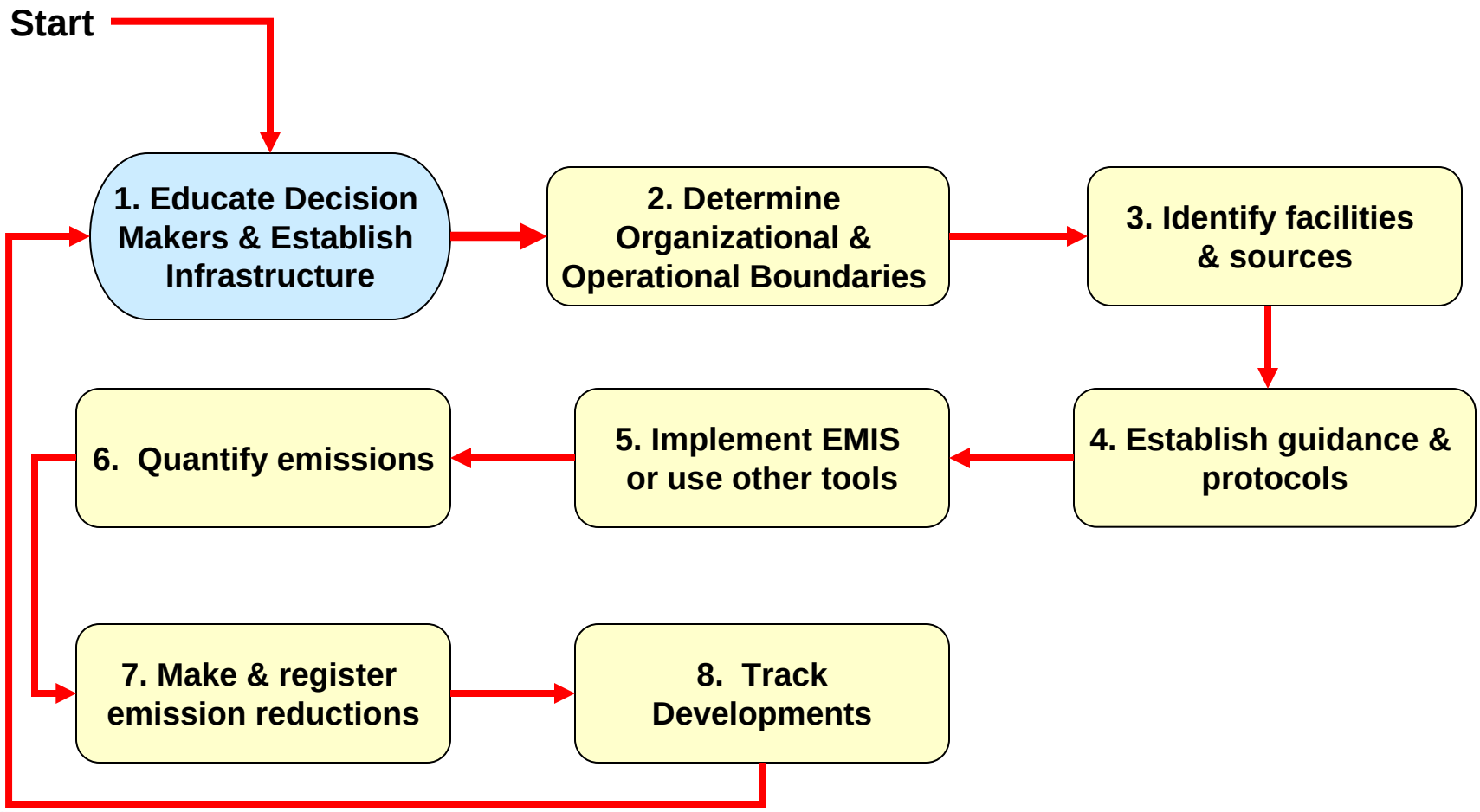
De Minimis Emissions

- 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
  - Revaluate 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



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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

General Manufacturing Company Case Study
Educating the Decision Makers

- 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

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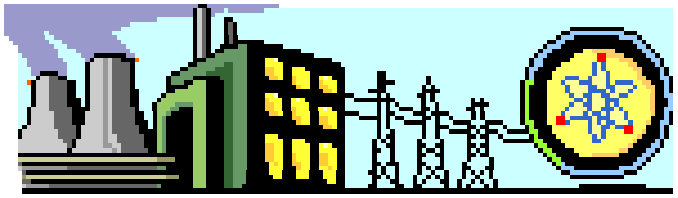
General Manufacturing Company Case Study: Identifying Emission Sources

- 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



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General Manufacturing Company Case Study
Designing the Inventory

- 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

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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

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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

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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?