Introduction

Atmospheric concentrations of certain manufactured greenhouse gases (GHGs) have risen over the last few centuries. GHGs can remain in the atmosphere from a decade to many millennia. Over time, GHGs are removed from the atmosphere by carbon sinks, like oceans and vegetation. However, GHGs are entering the atmosphere more quickly than they are being removed.

Manufacturing and related supply chains often produce GHGs emissions. This resource will provide details on basic reporting and removal practices of the main GHGs to and from the atmosphere. While designed for the automotive sector, many of the practices can be used by others.

Greenhouse Gas Emissions

The main four GHGs are:

- Carbon Dioxide (CO2),
- Methane (CH4),
- Nitrous Oxide (N2O),
- Fluorinated Gases (HFC, CFC, SF6, NF3)

Carbon dioxide is released through the burning of fossil fuels, solid waste, and biological materials. Methane is emitted in the transportation of fossil fuels as well as in agriculture. Nitrous oxide is emitted in agricultural and land use as well as industrial processes, combustion of fossil fuels and wastewater treatment. Fluorinated gases are synthetic gases used in industrial processes. To help improve the environment there is a significant emphasis globally to reduce Scope 1, 2 and 3 GHG emissions.

Need Help...

- establishing a pollution prevention program,
- training a team,
- or educating employees about preventing pollution?

Contact the Kentucky Pollution Prevention Center!

Website: www.kppc.org
Email: info@kppc.org
Phone: 502-852-0965
Greenhouse Gas Scopes

To help with GHG emission reporting, emissions are broken up into three scopes.

- **Scope 1** refers to direct emissions, where the combustion or release of GHG emissions occurs by a company owned or operated piece of machinery. The most common and likely the largest Scope 1 energy source is natural gas. Other sources of Scope 1 could be refrigerants, propane, fuel oil, coal, diesel, and gasoline.

- **Scope 2** refers to indirect emissions, where the emissions occur at the utility, but the utilities product is purchased by the company. For the majority of companies, this is electricity.

- **Scope 3** are indirect emissions within the company’s supply chain and are categorized into upstream and downstream emissions. These are emission sources not controlled by the company.

**Scope 3 Emissions: By Category**

**Upstream Scope 3 Emissions**
- Purchased Goods and Services
- Capital Goods
- Fuel- and Energy-related Activities
  - Not included in Scope 1 or 2
- Upstream Transportation and Distribution
- Waste Generated in Operations
- Business Travel
- Employee Commuting
- Upstream Leased Assets

**Downstream Scope 3 Emissions**
- Downstream Transportation and Distribution
- Processing of Sold Products
- Use of Sold Products
- End-of-Life Treatment of Sold Products
- Downstream Leased Assets
- Franchises
- Investments

Some companies separately account for and report on Scope 1 and 2 emissions (at a minimum) while others also account for Scope 3.
Calculating Emissions

For companies just getting started, there are some great free calculators available. The U.S. Environmental Protection Agency (EPA) publishes a robust calculator, called the Simplified GHG Emissions Calculator where you input activity data and it will automatically calculate emissions. It walks you through each emission source (Scope 1, 2 and 3) and how to enter the data. It is an annualized emission calculator with a summary tab to help with reporting.

EPA Center for Corporate Climate Leadership

Simplified GHG Emissions Calculator


Things to Consider

Here are some best practices to consider.

**Establish a standard reporting process and timeline:**
- Decide how you are going to calculate emissions. This could be by hiring consultants or doing it in-house. Either way, the data sources, emissions factors, data quality, and calculation methods need to be determined.
- A process should be developed and documented for data collection. Several data sources from many facets of the business come together for the GHG emissions inventory. This should be documented so that each year it can be reviewed and executed. Processes need to be updated when significant changes to the process occur.
- Some companies report on a fiscal year and others on a calendar year. Either way is correct, but the timeline should be consistent year after year. In addition to setting the timeframe for calculating emissions, a timeline of events should be created so a company knows when data should be collected.

**Set targets and goals:**
- Set goals and targets over a one to five year timeline. Get team member buy in and make sure the company knows what the goals are and how you will get there.
- Tie goals in with other company strategies.
- GHG emission goals should be tied into the company’s values and other sustainability strategies, creating leadership buy-in. Companies will have more success this way.

**Communicate results:**
- Regardless of how you do emissions reporting, communicate your results. Whether that be just a GHG inventory or reporting out results on progress towards a goal, communicate the results to those with a need to know.
Implementing Change

Develop and implement an action plan by using a team approach. The team approach can be one team or a network of teams and assists with buy-in from all levels of the organization. Full management support is key for success. Also make sure to internally recognize the contributions of teams and individuals. Even simple acts of recognition will encourage greater improvement and maintain motivation. Note: External recognition from a third party will provide additional validation for energy management endeavors, provide satisfaction to those who earned the award and enhance the company's public image.

Additional Resources

U.S. Environmental Protection Agency
- https://www.epa.gov/ghgemissions/overview-greenhouse-gases

Suppliers Partnership for the Environment
- https://www.supplierspartnership.org/supplier-ghg-guidance/

World Resources Institute

Kentucky Pollution Prevention Center
- www.kppc.org
- info@kppc.org
- 502-852-0965

Kentucky Excellence in Environmental Leadership
- https://eec.ky.gov/kyexcel
- envhelp@ky.gov
- 502-782-6189

Recognition Opportunity...

Kentucky Excellence in Environmental Leadership (KY EXCEL) is a program that recognizes environmental achievements throughout Kentucky.

For details, contact KY EXCEL!

Email: envhelp@ky.gov
Phone: 502-782-6189

Data Analysis

Analyzing your data will facilitate data-driven decision making. A few basic analysis techniques include:

- Looking for patterns and trends in your data.
- Comparing current data against a baseline.
- Comparing current usage data to a benchmark.

Reduction Opportunities

Reduced emissions results from:

- Energy efficiency – a more efficient use of energy resources.
- Energy conservation – using less energy, by reducing wasted energy use.
- Fuel switching – utilizing a fuel producing reduced emissions or incorporating renewable energy.
- Carbon capture and sequestration – capturing carbon emissions and storing it.
- Land use and management - practices directly influencing GHG emissions related to strategies for providing open space and habitat, food, natural resources, and places for people to live, work, and recreate.

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**SCOPE 1**
- Direct

**SCOPE 2**
- Indirect
- (Upstream)

**SCOPE 3**
- Indirect
- (Downstream)

- Goods & Services Bought
- Capital Goods
- Transport & Delivery
- Fuel & Energy Related Activities
- Waste Creating Actions
- Business Travel
- Employee Commute
- Company Facilities
- Company Vehicles
- Product Creation
- Product Use
- Product End of Life
- Leased Assets
- Investments
- Franchise
Strong energy management is a strategic asset that creates a competitive edge by reducing energy costs and greenhouse gas emissions. Below are a few ideas.

**Facility Energy Assessments**
Organize facility walk-throughs to assess energy use and find energy saving opportunities. Assessments are powerful tools for involving employees and encouraging buy-in. These events are also opportunities for hands-on learning and to see best practices in action. After an assessment, an in-depth report should be written and a summary circulated internally.

**Sub-Metering Devices**
In order to reduce energy, one must know how much energy is being used at specific points throughout the process. Sub-metering can be an expensive investment, but there are simple, in-line, manual sub-meters available that are relatively inexpensive when compared to the digital, power line communication (PLC) based models. Sub-metering helps a facility develop a more accurate understanding of where energy is being consumed for a particular process or equipment.

**Plug Load Management**
Conduct an assessment of non-essential items being left plugged in during times of non-use or shutdowns (i.e. nights and weekends). Electrical power consumed by electronic appliances while switched off or in standby mode is called phantom load. Approximately 1-3% of the company's annual plug load usage is due to phantom load. Take inventory of non-essential equipment left plugged in and address these items with the appropriate department teams.

**Equipment Shutdown/Load Strategy**
Investigate equipment being left on during temporary shutdowns, longer shutdowns, and times of non-use. Once equipment is identified, develop a policy to turn off or reduce the load on select equipment. By turning off process equipment when not in use, the company can reduce their energy usage and demand load. Identify the equipment that is critical to the production process first, and then consider ways to reduce the load from other equipment.

**Demand Reduction Strategies**
High demand charges can result from a high rate of energy usage for even a short period of time. Plant production schedules and the economics of each situation should be considered. One possible solution may be to distribute the facility's electrical usage over alternate shifts. Another possibility is to schedule the operation of high demand electrical equipment to when overall demand is lower. Coordinating these times could reduce the amount of equipment operating at any one time, thus decreasing the billing period's maximum demand.