CHE 670 Sustainability Seminar

GHG Calculators

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``I think you should be more explicit here in step two...''
EPA Greenhouse Gas Equivalencies Calculator

- Uses the Emissions & Generation Resource Integrated Database (eGRID) U.S. annual non-baseload CO₂ output emission rate
- Puts carbon dioxide (CO₂) emissions reductions in everyday terms
- May be useful in communicating your greenhouse gas reduction strategy, reduction targets, or other initiatives aimed at reducing greenhouse gas emissions
- Useful for emissions reductions from energy efficiency or renewable energy programs
- Only for CO₂, no other GHG
- http://www.epa.gov/RDEE/energy-resources/calculator.html
EPA’s Pollution Prevention GHG Calculator

• Quantifies reductions based on conversion factors
  – Electricity conservation
  – Green energy
  – Fuel substitution
  – Greening chemistry
  – Water conservation
  – Materials management

• GHG Conversion Tool  May 2009.xls
EPA’s Mandatory Reporting Rule

- Tier 1: \( \text{CO}_2 = 1 \times 10^{-3} \times \text{Fuel} \times \text{HHV} \times \text{EF} \)
  - Fuel = mass or volume of fuel combusted/year (mass in short tons, volume in scf [gas] or gallons [liquid])
  - HHV = default high heat value (Table C-1) (mmBTU/mass or volume)
  - EF = fuel-specific default CO2 emission factor
  - \( 1 \times 10^{-3} = \) conversion factor for kg to metric tons
EPA’s Mandatory Reporting Rule

- Tier 2: CO2 = 1x10^-3 x Fuel x HHV x EF
  - HHV = annual average high heat value of fuel from all valid samples for the year
    - If fuel samples > monthly, HHV (annual) = \( \sum (HHV)_i \times (Fuel)_i \) / \( \sum (Fuel)_i \)

- Tier 3: depends on solid, liquid, gas
- Tier 4: CEMS
EPA Applicability Tool

- Assess whether your facility would be required to report GHG
- Applicability depends on the source categories and, for some source categories, the emission level or production capacity
- Not intended for Suppliers of fossil fuels or industrial GHGs and Engine Manufacturers
- Applicability Tool
The Climate Registry

- General Reporting Protocol, May 2008
- Electric Power Sector Protocol
- Oil and Gas Production Protocol

Data Quality Tiers
- A1 Direct Monitoring
- A2 Calculation based on fuel use (measured carbon content and measured heat content)
- B Calculation based on fuel use (measured heat content and default carbon content, or vice versa)
- C Calculation based on fuel use (default CO₂ emission factors by fuel type)
EPA Climate Leaders Simplified
GHG Emissions Calculator (SGEC)

• Based on Climate Leaders GHG protocol guidance
• Determines direct and indirect emissions at all sources in the company
• http://www.epa.gov/climateleaders/documents/sgec_tool_v2%208.xls
GHG Protocol

- Default emission factors are averages based on the most extensive data sets available
- Largely identical to those used by the Intergovernmental Panel on Climate Change (IPCC)
- Businesses should use custom values whenever possible
- Cross-sector tools
  - Stationary combustion
  - Purchased electricity, heat, and steam
  - Transport or mobile sources
  - Employee commuting
  - Refrigeration and air-conditioning
- [http://www.ghgprotocol.org/calculation-tools/all-tools](http://www.ghgprotocol.org/calculation-tools/all-tools)
  - Stationary combustion tool
American College & University Presidents Climate Commitment (ACUPCC)

• Clean Air-Cool Planet Campus Carbon Calculator: http://www.cleanair-coolplanet.org/toolkit/content/view/43/124/
Comparison of Calculators

57,200,000 scf natural gas

- GHG Equivalencies – 2,860 metric tons CO$_2$e (therms)
- P2 GHG Calculator – 3,128 (scf); 3,043 (therms)
- Climate Leaders – 3,131 (scf)
- EPA Applicability Tool – 3,118 (scf)
- GHG Protocol – 3,053 (scf); 3,386 (therms)
- ACUPCC – 3,017 (MMBTU)