

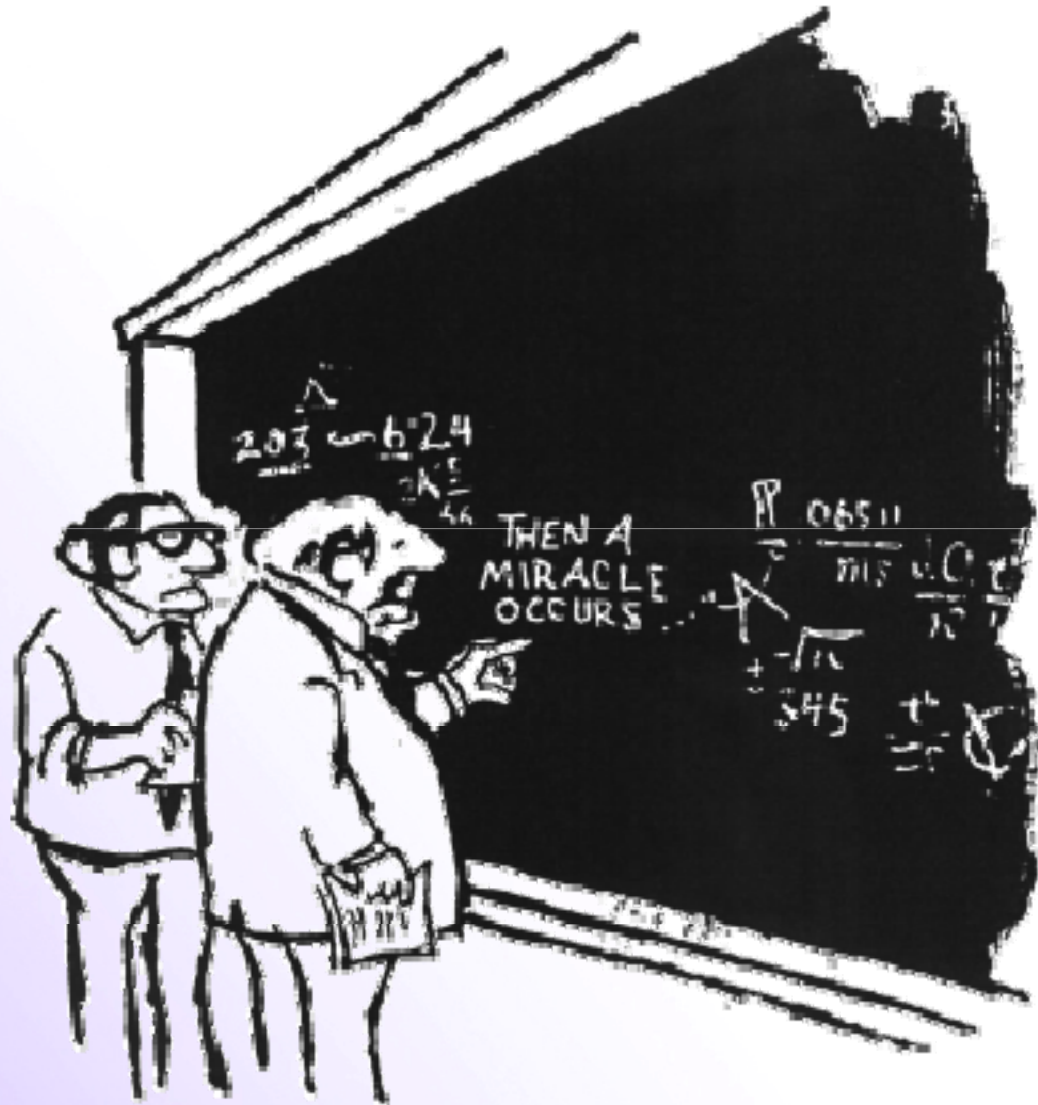
CHE 670 Sustainability Seminar

GHG Calculators

David A. Carter
Kansas State University Pollution Prevention Institute

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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
 - 1×10^{-3} = conversion factor for kg to metric tons

EPA's Mandatory Reporting Rule

- Tier 2: $CO_2 = 1 \times 10^{-3} \times \text{Fuel} \times \text{HHV} \times \text{EF}$
 - HHV = annual average high heat value of fuel from all valid samples for the year
 - If fuel samples > monthly, $\text{HHV (annual)} = \frac{\sum (\text{HHV})_i \times (\text{Fuel})_i}{\sum (\text{Fuel})_i}$
- 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
- Local Government Operations Protocol (adopted June 2, 2009)
- 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)

The Climate Registry

- Estimating emissions from stationary combustion using fuel use data involves six steps
 1. Determine annual consumption of each fuel combusted at your facility
 2. Determine the appropriate CO₂ emissions factors for each fuel
 3. Determine the appropriate CH₄ and N₂O emissions factors for each fuel
 4. Calculate each fuel's CO₂ emissions
 5. Calculate each fuel's CH₄ and N₂O emissions, and
 6. Convert CH₄ and N₂O emissions to CO₂ equivalent and determine total emissions

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>
 - 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 CO₂e (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 – 3,017,628 (MMBTU)