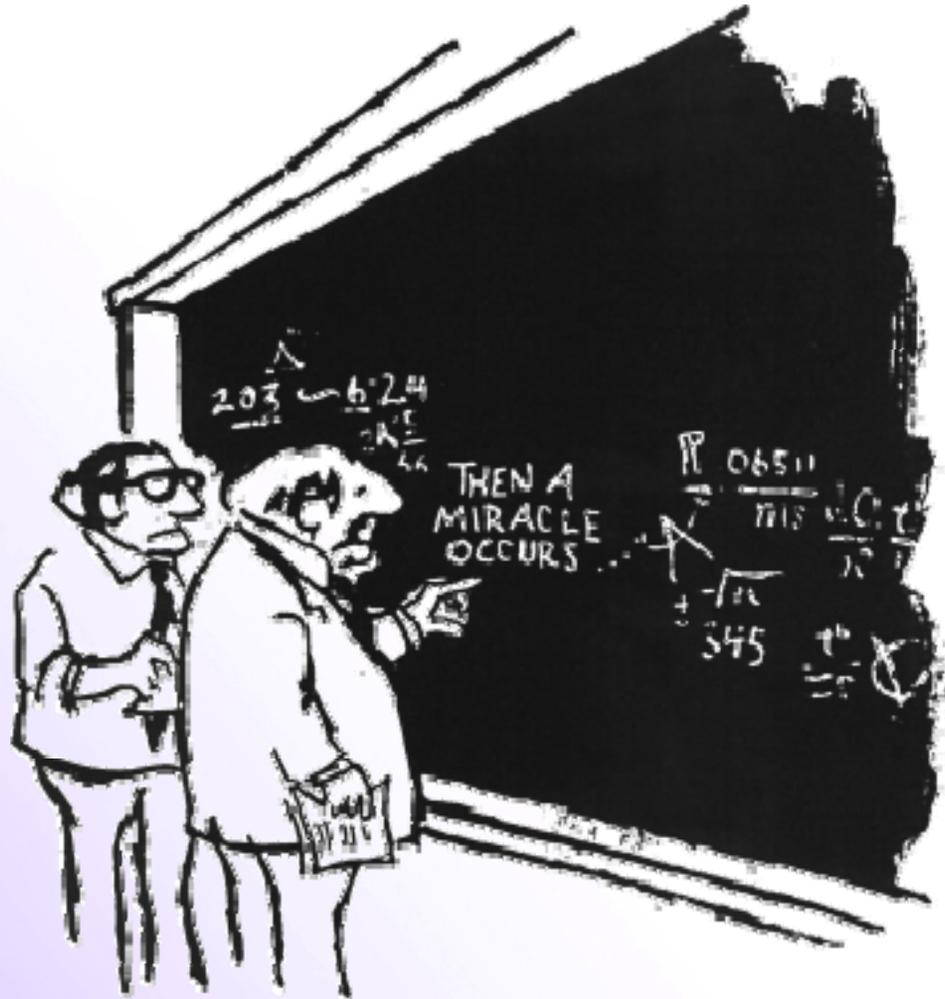# CHE 670 Sustainability Seminar

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 CO_2 output emission rate

- Puts carbon dioxide (CO_2) 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 CO_2, no other GHG

- http://www.epa.gov/RDEE/energy-resources/calculator.html

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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: $CO_2 = 1 \times 10^{-3} \times$ Fuel x HHV x 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

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EPA's Mandatory Reporting Rule

- Tier 2: CO_2 = 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) = $\dfrac{\sum (HHV)_i \times (Fuel)_i}{\sum (Fuel)_i}$

- 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**

- <u>**Applicability Tool**</u>

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 CO_2 emission factors by fuel type)

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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/): 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_2e (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)