



NASA Greenhouse Gas (GHG) Activities

May 19, 2009

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Outline

- NASA GHG Activities To Date
- Progress on EO 13423 Toxic & Hazardous Chemical Goal
- Agency-Level GHG Emission Inventory
- Potential Reporting Requirements under EPA Draft Rule



NASA GHG Activities

- Developed a Excel-based “tool” over the last 2 years using NETS and FAST data
- Tool follows WRI/WBCSD* protocol - recognized as the “Gold Standard”
 - Remains *compatible* with recent guidance documents:
 - *LMI Research Institute Recommended Public Sector GHG Accounting and Reporting Protocol*
 - EPA’s Draft Mandatory Greenhouse Gas Reporting Rule
 - Allows for rapid modification of boundary and scope allocation
- Calculated data from 2003, 2006, 2007, 2008



Tool Organizational and Operational Boundaries

- **Organizational boundaries.** Those for which NASA has full authority to direct operating policies, such as:
 - Fuels used in fleet vehicles (Scope 1)
 - Boilers for building heat (Scope 1)
 - Electricity use in buildings (Scope 2)
- **Operational boundaries.** As defined by WRI:
 - Scope 1: Direct emissions
 - Scope 2: Primary indirect emissions
 - Scope 3: Secondary indirect emissions



Tool Emissions Methodologies & Factor Sources

- Use WRI protocol with FEMP QA sequence
- Concentrate on two main emissions factor sources for Scope 1 and 2
 - Intergovernmental Panel on Climate Change (IPCC)
 - www.ghgprotocol.org Calculation Tools and Factors
- Use alternate sources to close any gaps
 - Environmental Protection Agency (EPA) Documentation
 - American Petroleum Institute (API)



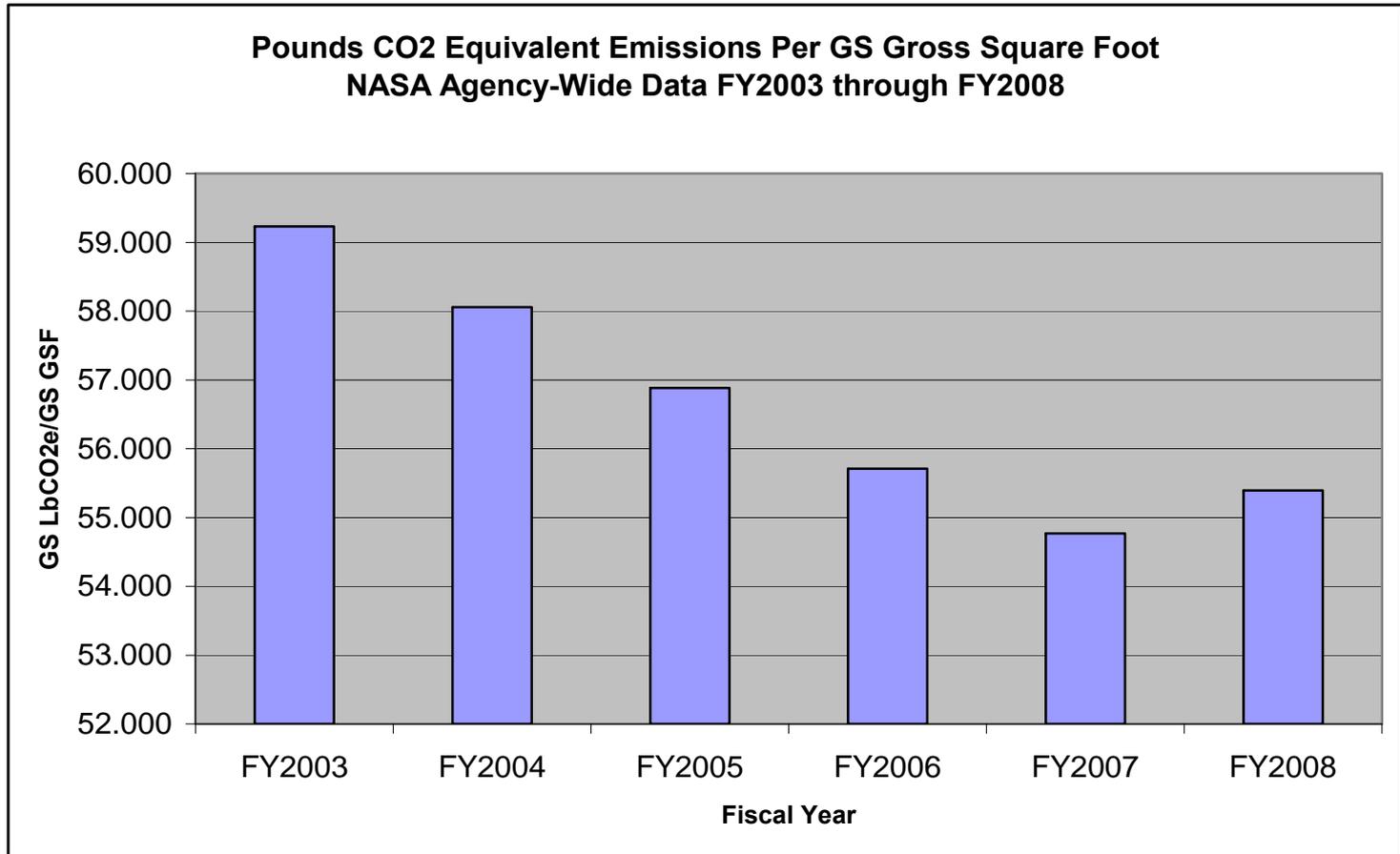
EO 13423 Toxic & Hazardous Chemical Goal

GOAL: Reduce Agency's greenhouse gas emissions by 1% annually or 9% by FY2015 after the established baseline period, complementing the Agency's energy intensity reductions

- **FY03** is baseline year
- Goal Subject (GS) buildings only
- 7.47% reduction on total mt CO2e of GS



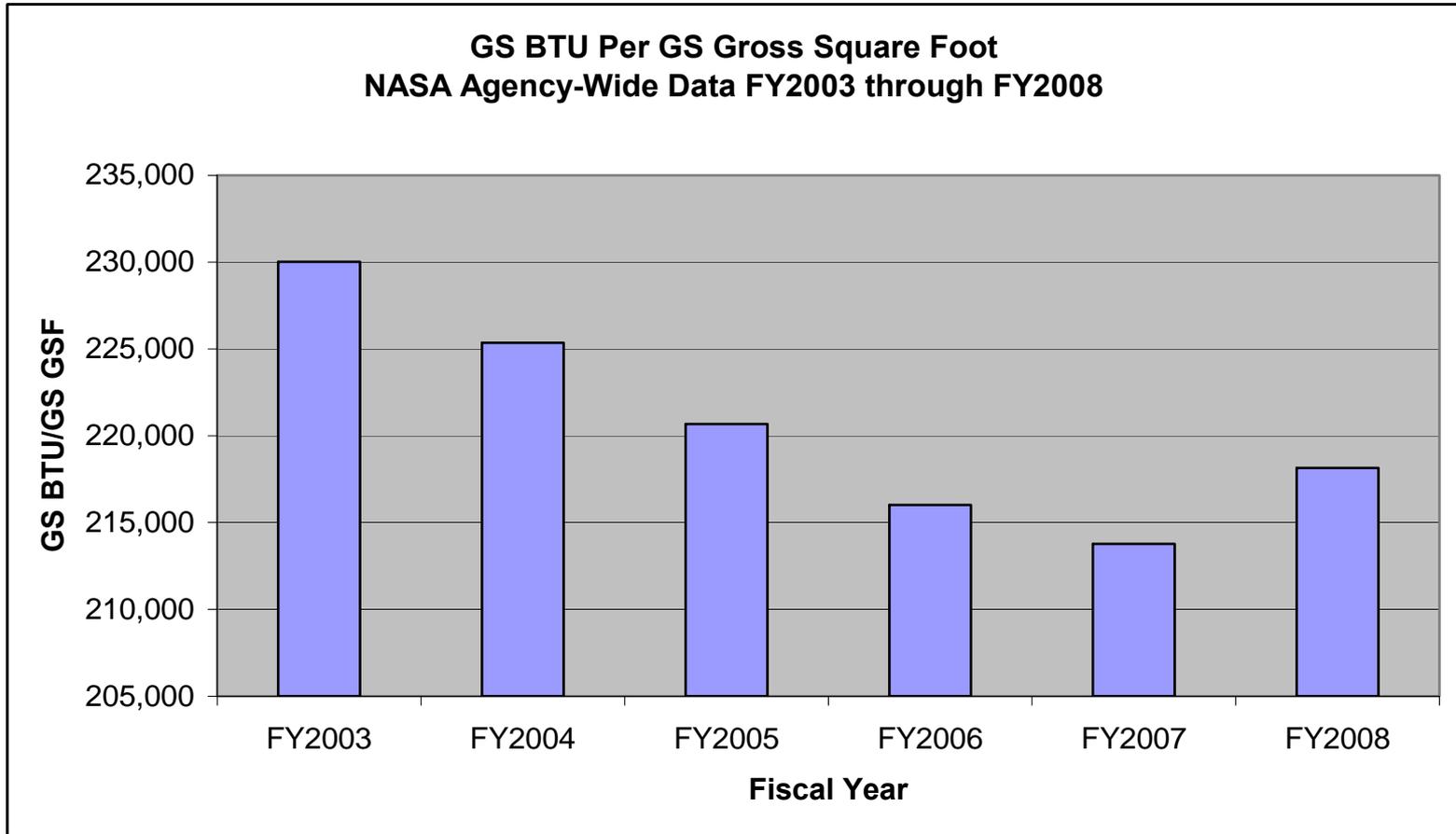
Progress – GHG / GSF = ↓6.9%



Fiscal Year	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
GS MBTU	6,850,439	6,682,842	6,515,245	6,347,648	6,301,151	6,427,862
GS GSF	29,781,849	29,650,194	29,518,539	29,386,884	29,477,413	29,466,761
GS GHG (MtCO2e)	800,160	780,975	761,791	742,607	732,288	740,389
BTU/GSF	230,021	225,348	220,675	216,003	213,762	218,139
GS LbCO2e/GSF	59.232	58.059	56.885	55.711	54.768	55.394



Progress – BTU / GSF = ↓5.45%



Fiscal Year	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
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NASA GHG Inventory



NASA CY 08 GHG Inventory

- Scopes based upon WRI/WBCSD guidance
- Total Emission Quantities CY 2008
- NOTE - Onsite Heat is covered under EPA Draft Rule

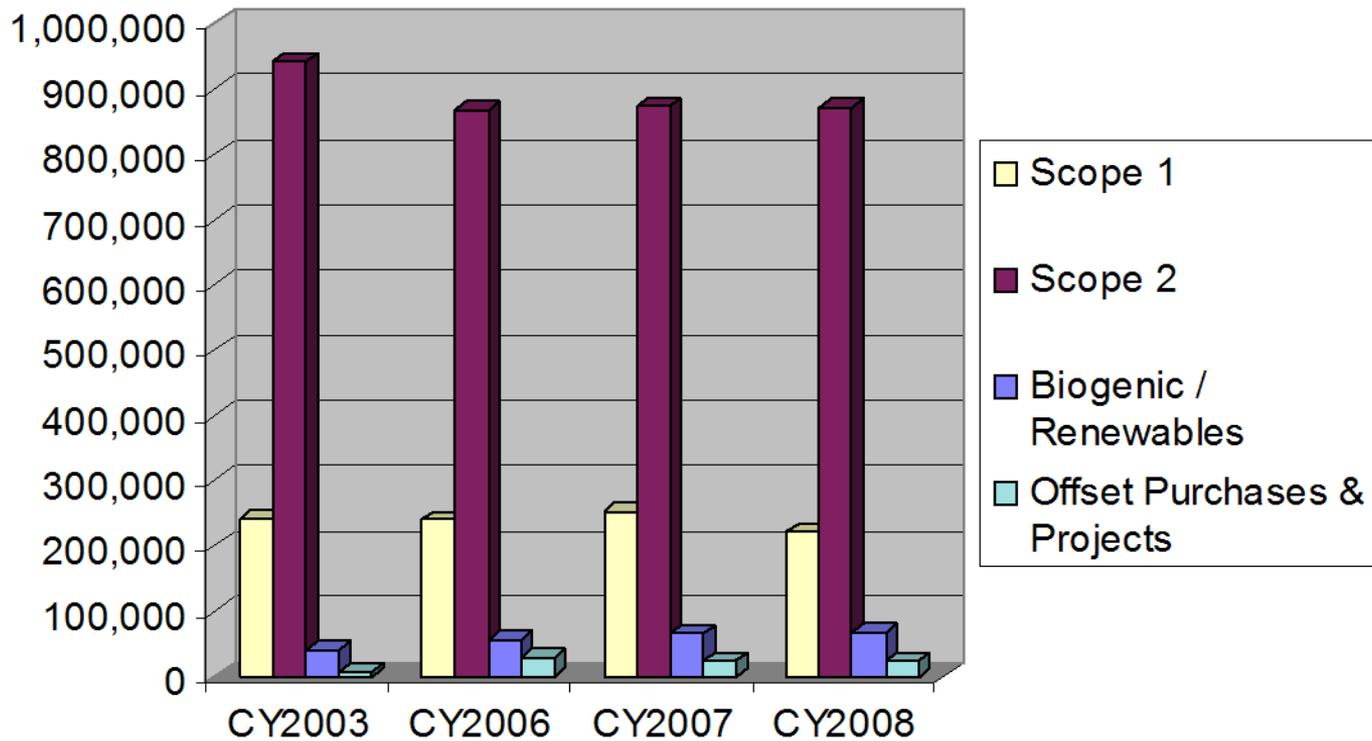
Scope Area	MtCO₂e	% of Total*
Scope 1 Onsite Heat (Buildings)	160,827	13.9%
Scope 1 Transportation	59,891	5.2%
Scope 2 Electricity (Buildings)	852,169	73.5%
Scope 2 Offsite Heat (Buildings)	19,473	1.7%
Biogenic / Renewables	67,837	5.8%

*Percentage represents portion of total emissions from NASA Centers related to a given Scope Area. These emissions may be biogenic (Biogenic / Renewables) or anthropogenic (all other categories). This table represents 100% of all GHG emissions from the Agency.



Agency Wide

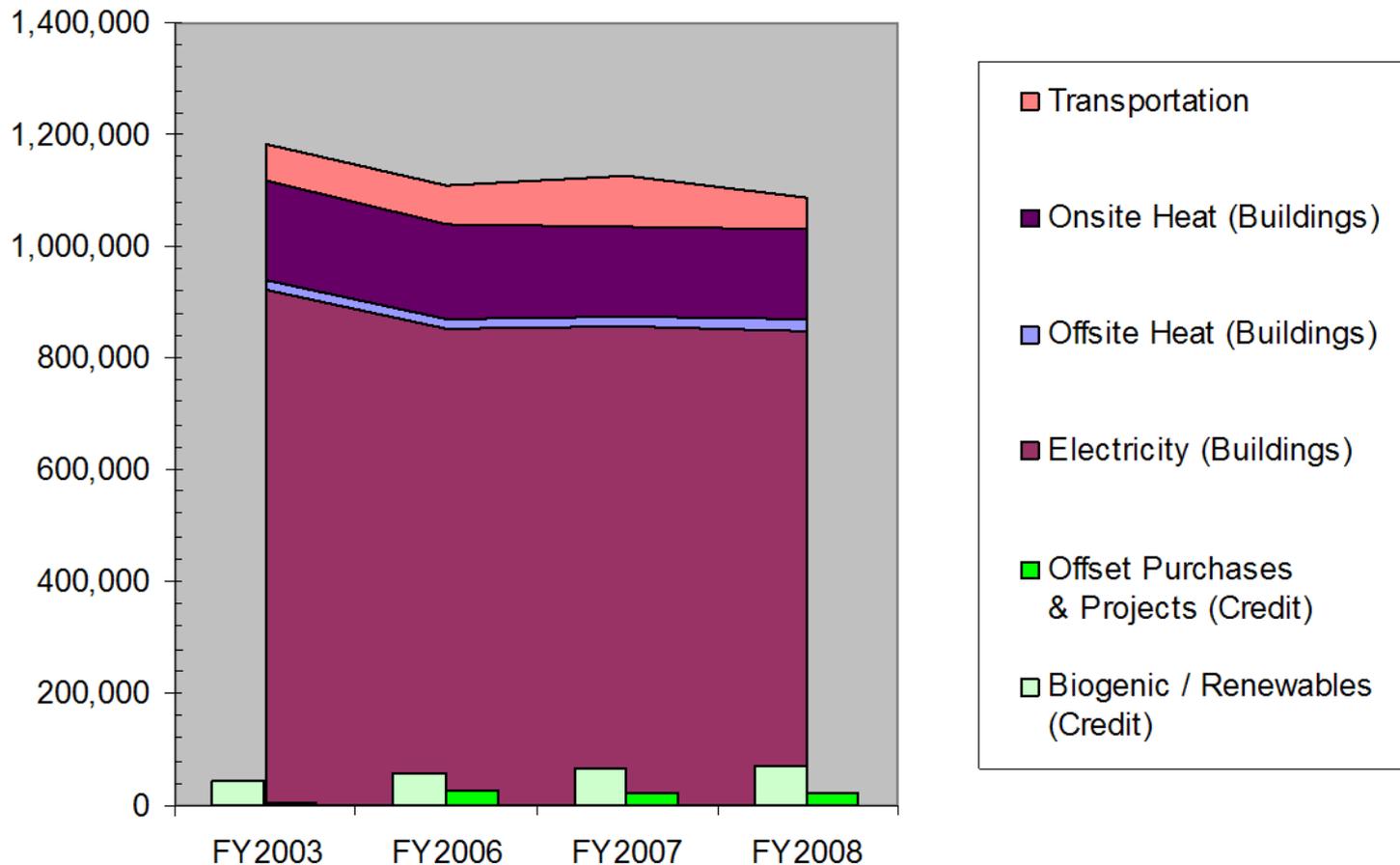
**NASA GHG Emissions in Metric Tons CO₂e
for CY2003 & 2006 - 2008**



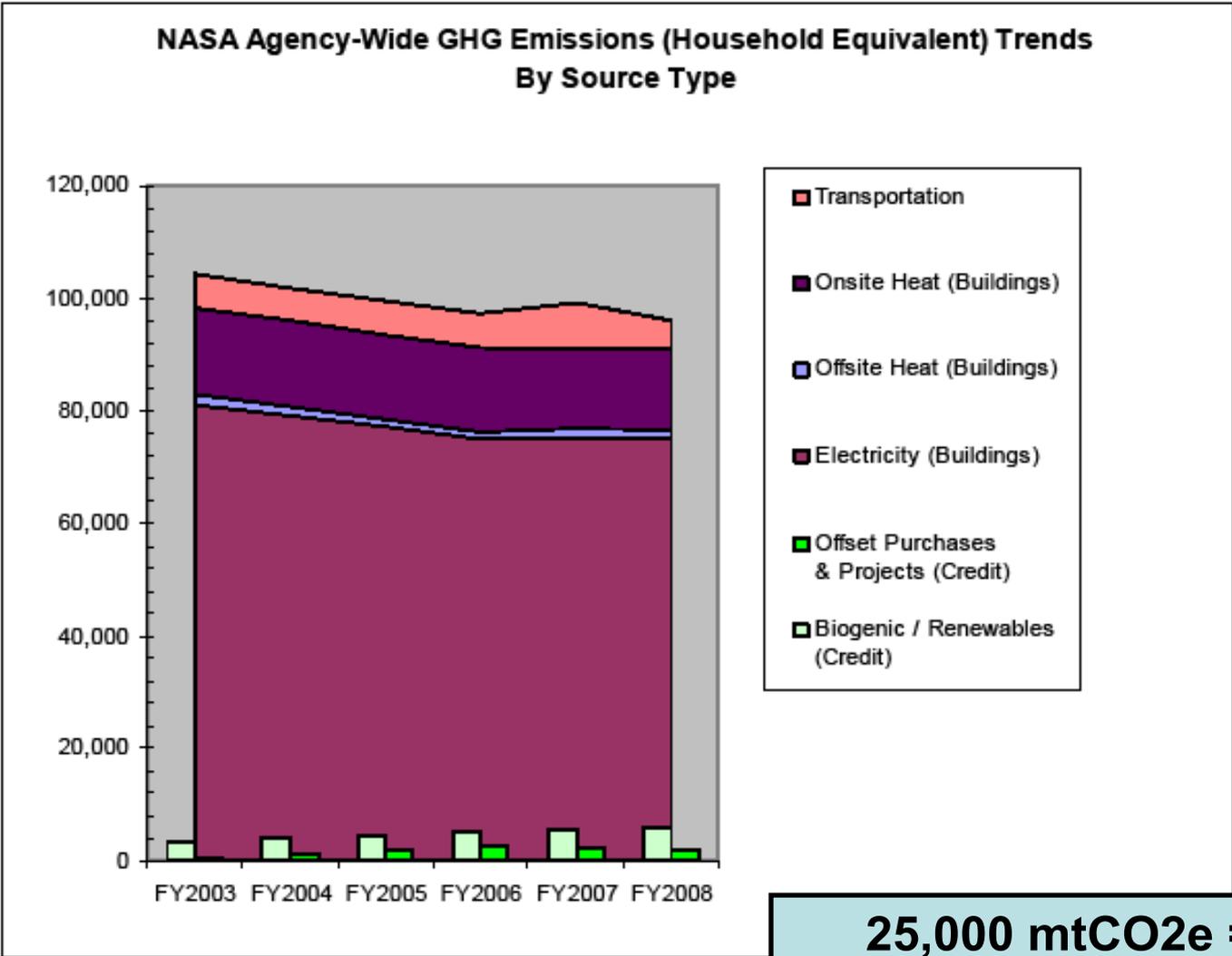


Agency Wide

NASA GHG Emissions (MTCO₂e) Trends By Source Type



Converted to Household Equivalent



25,000 mtCO₂e = 2200 households



EPA's Draft Mandatory Reporting Rule*

- **Scope:**
 - Generally facility level, begin reporting annually in March 2011 for 2010 emissions
 - Exceptions: engine/vehicle reports begin MY2011, corporate level for engine/vehicle manufacturers and for suppliers
- **Greenhouse Gas Emissions Covered:**
 - CO₂, CH₄, N₂O, SF₆, HFCs, PFCs, NF₃, HFEs
 - All as direct emissions and/or potentially direct emissions (suppliers), no indirect emissions reporting or delineation by 'scope'

*Proposed rule published in the *Federal Register* April 10, 2009
www.epa.gov/climatechange/emissions/ghgrulemaking.html



EPA's Draft Mandatory Reporting Rule (cont)

- **Threshold:**
 - Generally 25,000 MT CO₂e threshold, as an aggregate of emissions from all sources for which a calculation method is provided
- **Some Things to Watch:**
 - Large stationary combustion units (>250 mmBtu/hr rating)
 - Different methodologies based upon type – seem to mirror WRI protocol
- Currently no requirement of 3rd party verification
 - Reports are self-certified and QA/QC conducted by EPA
- No offsets, no reductions



EPA's Draft Mandatory Reporting Rule (cont)

Mobile Sources

- EPA seeking comment on the need to collect additional emissions and activity data from fleet operators and state and local governments, for example:
 - What are the current gaps in reported travel activity?
 - Should reporting occur on a more frequent basis?
 - Are there certain categories of mobile source that should be included or excluded in potential reporting requirements?
 - Should fleet operators be required to report to EPA outside of voluntary participation in the SmartWay or Climate Leaders programs?



0.001 = Conversion factor from kg to metric tons.

(iii) For a gaseous fuel, use Equation C-5 of this section:

$$CO_2 = \sum_{p=1}^n \frac{44}{12} * (Fuel)_n * (CC)_n * \frac{MW}{MVC} * 0.001 \quad (\text{Eq. C-5})$$

Where:

- CO₂ = Annual CO₂ mass emissions from combustion of the specific gaseous fuel (metric tons).
- N = Number of required carbon content and molecular weight determinations for the year.
- (Fuel)_n = Volume of the gaseous fuel combusted on day "n" or in month "n", as applicable (scf).
- P = Measurement period (month or day, as applicable).
- (CC)_n = Average carbon content of the gaseous fuel, from the fuel analysis results for the day or month, as applicable (kg C per kg of fuel).
- MW = Molecular weight of the gaseous fuel, from fuel analysis (kg/kg-mole).
- MVC = Molar volume conversion factor (849.5 scf per kg-mole at standard conditions).
- 44/12 = Ratio of molecular weights, CO₂ to carbon.
- 0.001 = Conversion factor from kg to metric tons.

(iv) In applying Equation C-5 of this section to natural gas combustion, the CO₂ mass emissions are



Questions?
Comments?