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**Using the Five Principles of Greenhouse  
Gas Accounting to Produce High  
Quality Inventories**

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# Agenda

What is the purpose of a greenhouse gas (GHG) emission inventory?

What are the elements of a high quality GHG inventory?

How the five principles of GHG accounting support high-quality GHG inventories.

# What is the purpose of a GHG emission inventory?

- To provide stakeholders with the knowledge needed to make informed GHG management decisions
  - Understand agency's emission profile
  - Set achievable goals and targets
  - Prioritize mitigation actions
  - Build support
- Why invest in quality?
  - Informed decisions = successful investments

# What are the Elements of a High Quality GHG Inventory?

The five principles of GHG accounting\*

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy

\*Source: World Resources Institute/World Business Council for Sustainable Development, GHG Protocol Corporate Accounting and Reporting Standard

# Relevance

Ensure the GHG inventory appropriately reflects the GHG emissions of the organization and serves the decision-making needs of users – both internal and external to the organization

*“An important aspect of relevance is the selection of an appropriate inventory boundary.”*

# Relevance – *Boundary Setting*

WRI/WBCSD Corporate  
Standard



Federal GHG Guidance



The results of the ICF GHG emission inventory vary considerably depending on which protocol is used to define the inventory boundaries.

# Relevance - *Boundary Setting*

- Boundaries determine whether an emission source is included in a GHG inventory and whether it is considered a scope 1, scope 2, or scope 3 emission source
  - Federal agencies have different emission reduction goals for scope 1 and 2 and scope 3 emissions
- An organization's *indirect* GHG emissions (scope 2 and 3) are, by definition, another organization's *direct* (scope 1) emissions
- Federal agencies should use the *Federal Greenhouse Gas Accounting and Reporting Guidance* to establish boundaries
  - Differs from the WRI/WBCSD Corporate Standard in handling of leased space
- Agencies must use consistent boundaries throughout a time series to ensure accurate comparison of GHG estimates over time

# Completeness

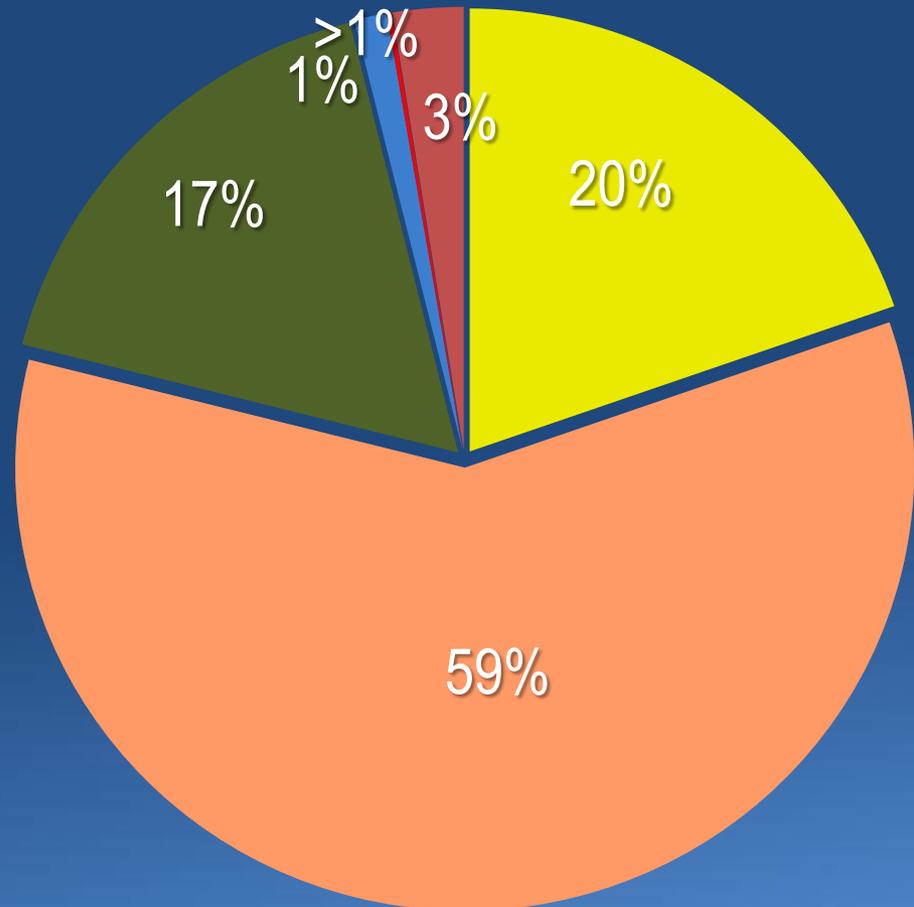
Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

*All relevant emissions sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled.*

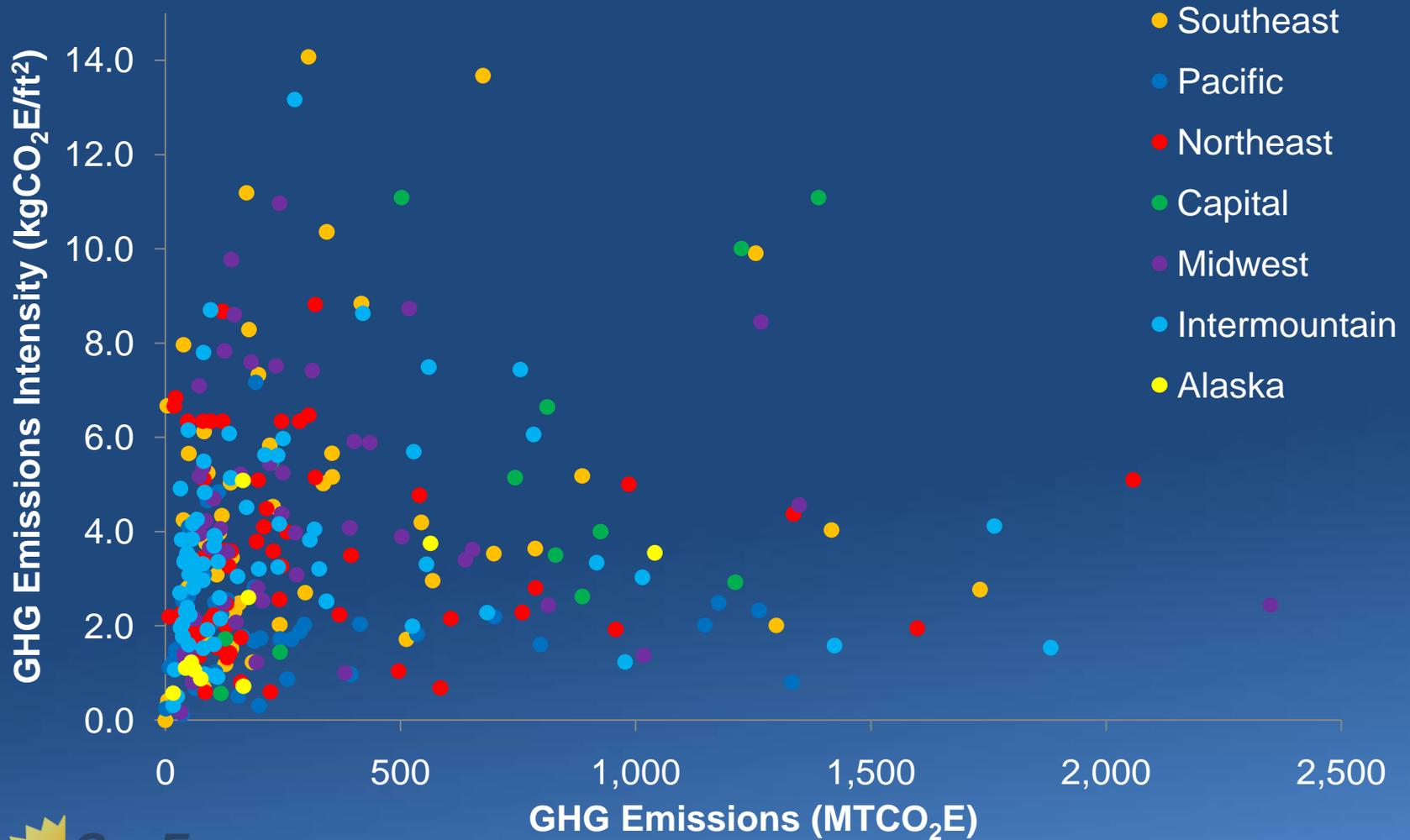
# Completeness - *Inventory Resolution*

National Park Service 2008 Scope 1 and Scope 2 GHG emission estimates

- Stationary Combustion
- Purchased Electricity/Steam
- Mobile Combustion
- F-GHG (Refrigerant/AC)
- On-site Wastewater
- On-site Landfilled Waste



# Completeness – *Inventory Resolution*



# Completeness – *Inventory Resolution*

## Mount Rainier NP - Henry M. Jackson Memorial Visitor Center

- Replace flat-roof visitor center
- Diesel fuel consumption decreased by 78%
- Electricity consumption decreased by 67%
- 500 MTCO<sub>2</sub>E saved annually (3% of region's energy-related GHGs)

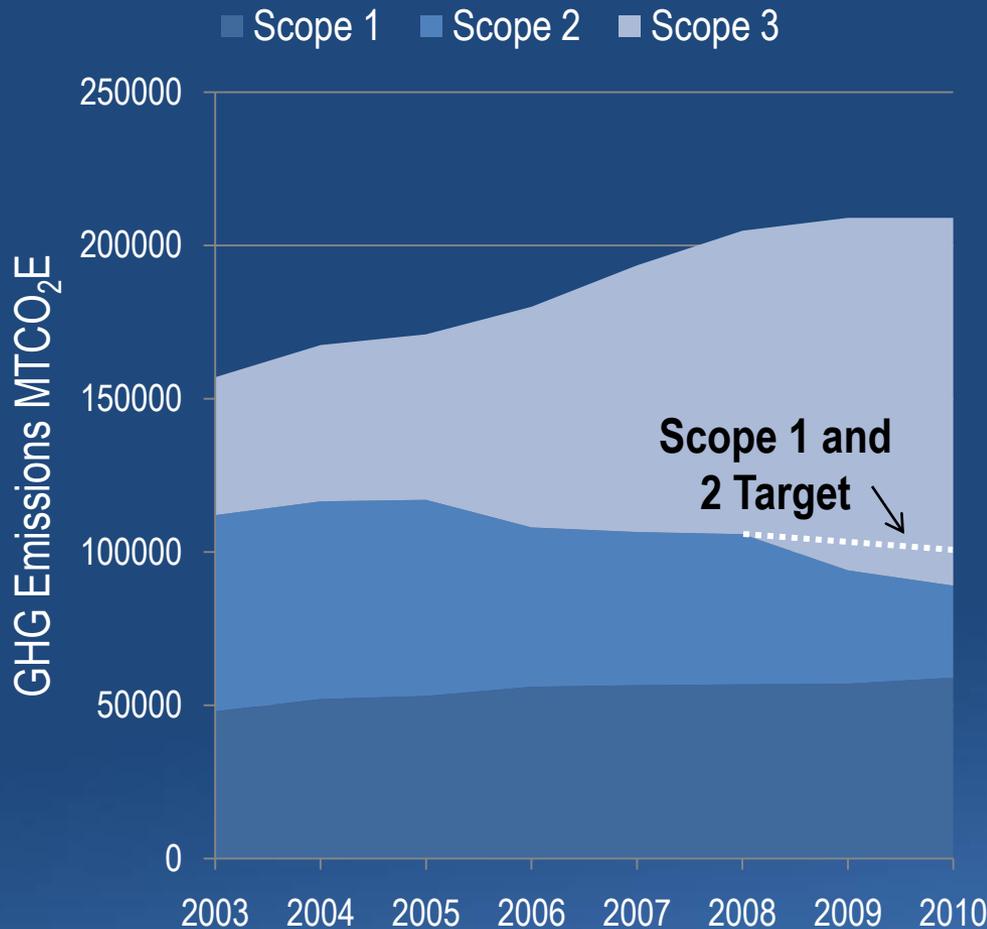


# Consistency

Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

*“Track and compare GHG emissions information over time in order to identify trends and to assess the performance of the reporting organization.”*

# Consistency – *Factors Affecting*



- Add/remove emission sources
- Changes in inventory boundaries
  - Acquisition or construction of new buildings; downsizing
  - Insourcing or outsourcing of activities
  - Treatment of leased space
- Changes in methodology
  - Default versus advanced approach
- Changes in data
  - Increased data availability, accuracy or resolution
- Other factors
  - Interannual weather variability
- Discovery of significant errors

# Consistency – Accounting Tools

GHG Accounting Tools use embedded protocol-compliant accounting methodologies, defined data inputs, and recalculation features to ensure inventory consistency across agencies and across years

- Publicly available tools include:
  - FEMP Annual GHG and Sustainability Data Report
  - GSA Carbon Footprint Tool
  - NPS Climate Leadership in Parks (CLIP) Tool (featured at right)
- Other tool options include:
  - Modifying existing agency financial-, asset-, or environmental-management systems to include GHG accounting
  - Off-the-shelf Environmental Management Information Systems (EMIS)



# Transparency

Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

*“Information needs to be recorded, compiled, and analyzed in a way that enables internal reviewers and external verifiers to attest to its credibility.”*

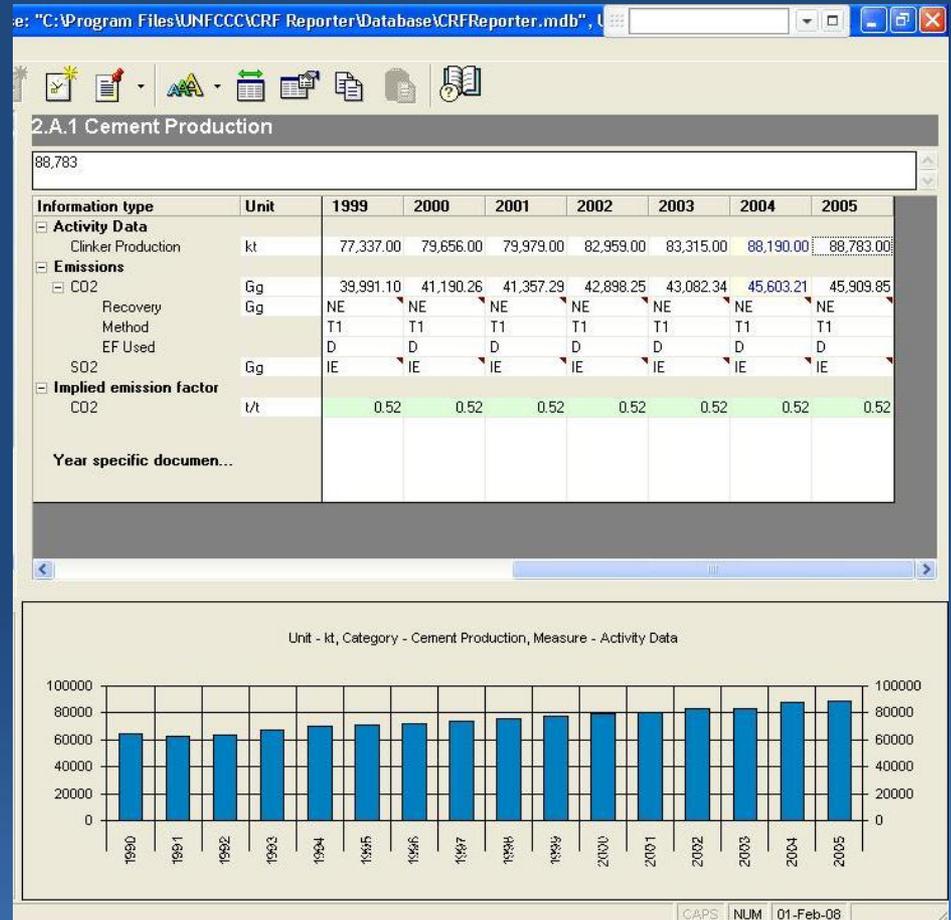
# Transparency – QAQC

- Quality control is a system of routine technical activities to measure and control the quality of the inventory as it is being developed. These QC activities include:
  - Performing consistent checks to ensure data integrity, correctness, and completeness
  - Identifying and addressing errors and omissions, and
  - Documenting and archiving inventory material including inventory methods, roles and responsibilities, and data sources in an Inventory Management Plan
- Quality assurance consists of a series of procedures performed after completing an inventory to ensure that the inventory receives a thorough review and that it adheres to the GHG accounting principles of relevance, completeness, consistency, transparency, and accuracy.
  - Address quality assurance in an Inventory Management Plan
  - Conduct *internal* verification through a second party not affiliated with the inventory
  - Conduct *external* verification by a party outside the agency that is not affiliated with the inventory (optional)

# Transparency – QAQC

As an example, the Common Reporting Format (CRF) Reporter used by the United Nations Framework Convention on Climate Change (UNFCCC) to compile national GHG inventories.

- Calculates implied emission factors
- Requires detailed documentation for omitted sources
- Specifies methods used
- Flags timeseries discrepancies



# Accuracy

Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged.

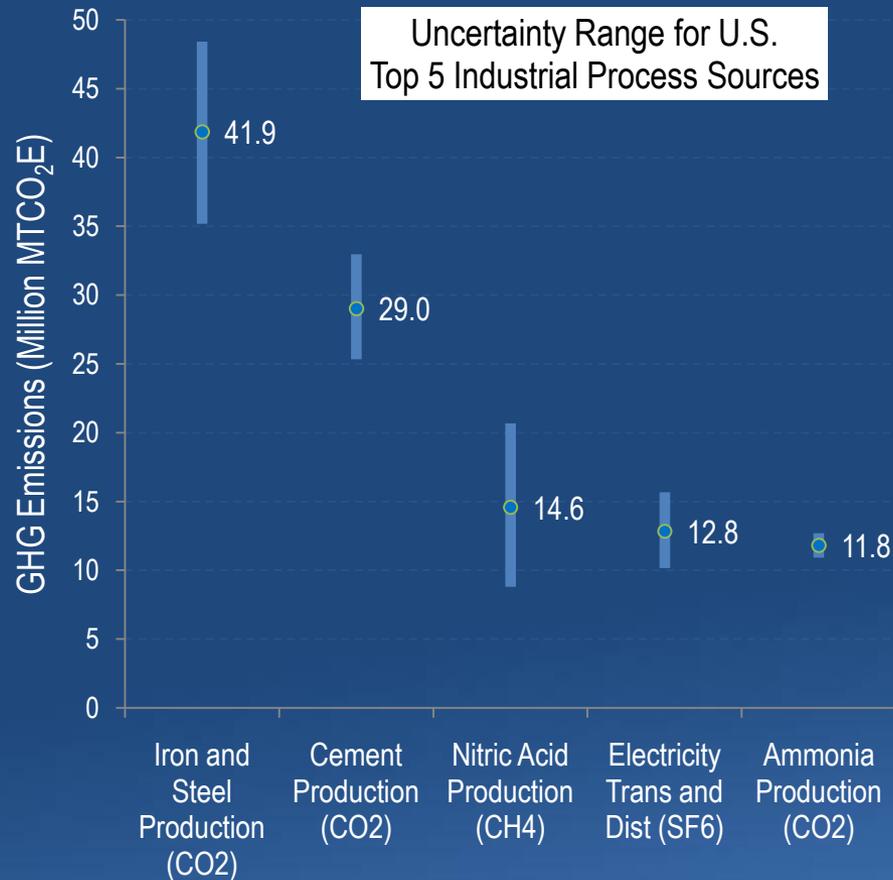
*“The quantification process should be conducted in a manner that minimizes uncertainty.”*

# Accuracy – Addressing Uncertainty

## Three types of uncertainty

- Parameter uncertainty
  - Uncertainty associated with the lack of precise activity data and/or emission factors
- Model uncertainty
  - Uncertainty associated with the ability of the calculations to accurately account for real-world emissions
- Scientific uncertainty
  - Arises when the science of actual emissions is not understood adequately (e.g., land use, land-use change, and forestry)

# Accuracy - Addressing Uncertainty



- Qualitatively discuss uncertainty
  - Identify known data concerns
  - Discuss model limitations
- Target inventory improvements to reduce uncertainty
  - Improve data collection
  - Employ advanced methodologies over time
- Include above items in GHG Inventory Management Plan

# Summary Points

High-quality inventories adhere to the five principles of GHG accounting

- Relevance – define boundary carefully and stay within lines
- Completeness – finer data supports focused decisions
- Consistency – consistency is key to tracking performance
- Transparency – HQ inventories value QAQC
- Accuracy – uncertainty drives inventory improvements

*Lastly, the most important inventory principle is to engage your audience...*

# Engage Audience

- Successful inventories support employee engagement by providing data upon which to base GHG reduction campaigns, but numbers can be intangible.
- Look for opportunities to communicate data

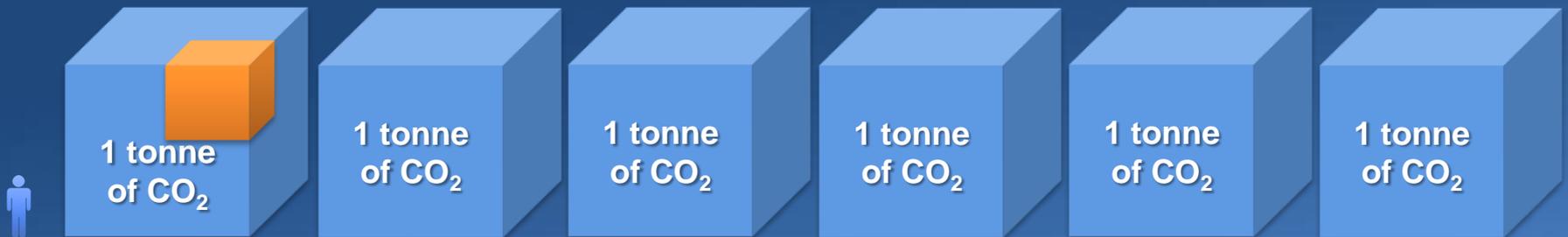


**1 tonne of CO<sub>2</sub>**

# Engage Audience

- My travel to GovEnergy

- Home to Harrisburg, PA (40 ground miles, solo) = 27 lbs CO<sub>2</sub>
- Harrisburg, PA to Cincinnati, OH (411 air miles) = 210 lbs CO<sub>2</sub>
- Airport to hotel (10 ground miles, carpool) = 3 lbs CO<sub>2</sub>
- Total = 240 lbs
- *And back = 480 lbs or 0.2 MTCO<sub>2</sub>E*



# Thank You!

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*Come meet with us at Booth 435!*



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