US EPA Experience with Monitoring, Reporting and Verification of GHG Emissions

Tracking Emissions and Mitigation Actions: Learning from National Practice

CPI Side Event

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Selected USEPA Activities on MRV

	Monitoring	Reporting	Verification
US Domestic	Facility-level monitoring GHG Inventory Partnership mitigation programs	Facility-level reporting Report to UNFCCC Annual Reports	Facility-level verification Peer and public inventory review Federal government auditing
International capacity building	*Facility-level monitoring* National GHG inventories	*Facility-level reporting tools* National GHG reporting tools (ALU)	*Domestic QA/QC tools* Domestic QA/QC tools

Overview: U.S. EPA Mandatory GHG Reporting Rule

Goal is to collect accurate and timely data on GHG information to inform future policy decisions.

- Monitoring began in 2010 for most emission sources with first reports submitted to EPA in September, 2011.
- An additional 12 source categories began collecting data in 2011 (reporting in 2012).
- Rule covers nationally-defined 41 source categories for reporting, accounting for 85-90% of total U.S. GHG emissions, informed by IPCC.
- Reporting only, no control or use requirements.
- Legal Authority: 1990 Clean Air Act, Section 114.

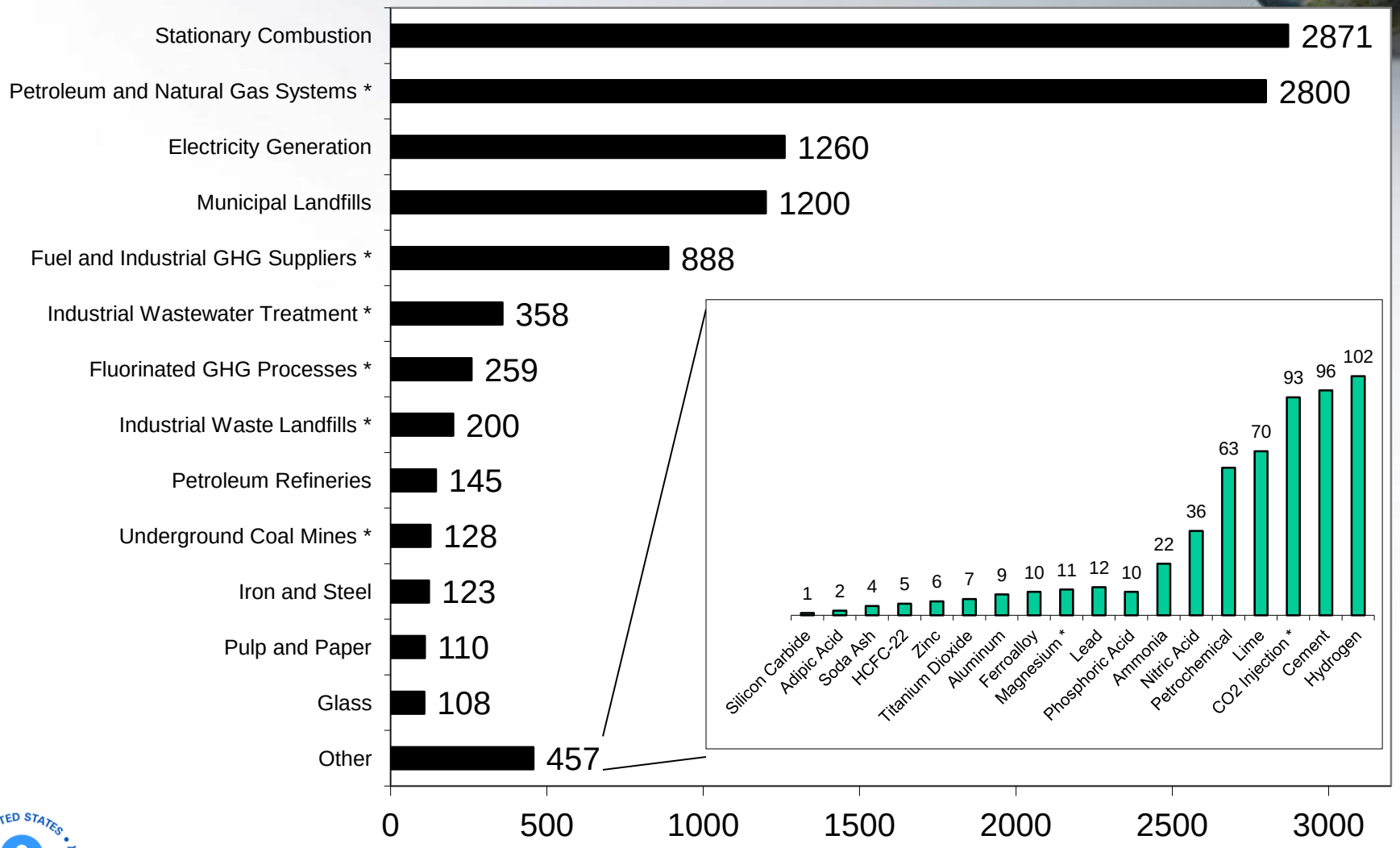





Key Elements of the GHG Reporting Rule

- Annual reporting of GHG by:
  - 41 source categories, which includes:
    - 35 types of direct emitters
    - 6 types of suppliers of fuel and industrial GHG
  - Facilities that inject CO_2 underground for geologic sequestration, enhanced oil recovery, or any other purpose.
- Thresholds: Generally 25,000 tonnes CO_2e
- Direct reporting to EPA electronically
- EPA verification of emissions data

Approximately 10,000 U.S. Facilities & Suppliers Covered



* Approximate (first reports due Sep 2012)

What GHGs Are Reported?

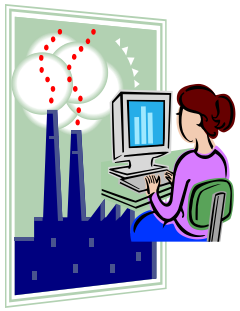
- CO_2
- CH_4 (methane)
- N_2O (nitrous oxide)
- Fluorinated GHGs
  - HFCs (hydrofluorocarbons)
  - PFCs (perfluorocarbons)
  - SF_6 (sulfur hexafluoride)
  - Other fluorinated gases (except CFC and HCFC and gases <1 mm Hg @25^o C)

Methodologies (Stationary Combustion)

Tier	Method	Usage
1	Fuel / Mass Bal	Company Records for Fuel Use (e.g. tank drop measurements, billing records etc…) and default HHV & CO2 emission factor
2	Fuel / Mass Bal	Company Records for Fuel Use and HHV (high heating value of fuel) plus default CO2 emission factor. HHV minimum sampling frequency of weekly, monthly, quarterly, biannual depending on fuel type.
3	Fuel / Mass Bal	Company Records* for Fuel Use and Carbon Content Carbon content has minimum fuel sampling frequency depending on fuel type.
4	Direct Measurement	Monitor CO2 emissions with CEMS (Continuous Emissions Monitoring System) Install CO2 and volumetric flow rate monitor

Collecting, Verifying, Publishing GHG Data

- Electronic Reporting Only



Reporter (Facility or Supplier)

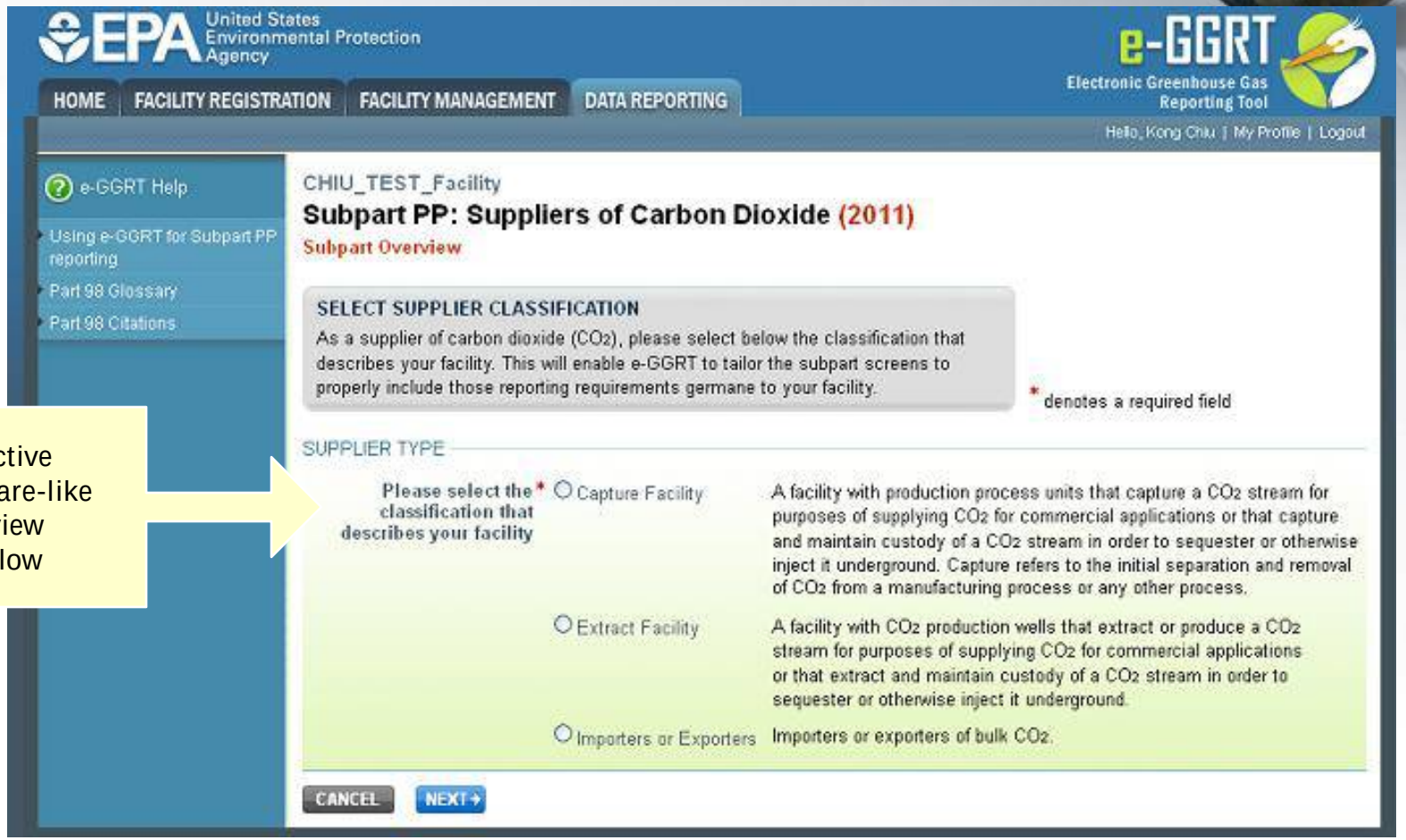
e-GGRT Electronic Greenhouse Gas Reporting Tool

Web Form or Bulk XML Upload

EPA Web & Oracle DB Servers

EPA Verifies & Publishes GHG Data

Electronic Reporting Tool



Interactive
Tax software-like
Interview
workflow

Data Verification

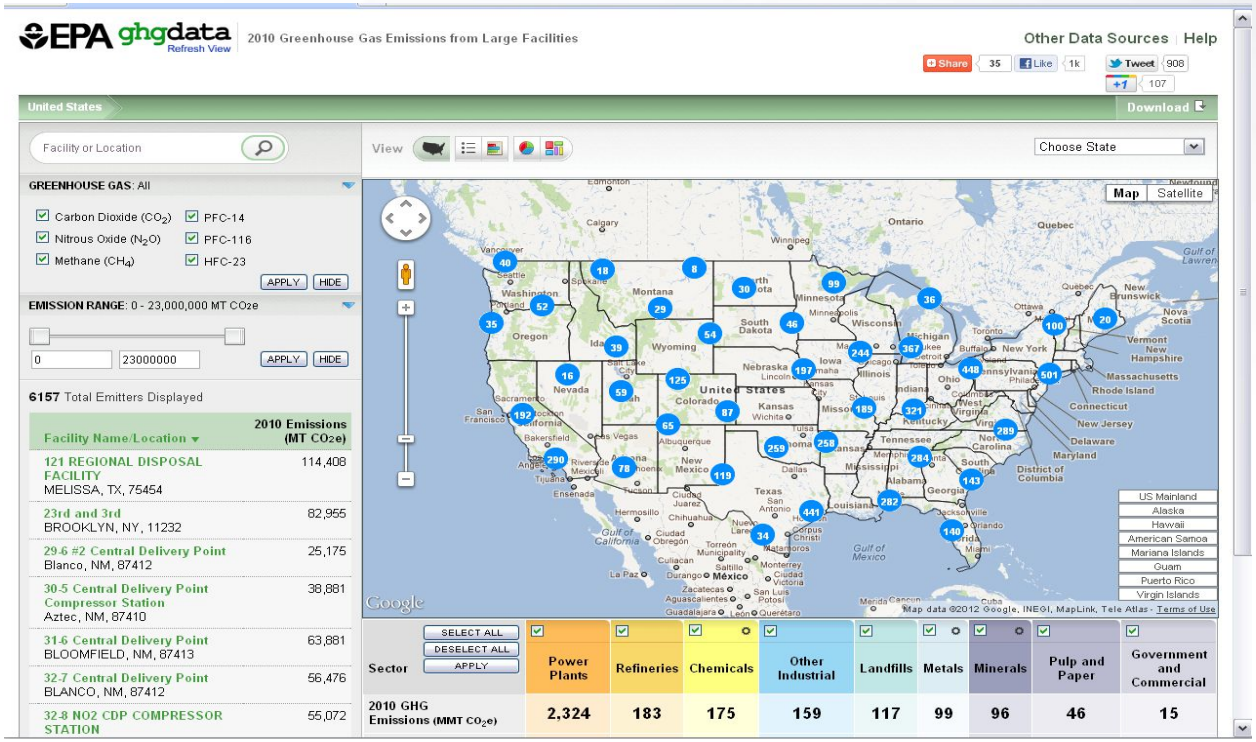
- Reporter Self-Certifies
- Electronic Verification
    - Pre-submittal warning for reporters entering data outside reasonable ranges or missing data
    - Post-submittal verification through logic checks, use of outside data sets, and statistical analyses across facilities
- Staff review and direct follow-up
    - Staff review electronic verification results
    - Phone/email follow-up

Goals of GHG Data Publication

- Increase understanding of the sources of GHG emissions in the U.S. among the public
- Voluntary management ("TRI effect")
- Improve quality of reported data
- Support regional, state, and local programs
- Provide a tool for schools, students, researchers and journalists
- Information displayed in a simple, transparent manner
  - Allows public to use data in creative ways

Data Publication

- http://GHGdata.epa.gov/ghgp/main.do
- Data publication tool allows stakeholders and the public to access the key data elements quickly and easily and to sort data by location, sector, and by gas.
- 2010 data published in January 2012.



2010 GHG Data Quick Summary

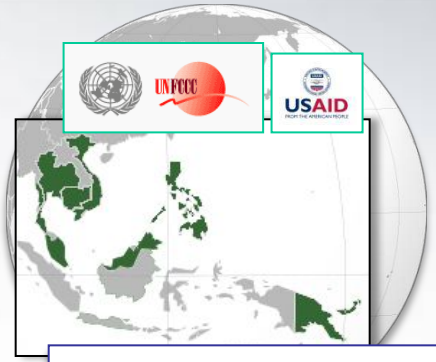
- Reports from over 6,700 entities
- Power plants are largest stationary source of direct emissions- 2,324 MMTCO2e
- Refineries are second at 183 MMTCO2e
- 100 facilities reported over 7 MMTCO2e including 96 power plants, 2 iron and steel mills, 2 refineries
- 2010 data accounts for roughly 80 percent of total U.S. emissions.
  - This percentage reflects both upstream suppliers and direct emitters.
  - Among the data not covered are GHG emissions from smaller sources, and from agricultural and land-use activities.

GHGRP vs. U.S. GHG Inventory

- The U.S. GHG Inventory is a comprehensive top-down assessment of national GHG emissions and removals which presents emissions across multiple years starting in 1990.
  - U.S. GHG emissions calculated using internationally-accepted methods and nationally appropriate statistics
  - Emissions estimates generally not provided at the geographic or facility level
  - Complete coverage, including
    - small industrial emitters, residential and commercial sectors
    - Includes agriculture and land-use/forestry sectors
- When compared in aggregate, some of the summary emissions totals for specific industries appear different in the Inventory and GHGRP.
  - Different Source Category Definitions
  - Reporting Threshold
  - Lack of Disaggregated Data to Represent Certain Industries
  - Use of Continuous Emissions Monitoring Technologies
  - Differences in use of Default International Factors from Facility-Specific Methods

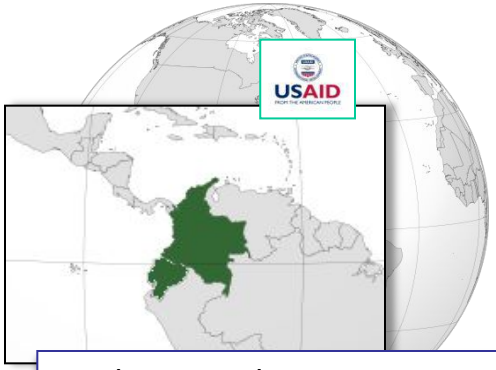
Past and Current GHG Capacity Building Efforts

Central America : First regional project. Developed our current approach and designed our tools.
Phase I: 2004-2007
Phase II: 2007-2010



South East Asia: Currently 6 country project. Strong partnership with UNFCCC. Applied the lessons and tools developed in CA. Phase I: 2008-2010. Phase II: 2011-2012.

Eastern and Southern Africa: Apply the lessons and tools developed in other regions. Strong partnerships with UNFCCC, CD-REDD and others so we can provide the expertise needed to get the job done. Phase I: 2011-2013



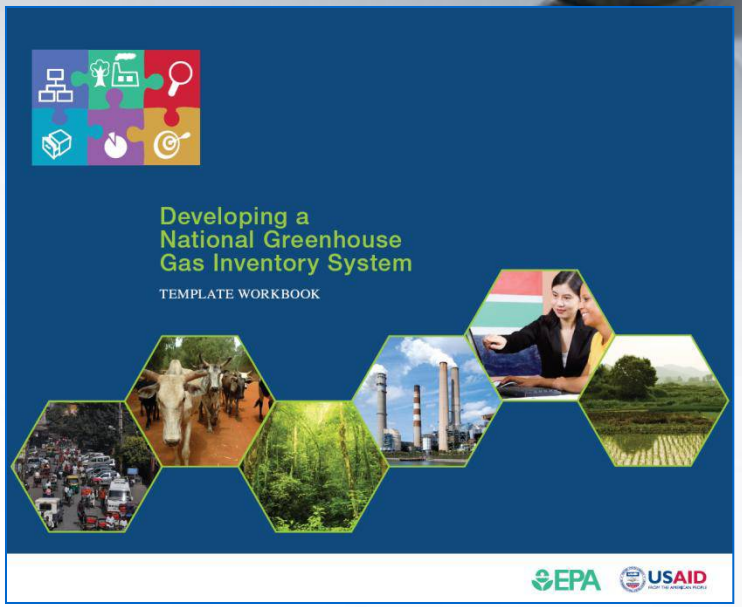
Andean Region: Scoping trips to Colombia , Ecuador and Peru in 2011, early 2012. Applying the lessons learned and tools developed for other regions. Collaborating with US SilvaCarbon Program.

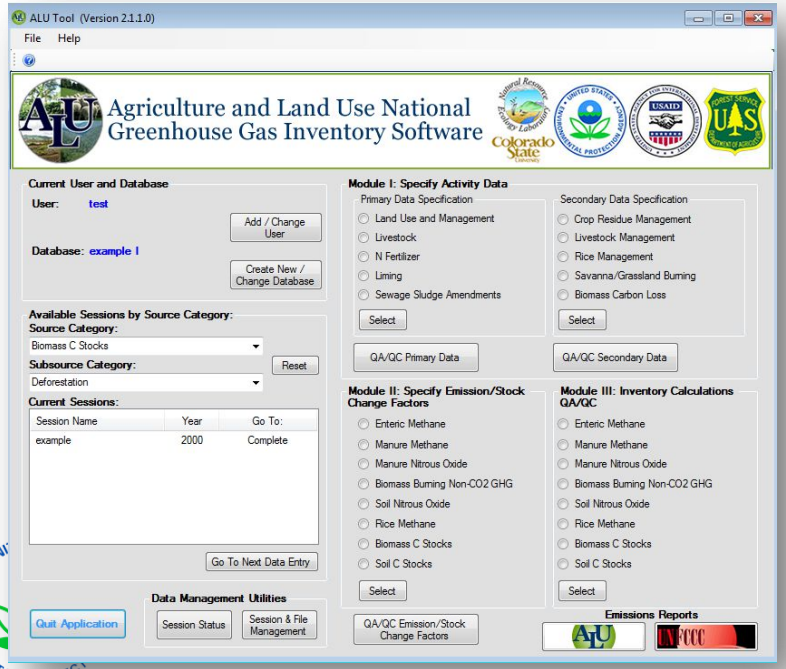
China: Initial workshop in Aug. 2010, currently discussion new work , translated existing tools for use in provinces.

Capacity Building Tools

National System Templates

Helps to document, institutionalize and streamline the inventory management process





ALU Tool

Helps to compile AD, perform calculations, implement QA/QC procedures and produce reports

MRV – Selected Mitigation Actions

4 Policies and Measures 39

ENERGY STAR Qualified Products

Table 4-3 **Summary of U.S. Actions to Reduce Greenhouse Gas Emissions** (Tg CO_2 Eq.)[1]

Name of Policy or Measure	Objective and/or Activity Affected	Greenhouse Gas Affected	Type of Program	Status	Implementing Entities	Estimated Mitigation Impact for 2007	Estimated Mitigation Impact for 2010	Estimated Mitigation Impact for 2015	Estimated Mitigation Impact for 2020
Energy: Residential and Commercial[2]									
Appliances and Commercial Equipment Standards Program, Appliance Energy Efficiency Standards	Analyzes, develops, reviews and updates efficiency standards for most major household appliances and major commercial building technologies and equipment.	CO_2	Regulatory	Implemented	DOE	0.0	1.3	4.3	6.1
Building Energy Codes Program	Promotes stronger building energy codes and helps states adopt, implement, and enforce them. Recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement.	CO_2	Regulatory	Implemented	DOE	0.0	1.3	5.8	11.3
Lighting Energy Efficiency Standards	Mandates standards that will result in phasing out the 130-year-old incandescent light bulb by the middle of the next decade and phases out less efficient fluorescent tubes. New standards will also apply to reflector lamps—the cone-shaped bulbs used in recessed and track lighting.	CO_2	Regulatory	Implemented	DOE	0.0	0.4	1.2	1.5
ENERGY STAR Labeled Products	Labels distinguish energy-efficient products in the marketplace.	CO_2	Voluntary	Implemented	EPA/DOE	64.5	82.5	113.6	141.2

ENERGY STAR-Qualified Products Overview

- EPA launched the ENERGY STAR Program in 1992, and over the last 20 years, it has grown to become one of the most trusted sources of unbiased information to identify energy efficient products, buildings, homes and industrial facilities.
- Products that can earn the ENERGY STAR range from printers and computers to televisions, light bulbs, and refrigerators.
- Over the years, consumers have purchased more than 5 billion ENERGY STAR-qualified products from 1,700 manufacturers in 60 categories.

ENERGY STAR Qualified Products - Achievements

- In 2010, the entire ENERGY STAR program helped Americans save more than $20 billion on their utility bills, avoid 244.6 billion kWh of electricity (5% of total 2010 U.S. electricity demand), and prevent 195 MMT(eq. to 38 million vehicles) of GHG emissions.
- Of the 244.6 billion kWh of energy saved, qualified products accounted for 114.8 billion kWh (47%). Of the 195.8 MMT of GHGs avoided, qualified products accounted for 81.4 MMT (41.6%).
- American consumers purchased about 200 million ENERGY STAR-qualified products in 2010 alone.

ENERGY STAR Qualified Products – Measuring Progress

- Sales of products due to the ENERGY STAR program are determined as those *above and beyond* established BAU purchases for these products. The sales are estimated in the following ways:
  - Manufacturer Data Collection: The program collects annual sales data from manufacturers and supplements the data with industry reports on total annual product sales.
  - BAU Baselines: The program creates BAU baselines for specific industry sectors using historical data and expert judgement which are used to measure increases and decreases in product sales.

ENERGY STAR-Qualified Products – Measuring Progress (cont.)

- Annual energy savings are calculated using established values for the difference in annual energy use between a *single* ENERGY STAR product and a typically purchased product. These values are calculated in the following ways:
  - EPA assumes that ENERGY STAR-qualified products just meet the ENERGY STAR performance thresholds (although some products greatly exceed these levels), keeping the values extremely conservative.
  - EPA also assumes that the typically purchased product meets minimum efficiency standards where standards exist or uses average energy use for products in that category if no standards exist.
- Avoided GHG emissions were determined using marginal emissions factors for CO2 equivalency based on factors established as part as part of the U.S. government's reporting to the UNFCCC and emissions data from EPA's eGRID database.

Table 4-3 (Continued) **Summary of U.S. Actions to Reduce Greenhouse Gas Emissions** (Tg CO_2 Eq.)[1]

Name of Policy or Measure	Objective and/or Activity Affected	Greenhouse Gas Affected	Type of Program	Status	Implementing Entities	Estimated Mitigation Impact for 2007	Estimated Mitigation Impact for 2010	Estimated Mitigation Impact for 2015	Estimated Mitigation Impact for 2020
Waste Management									
Stringent Landfill Rule	Reduces methane/landfill gas emissions from U.S. landfills.	CH_4	Regulatory	Implemented	EPA	9.2	9.2	9.5	9.9
Landfill Methane Outreach Program	Reduces methane emissions from U.S. landfills through cost-effective means.	CH_4	Voluntary, Information, Education	Implemented	EPA	19.1	22.7	26.4	30.8
Waste Wise	Encourages recycling, source reduction, and other progressive integrated waste management activities to reduce GHG emissions.	All	Voluntary, Information, Research	Implemented	EPA	20.1	23.4	29.9	38.1

The Landfill Methane Outreach Program - Overview

- Created in 1994, EPA's Landfill Methane Outreach Program (LMOP) helps reduce methane emissions from landfills by encouraging the recovery and use of landfill gas as an energy resource.
- LMOP forms partnerships with communities, landfill owners, utilities, power marketers, states, tribes, and non-profit organizations to assess project feasibility, find financing, and market the benefits of projects to their communities.
- LMOP offers technical assistance, guidance materials, project feasibility software, informational materials, and networking opportunities with peers and experts.

The Landfill Methane Outreach Program - Achievements

- From 1995-2011, LMOP assisted 545 landfill gas energy projects which have collectively reduced methane emissions from landfills and avoided emissions totaling 197.8 MMTCO$_2$e.
- LMOP-assisted projects are operating nationwide, with more than 20 projects each in California, Pennsylvania, Illinois, Texas, Virginia, Michigan, Wisconsin, and North Carolina.
- In 2011, methane emissions were reduced by 3.9 MMTCO$_2$e by LMOP Partners as a result of 37 new projects.
- The program also provided stakeholders with 25 preliminary economic analyses, conducted 18 locator searches to match end users with landfills, and ran gas generation models for 19 potential landfill gas energy projects.

The Landfill Methane Outreach Program – Measuring Progress

- EPA maintains a comprehensive database of operational data for U.S. landfills and landfill gas energy projects
  - The data are updated frequently based on information submitted by industry, LMOP's outreach efforts, and other sources.
- Reductions of methane that occur as a result of compliance with EPA air regulations are not included in the program estimates.
- Only the emission reductions from projects that meet the LMOP assistance criteria are included in program benefit estimates.
- EPA uses emissions factors that are based on research, discussions with experts in the landfill gas industry, and published reference sources.

Thank you

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- GHG Reporting Program Resources
  - www.epa.gov/climatechange/emissions/ghgrulemaking.html
- GHG Reporting Program Data
  - http://ghgdata.epa.gov/ghgp/main.do
- US GHG Inventory
    - http://www.epa.gov/climatechange/emissions/usinventoryreport.html
- GHG Inventory Capacity Building
  - http://www.epa.gov/climatechange/emissions/ghginventorycapacitybuilding/index.html
- Energy STAR
  - http://www.energystar.gov/
- Landfill Methane Outreach Program
  - http://www.epa.gov/lmop/