EPA CENTER FOR CORPORATE
CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Reducing Supply Chain GHG Emissions from LCD Panel Manufacturing

Wednesday, September 24, 2014

Presented by:

Melissa Klein, U.S. EPA

Verena Radulovic, U.S. EPA

Guest Speakers:

Zach Freeze, Vice-President, Sustainability, General Merchandise, Wal-Mart

Rob Taylor, Director, Environmental Affairs, Sustainability & Corporate Safety and Standards, Lenovo

Scott O'Connell, Director, Environmental Affairs, Dell

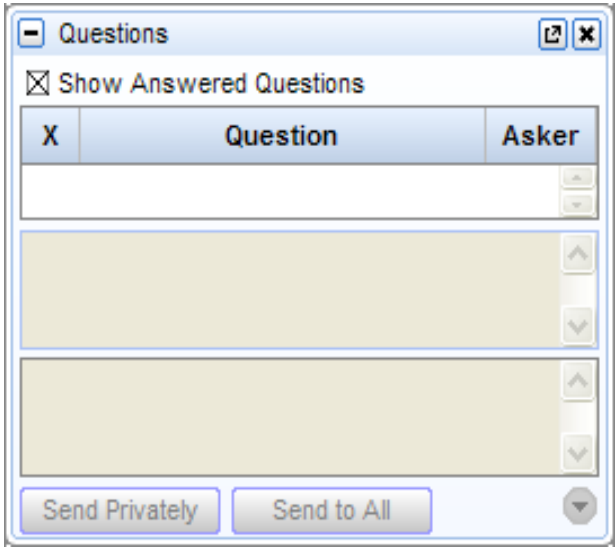
Alexandra Degher, Worldwide LCA and Conflict Minerals Program Manager, HP

Webinar Agenda

- Introduction and webinar logistics
- Supply Chain Focus: Fluorinated GHG emissions in LCD panel manufacturing
- Speakers
  - Verena Radulovic, Consumer Electronics Product Lead, ENERGY STAR
  - Zach Freeze, Vice-President, Sustainability, General Merchandise, Wal-Mart
  - Additional comments:
    - Rob Taylor, Director of Environmental Affairs, Sustainability & Corporate Safety and Standards, Lenovo
    - Scott O'Connell, Director of Environmental Affairs, Dell
    - Alexandra Degher, Worldwide LCA and Conflict Minerals Program Manager, HP
- Q&A and Post-webinar survey

Webinar Logistics

- Attendees are muted to reduce background noise.
- Submit questions and comments in writing via the online control panel. →→ →



- Post-webinar survey on this webinar and topics for future webinars.

- Today's presentations will available at http://www.epa.gov/climateleadership/events

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

About the Center

- A resource center for organizations of all sizes looking to expand their work in the area of greenhouse gas (GHG) measurement and management.

- Provides technical tools & guidance, educational resources, opportunities for information sharing (e.g., Webinars) and peer exchange.

- Promote practices that reduce GHG emissions, drawing upon the successes of Climate Leadership Award recipients and innovations by organizations.

About the Center

- Co-sponsor Climate Leadership Awards with the Association of Climate Change Officers, the Center for Climate and Energy Solutions (C2ES), and The Climate Registry.

- Recognize exemplary corporate, organizational, and individual leadership in addressing climate change.
  - Includes Supply Chain Management

- EPA is also the headline sponsor for the Climate Leadership Conference.

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

CLIMATE LEADERSHIP AWARDS

About the Center

- Supply Chain section highlights resources and case studies: http://epa.gov/climateleadership/supplychain

- Sector Spotlight: Electronics
  - Flat Panel Display Manufacturing (LCD panels) http://epa.gov/climateleadership/supplychain/sector.html

What is the Situation?

- Manufacturing popular products
  - TVs
  - Tablets
  - Computer Monitors
  - Laptop screens
  - Mobile phones

….uses fluorinated greenhouse gases (F-GHGs).

What are F-GHGs?

- Some of the most potent and persistent GHGs affecting our climate today.

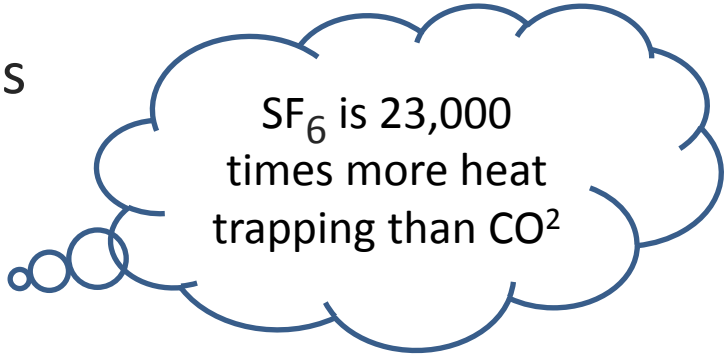
- Used in Flat Panel Display (LCD) Manufacturing:

  Perfluorocarbons: PFCs

  Hydrofluorocarbons: HFCs

  Nitrous Trifluoride: NF_3

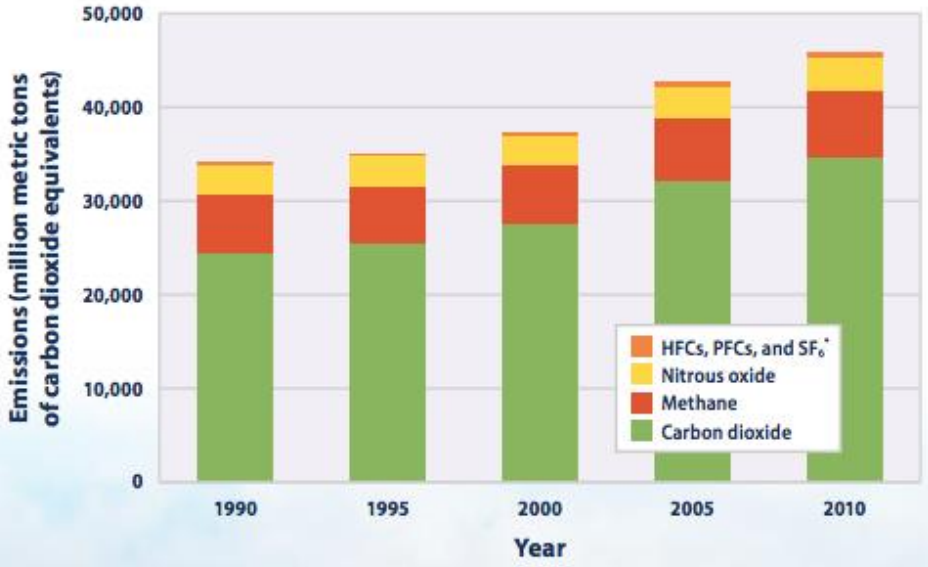
  Sulfur Hexafluoride: SF_6



Sometimes F-GHGs are referred to as perfluorocompounds (PFCs)

Global Emissions of F-GHGs

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010



This figure shows worldwide emissions of carbon dioxide, methane, nitrous oxide, and several fluorinated gases from 1990 to 2010. For consistency, emissions are expressed in million metric tons of carbon dioxide equivalents. These totals include emissions and sinks due to land-use change and forestry.

** HFCs are hydrofluorocarbons, PFCs are perfluorocarbons, and SF_6 is sulfur hexafluoride.*

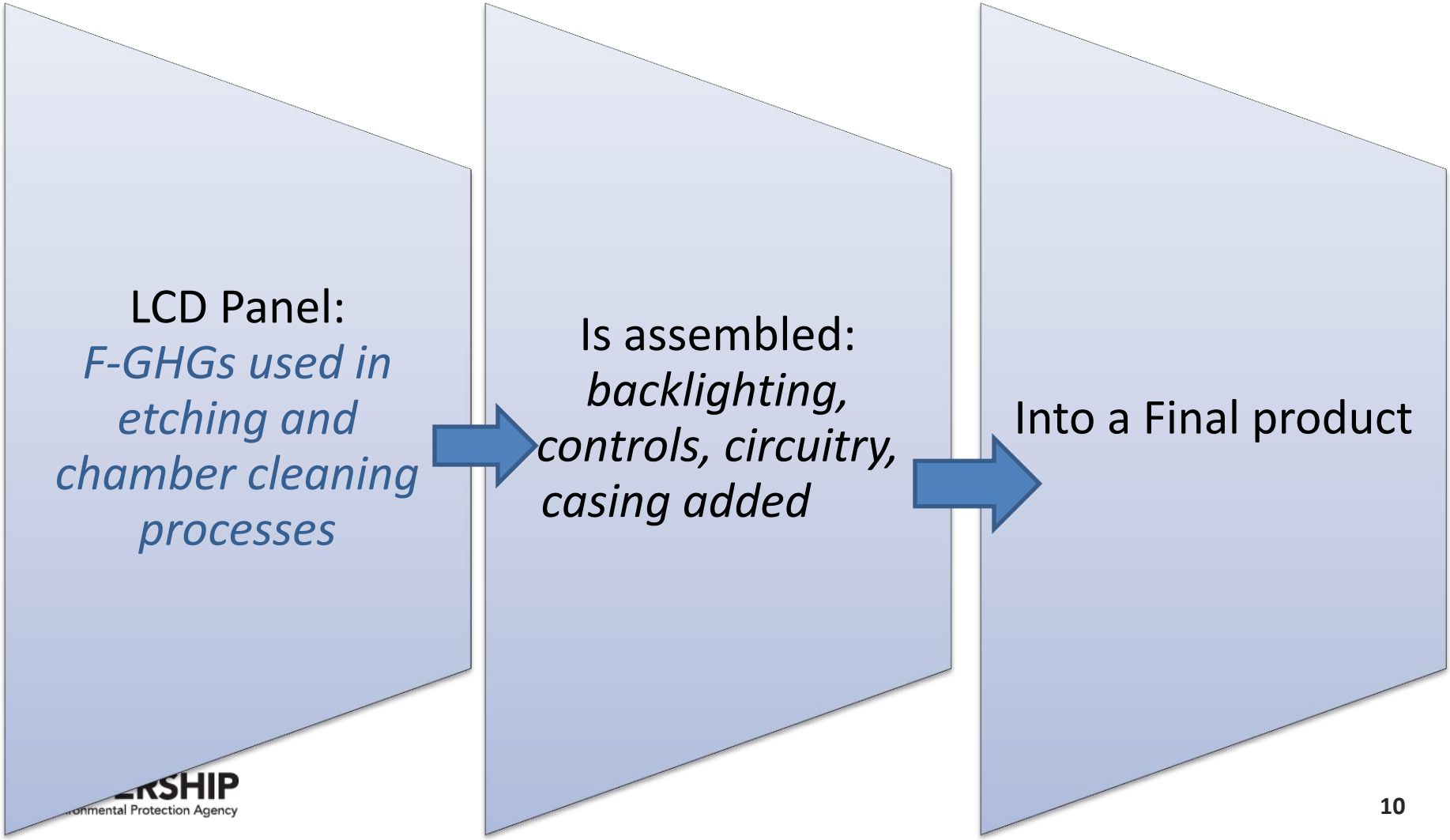
Data source: WRI, 2014;[10] FAO, 2014[11]

EPA's *Climate Change Indicators in the United States*, 2014

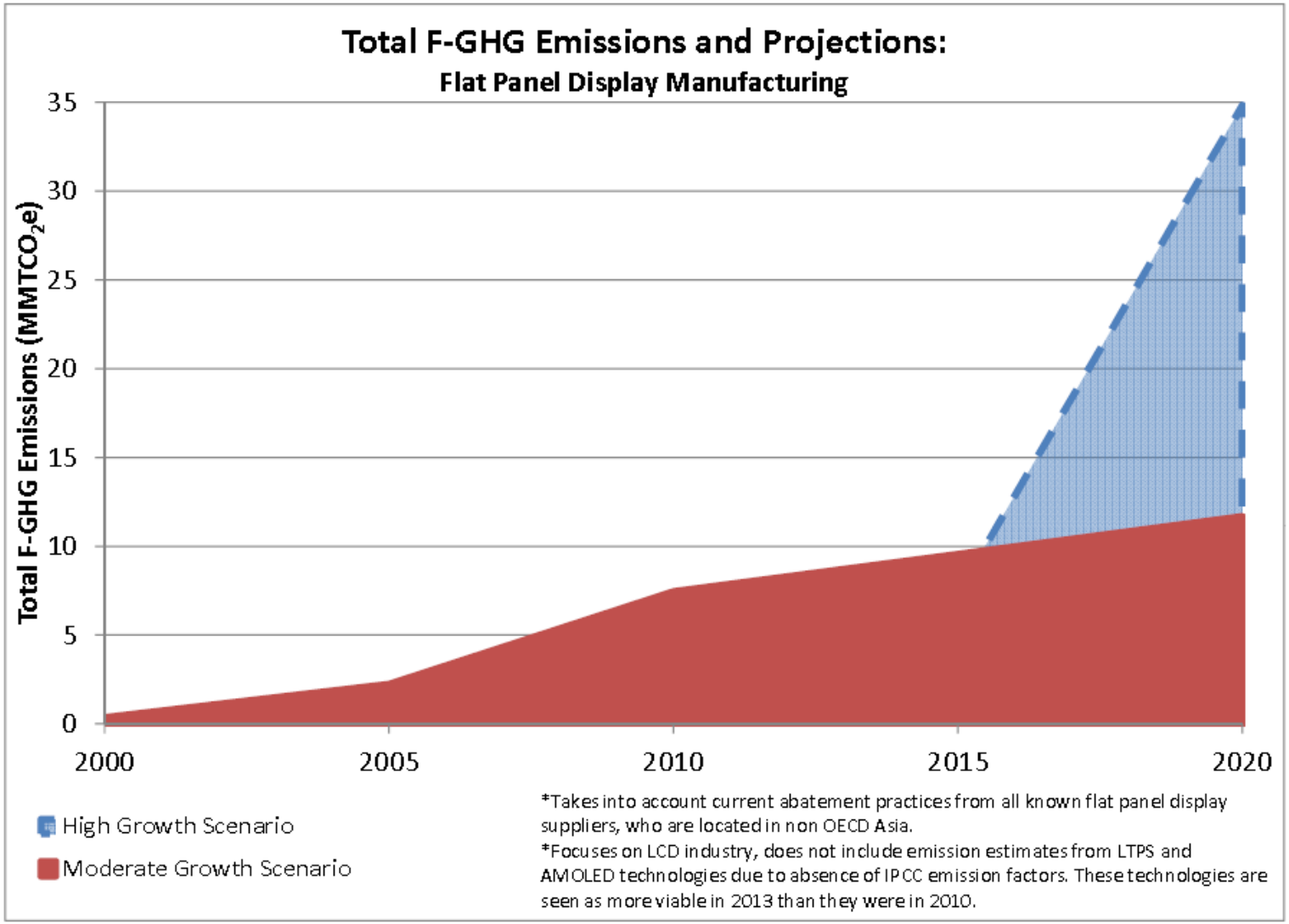
http://www.epa.gov/climatechange/science/indicators/download.html

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Where are F-GHGs Used in Panel Manufacturing?



Why is this a Concern?



In the Near Term:

In 2015, F-GHG emissions are expected to grow by over 2 million metric tons of CO_2 equivalent.

⇩

Emissions from approximately 280,000 homes' annual electricity use

…and if further reductions are not implemented

In 2020, F-GHG emissions are expected to grow by over 7 million metric tons of CO_2 equivalent.

⇩

Emissions from approximately 1,000,000 homes' annual electricity use

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Panel Suppliers

- Approximately 12 major suppliers of large-area LCD panels.
- Large-area LCD panels are often manufactured in newer facilities (called fabs) that have been built over the last decade.
- Large-area LCD glass is used to make larger display products like computer monitors, TVs.
- Demand has increased for tablets, mobile phones. Some fabs, once dedicated to manufacturing large area glass, are now also producing these smaller products.

Panel Suppliers

- Many major suppliers have been reducing F-GHG emissions for over a decade- some across all fabs, some across select fabs.
- Unknown if/how some emerging suppliers with growing market share are reducing F-GHG emissions.
- Industry collectively set F-GHG reduction goal from 2001-2010.
- Opportunity to set and achieve new F-GHG reduction goals.

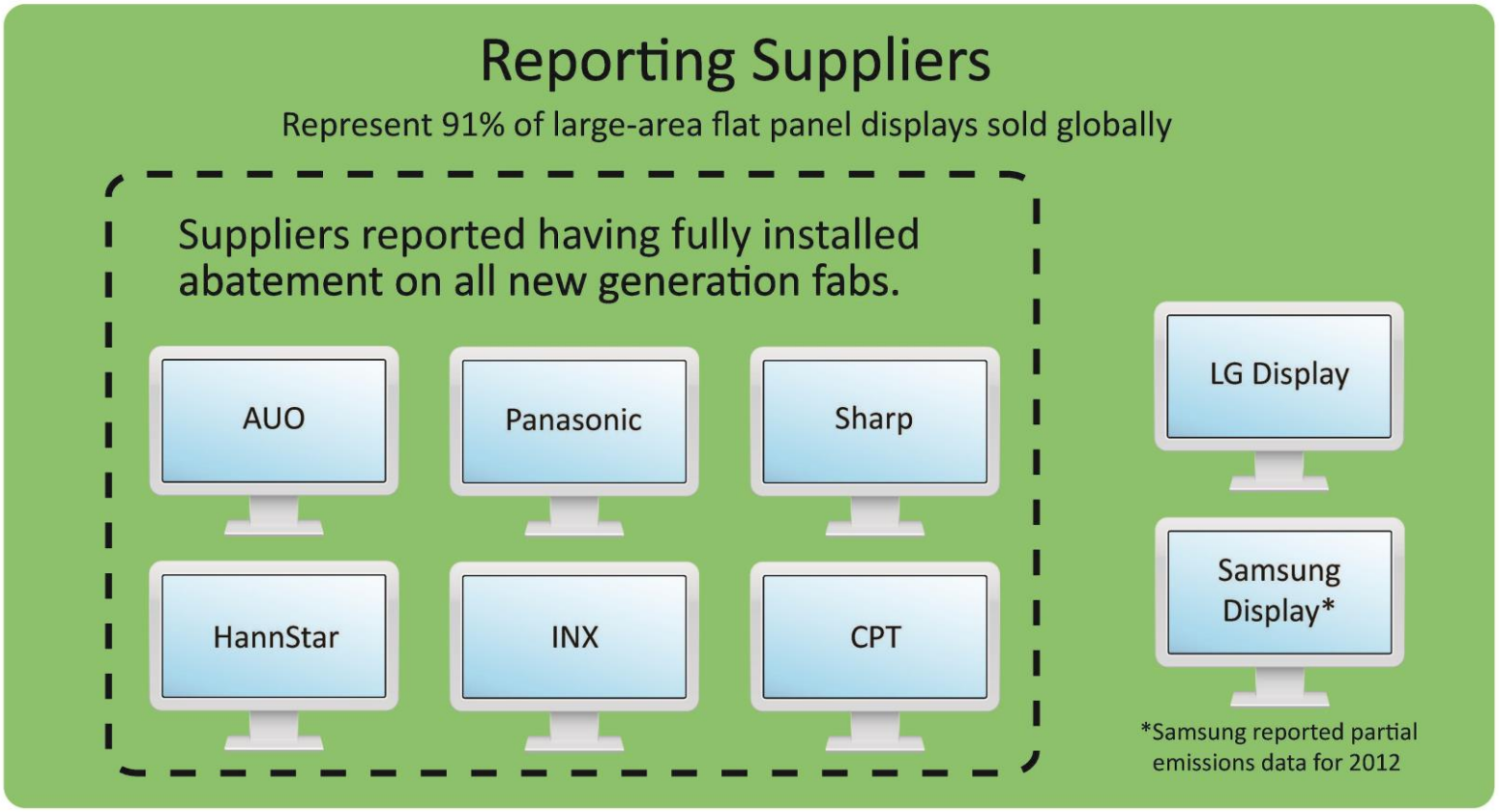
Panel Supplier Reductions

- In 2013, EPA began profiling how large-area flat panel suppliers measure and manage their F-GHG emissions.

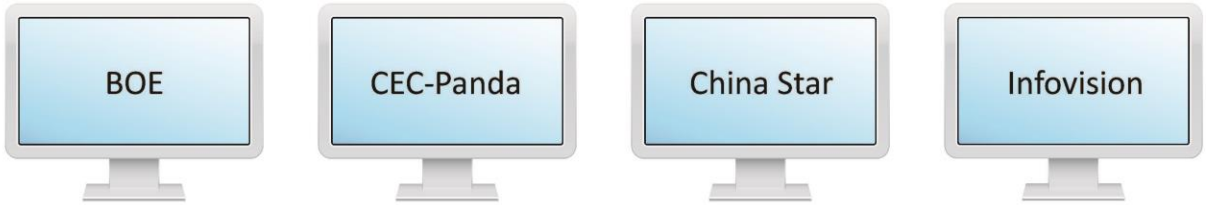
- Supplier Profiles cover:
  - F-GHG reduction goals and current reduction activities
  - Manufacturing processes and types of F-GHGs used
  - Installation of F-GHG abatement technologies
  - Information gathered from Carbon Disclosure Project; highlight other public reporting

F-GHG Emissions Reduction Efforts: Flat Panel Display Supplier Profiles

Information reflects 2012 data



Non-Reporting Suppliers (No available emissions data)



Panel Supplier Profiles

Update for Calendar Year 2012

LG Display

Specific F-GHG emissions reduction efforts and/or goals	LG Display's F-GHG emissions reduction efforts are part of its broader goals to reduce corporate-wide GHG emissions. LG Display has installed F-GHG abatement systems to reduce NF_3 emissions from all of its flat panel display (LCD, OLED) manufacturing fabs, and SF_6 emissions from two of its flat panel display (LCD) manufacturing fabs.

Update for Calendar Year 2012

AU Optronics (AUO)

Specific F-GHG emissions reduction efforts and/or goals	AUO reduced manufacturing emissions, specifically F-GHGs, by 8.06 million metric tons of CO_2e from 2003 to 2012. AUO considers itself a pioneer of F-GHG abatement in Taiwan. Since 2003, AUO voluntarily installed IPCC-recognized F-GHG abatement devices with destruction removal efficiencies (DRE) over 90 percent in dry etching and chemical vapor deposition (CVD) processes for all newly built fabs to reduce emissions from gases such as SF_6 and NF_3. In 2011, AUO planned to begin installing abatement systems for fabs constructed prior to 2003 and estimates that doing so should reduce the PFC emissions by 419,400 tons of CO_2e based on the global warming potentials of gases used during production in 2012. AUO is the only member in WLICC that installed abatement systems in all small to medium-sized LCD fabs ranging from G3.5 to G5.

Update for Fiscal Year 2012-2013

Panasonic Liquid Crystal Display (PLD)

Specific F-GHG emissions reduction efforts and/or goals	Panasonic Liquid Crystal Display (PLD) considers installation of abatement systems to be the most effective and realistic technique to reduce F-GHG emissions. PLD established a 100 percent installation of abatement systems for both SF_6 and NF_3 from the start-up of the Himeji factory in 2010. Currently, because its production lines are integrated in the Himeji factory, PLD has a 100 percent rate of abatement system installation. PLD would like to continue studying and assessing technology trends both inside and outside the company for further improvements in the future.

Public Reporting: CDP

CDP's 2014 Climate Change Information Request

Information & Communications Technology

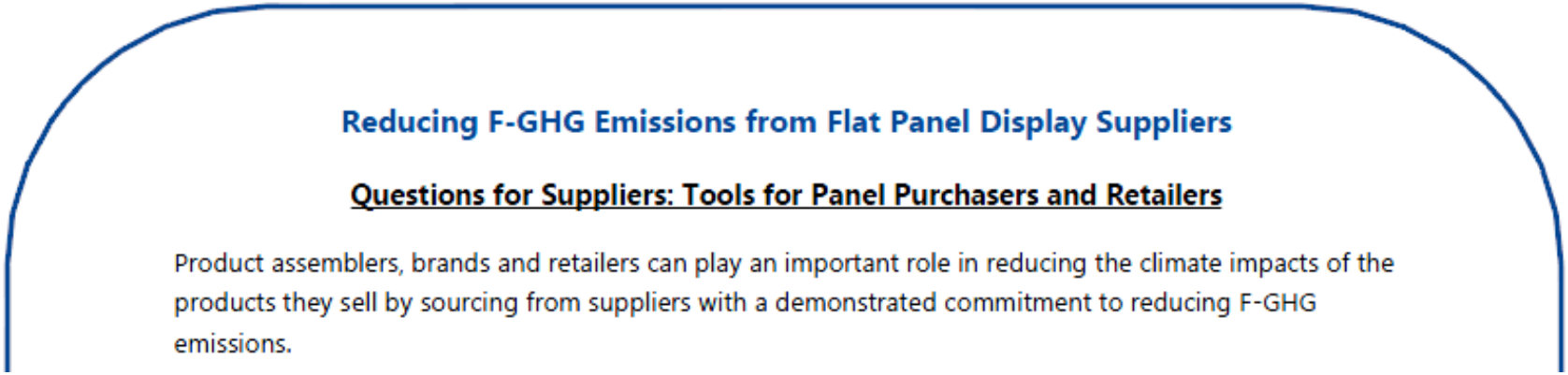
ICT3.2 Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the manufacture or assembly of hardware/components part of your business

Business activity	Scope 1 emissions (metric tonnes CO_2e)	Scope 2 emissions (metric tonnes CO_2e)	Annual electricity consumption (MWh)	Electricity data collection method
Manufacture or assembly of hardware/components				

ICT3.6 Please describe the GHG emissions abatement measures you have employed specifically in your ICT manufacturing operations

Supplier Questionnaire

- EPA developed tool to engage/dialogue with suppliers: http://www.epa.gov/climateleadership/documents/questions_for_suppliers.pdf
- Helps make it easier to ask supplier key questions on F-GHG reductions.
- Can be used by brands, retailers, and institutional purchasers to:
  - Specify products
  - Stock products
  - RFPs/Purchasing criteria



Reducing F-GHG Emissions from Flat Panel Display Suppliers

Questions for Suppliers: Tools for Panel Purchasers and Retailers

Product assemblers, brands and retailers can play an important role in reducing the climate impacts of the products they sell by sourcing from suppliers with a demonstrated commitment to reducing F-GHG emissions.

Driving Reductions

- How to encourage further F-GHG emission reductions?
  - Industry dialogue with suppliers
  - Supplier recognition: Awards from customers or other stakeholder groups
  - Purchasing Criteria (EPEAT)

Driving Reductions

Wal-Mart

Driving Reductions

Lenovo

Driving Reductions

Dell

Driving Reductions

HP

LCD Panel F-GHG Emission Reduction Project

- Project Objective
  - Establish long-term F-GHG emissions reduction goals that are feasible but result in meaningful F-GHG reductions
- Proposal (two-tiered)
  - Participating organizations will work collaboratively with WLICC members to develop F-GHG emission reduction goals, including a common method for measuring compliance
  - Work within the IEEE 1680.1 standard refresh program to implement criteria; the IEEE 1680.1 standard for computers and displays is currently being updated
- Benefits of this Project
  - Reduce a major GHG impact within our shared supply chain giving us the ability to make a significant impact
  - Proactively meet potential market access F-GHG requirements
  - Ability to use LCDs as a pilot for additional supply chain energy and GHG reduction efforts

Takeaways

- Reducing F-GHG emissions:
  - Achievable
  - Identifiable in supply chain
  - Already underway from some suppliers
  - Leadership within electronics sector
  - Partnerships and joint engagement on customer side important to further drive F-GHG emissions reductions

Q&A

Resources

Voluntary EPA programs that address reducing GHG emissions have seen suppliers join after being encouraged to do so by their customers who are also active participants.

- ENERGY STAR: technical information and tools for organizations and consumers to choose energy-efficient solutions and best management practices.
  - Buildings & Plants
  - ENERGY STAR's Portfolio Manager
  - Small Businesses
  - Products
- EPA's Combined Heat and Power Partnership
- EPA's Green Power Partnership

Access the list: epa.gov/climateleadership/supplychain/resources.html

Resources

- LMI's GAIA Sustainable Supply Chain Maturity Model provides companies with a framework to assess the maturity of their own organizations and programs for engaging suppliers on managing their GHG emissions, based on industry research.
- The Carbon Disclosure Project and its CDP Supply Chain Project initiative are programs for voluntary, public reporting of corporate GHG emissions inventories. The flagship CDP focuses on emissions disclosure by large corporations; CDP Supply Chain serves its member companies by collecting emissions inventories from their suppliers.
- World Resources Institute/World Business Council for Sustainable Development Product and Supply Chain Protocol Standards. WRI and WBCSD developed the GHG Corporate Protocol Standard, which is widely used to account for corporate-wide GHG emissions.
- The 2011 Electronics Industry Citizenship Coalition Report: *A Practical Approach to Greening the Electronics Supply Chain: Results from the 2011 EICC Carbon and Water Reporting Initiative.* Insights into how the electronics industry sector is engaging its suppliers on managing their GHG emissions.

Contact Us

Melissa Klein
Communications Director
Center for Corporate Climate Leadership, U.S. EPA
(202) 343-9207
klein.melissa@epa.gov

For more information, visit www.epa.gov/climateleadership

Follow us on Twitter: @EPAClimateCTR

Verena Radulovic (for F-GHG information)
ENERGY STAR for Consumer Electronics, U.S. EPA
(202) 343-9845
radulovic.verena@epa.gov

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency