

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

### Summary

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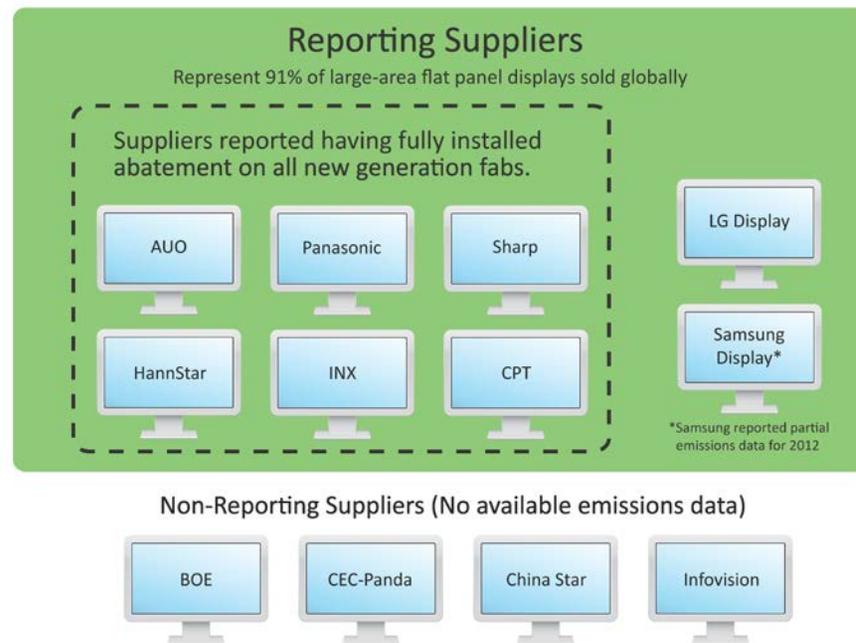
The Supplier Profiles (PDF) detail the efforts of large-area flat panel suppliers to reduce their F-GHG emissions in manufacturing across key areas. They cover current mitigation measures, future reduction goals, and public disclosure efforts. They also highlight whether emissions reduction efforts address all F-GHGs used in all manufacturing processes and the extent to which emissions abatement technologies are installed on newer generation fabs (i.e. those that make today's large-area panels used for products such as TVs and computer monitors). This summary reflects information, which was assembled from public sources and the suppliers themselves, on F-GHG emissions for calendar year or fiscal year 2012, depending on the supplier's reporting cycle. Public sources of information include suppliers' responses to the annual Carbon Disclosure Project Investor Questionnaire and annual sustainability reports. The twelve global suppliers covered produce 99% of all large-area flat panel displays sold globally.

#### **New Development:**

In late 2013, brands and retailers Walmart, Dell, HP, Lenovo and Best Buy took an important step to foster further voluntary F-GHG reductions among their LCD suppliers. These companies submitted to their suppliers a proposal calling for them to 1) develop a standard method for measuring and recording F-GHG emissions for the industry, 2) establish a voluntary long-term F-GHG emissions

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Information reflects 2012 data



reduction goal with public timelines for demonstrating progress, and 3) develop an annual progress report that can be shared with them and/or other supporting organizations.

**Data Assessment and Future Data Needs:**

- An opportunity exists to standardize F-GHG emissions reporting so that each supplier provides the same information. Currently, suppliers report information on their F-GHG emissions and amount of reductions with some variability. For example, it is not clear if all suppliers are including NF<sub>3</sub> in reporting their total PFC emissions and reductions, as some suppliers report NF<sub>3</sub> emissions and reductions separately from their PFC emissions and reductions.
- F-GHG emissions decreases and increases appear to be tied to changes in production levels. Going forward, EPA is interested in understanding the extent to which F-GHG emission reductions result from the use of F-GHG reduction technologies or other reduction measures. More information of this kind would facilitate better highlighting of pro-active measures to reduced F-GHG emissions intensity.
- Some suppliers reported their emissions intensity per square meter of glass produced. Going forward, EPA is interested in learning more about the inputs that determine F-GHG emissions intensity.

**Summary of Supplier Profiles:**

*This summary reflects information as it appears in each supplier's profile. In some cases, suppliers provided reasons for increases or decreases in annual F-GHG emissions from 2011 to 2012. Profiles will be updated as new information becomes available.*

**AU Optronics (AUO):** AUO installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. The company reports having reduced their F-GHG emissions by approximately 8.06 million tons of CO<sub>2</sub>e between 2003 and 2012, up from a 6.94 million ton reduction between 2003 and 2011.

**BOE Technology:** Information on F-GHG reduction efforts in flat panel manufacturing is still unknown, though general information on its broader GHG emissions management efforts is publicly available.

**CEC-Panda:** Information on F-GHG reduction efforts in flat panel manufacturing is still unknown.

**ChinaStar:** Information on F-GHG reduction efforts in flat panel manufacturing is still unknown.

**Chunghwa Picture Tubes (CPT):** CPT installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. CPT has publicly reported that F-GHG emissions accounted for approximately 30 percent of the company's total GHG emissions in 2012, up from 24 percent in 2011. CPT estimates having reduced its F-GHG emissions by approximately 23.8 million tons of CO<sub>2</sub>e between 2002 and 2012, up from a 21.8 million ton reduction between 2002 and 2011. (Note: CPT revised its emissions reduction estimates for the latter period - in its 2011 supplier profiles, CPT had estimated reducing 24 million tons of emissions between 2002 and 2011).

**HannStar:** HannStar installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. HannStar reported specific emissions reductions from only its Tainan fab, rather than across all of its production lines. From 2011 to 2012, HannStar's F-GHG emissions for its Tainan fab decreased by approximately 1,000 tons of CO<sub>2</sub>e, as its production of PFCs also decreased. Hannstar's ratio of PFC emissions to reductions at the Tainan fab was 68 percent in 2011 and 63 percent in 2012. The fab's emissions intensity decreased from 0.073 tons of CO<sub>2</sub>e/m<sup>2</sup> in 2011 to 0.069 tons of CO<sub>2</sub>e/m<sup>2</sup> in 2012.

**Infovision:** Information on F-GHG reduction efforts in flat panel manufacturing is still unknown.

**INX (Innolux):** INX installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. In 2012, INX's F-GHG emissions increased, but its rate of emissions reductions also increased. The company estimates having reduced F-GHG emissions by approximately 2.7 million tons of CO<sub>2</sub>e, up from approximately 2.1 million tons reduced in 2011. This reflects an increase in its annual emissions reductions rate by 28.3 percent. INX's emissions intensity decreased from 0.0094 tons of CO<sub>2</sub>e/m<sup>2</sup> in 2011 to 0.008558 tons of CO<sub>2</sub>e/m<sup>2</sup> in 2012. From 2011 to 2012, SF<sub>6</sub> emissions increased by approximately 74,000 tons of CO<sub>2</sub>e, PFC emissions increased by approximately 8,500 tons of CO<sub>2</sub>e, and HFC emissions increased by approximately 2,900 tons of CO<sub>2</sub>e. INX's cites an increase in F-GHG emissions mainly due to increased capacity in production.

**LG Display:** LG Display has installed F-GHG abatement systems on all lines of chemical vapor deposition (CVD) tools and on three lines of etch tools in its newer generation fabs. Its reduction efforts target SF<sub>6</sub>, PFCs, and NF<sub>3</sub> (LG Display does not use HFCs). Overall LG Display estimates that it reduced F-GHG emissions by approximately 8.3 million tons of CO<sub>2</sub>e in 2012, up from approximately 7 million tons reduced in 2011.

**Panasonic:** Panasonic installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. From 2011 to 2012, SF<sub>6</sub> emissions increased by approximately 290 tons of CO<sub>2</sub>e and NF<sub>3</sub> emissions increased by approximately 76 tons of CO<sub>2</sub>e.

**Samsung Display:** Samsung Display has installed F-GHG abatement systems on all lines of CVD tools and on some lines of etch tools in its newer generation fabs. Its reduction efforts target SF<sub>6</sub>, PFCs, HFCs and, in some manufacturing lines, NF<sub>3</sub>. Thus far, Samsung Display has reduced over 1 million tons of CO<sub>2</sub>e. In 2012, Samsung Electronics' absolute GHG emissions were significantly reduced due to a structural reorganization where Samsung Display separated from Samsung Electronics. Samsung Display's total F-GHG emissions for all of 2012 are not publicly available.

**Sharp:** Sharp installs abatement systems on all newer generation fabs, targeting SF<sub>6</sub>, PFCs, HFCs and NF<sub>3</sub> in all etch and clean processes. From 2011 to 2012, SF<sub>6</sub> emissions decreased by approximately 21,000 metric tons of CO<sub>2</sub>e, PFC emissions decreased by approximately 29,000 metric tons of CO<sub>2</sub>e, and HFC emissions decreased by approximately 1,500 tons of CO<sub>2</sub>e. Sharp's emissions were reduced due to a decrease in panel production and the removal of one fab.