

# Electronics Manufacturing

## Subpart I, Greenhouse Gas Reporting Program

### *What Must Be Monitored for Manufacturers of Electronics Devices?*

#### Measure or estimate these parameters annually

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| <ul style="list-style-type: none"> <li><input type="checkbox"/> Annual manufacturing capacity of each fab (m<sup>2</sup>).</li> </ul>   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Inventory of each fluorinated GHG and N<sub>2</sub>O stored in containers at the end of the reporting year.</li> </ul>  |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Annual production in terms of substrate surface area (m<sup>2</sup>) for each fab, including specification of the substrate.</li> </ul>   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Acquisitions of each fluorinated GHG and N<sub>2</sub>O through purchase records or other transactions (kg).</li> </ul>   |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Amount of each fluorinated GHG consumed in process sub-types, and process types; and the amount of N<sub>2</sub>O consumed in CVD and other N<sub>2</sub>O-using processes (kg).</li> </ul>   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Disbursements of each fluorinated GHG and N<sub>2</sub>O.</li> </ul>  |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Annual fab-level emissions of each fluorinated GHG, including each input gas and each by-product gas, used for the plasma etching/wafer cleaning process type and each of the process sub-types associated with the chamber cleaning process type, including in-situ plasma chamber clean, remote plasma chamber clean, and in-situ thermal chamber clean (metric tons).</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Disbursements under exceptional circumstances of gases through sales or other transactions.</li> </ul>  |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Annual emissions of N<sub>2</sub>O for each N<sub>2</sub>O-using process type, on a fab basis (metric tons).</li> </ul>   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Number of containers of gas returned by the facility to gas distributors.</li> </ul>  |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Inventory of each fluorinated GHG and N<sub>2</sub>O stored in containers at the beginning of the reporting year.</li> </ul>  | <ul style="list-style-type: none"> <li><input type="checkbox"/> Full capacities of gas containers used.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Fab-wide heel factors for each gas and container type used.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Process sub-type-specific, and process type-specific fluorinated GHG apportioning factors; and CVD-specific and other N<sub>2</sub>O-using process-specific N<sub>2</sub>O apportioning factors.</li> </ul> |

**If you elect to use the stack test method:**

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| <input type="checkbox"/> For each stack system in the fab for which testing is required, measure the emissions of each fluorinated GHG from the stack system by conducting an emission test. In addition, measure the fab-specific consumption of each fluorinated GHG by the tools that are vented to the stack systems tested. | <input type="checkbox"/> Develop fab-specific emission factors for each fluorinated GHG input gas consumed and each fluorinated GHG formed as a by-product; and calculate fab-level fluorinated GHG emissions. |
|  | <input type="checkbox"/> Total annual emissions of fluorinated GHGs from all of the combined stack systems that are not tested in the fab.   |

**If you use fluorinated heat transfer fluids (HTFs):**

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| <input type="checkbox"/> Annual emissions of fluorinated HTFs on a fab basis using the mass balance approach, as applicable.            | <input type="checkbox"/> Acquisitions of each fluorinated HTF, including the amounts purchased from chemical suppliers, equipment suppliers with or inside equipment, and returned to the facility after off-site recycling. |
| <input type="checkbox"/> The density of each fluorinated HTF used at the facility.  | <input type="checkbox"/> Total nameplate capacity of equipment that uses a fluorinated HTF and is newly installed during the reporting year.   |
| <input type="checkbox"/> Inventory of each fluorinated HTF in containers, other than equipment, at the beginning of the reporting year. | <input type="checkbox"/> Total nameplate capacity of equipment that uses a fluorinated HTF and is removed from service during the reporting year.  |
| <input type="checkbox"/> Inventory of each fluorinated HTF in containers, other than equipment, at the end of the reporting year.       | <input type="checkbox"/> Disbursements of each fluorinated HTF, including amounts returned to chemical suppliers, sold with or inside of equipment, and sent off-site for verifiable recycling or destruction.               |

**If controlled emissions from the use of abatement systems are reported:**

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| <input type="checkbox"/> Fraction of each fluorinated GHG used in process sub-types, or process types with abatements systems; and the fraction of N <sub>2</sub> O used in CVD or other N <sub>2</sub> O-using processes.  | <input type="checkbox"/> The total time, in minutes, that abatement system p, connected to process tool(s) in the fab using input gas in process sub-type or process type j, is not in operational mode. |
| <input type="checkbox"/> Fraction of each fluorinated GHG destroyed or removed in abatement systems for process sub-types, or process types; Fraction of N <sub>2</sub> O used in each N <sub>2</sub> O-using process with abatement systems; and the fraction of N <sub>2</sub> O destroyed or removed in abatement systems for CVD or other N <sub>2</sub> O-using processes. | <input type="checkbox"/> Properly measured and class average DREs, when the EPA default DRE factor is not used.  |
| <input type="checkbox"/> Amount of each fluorinated GHG consumed for process sub-type, and process type fed into each abatement device used at the facility; the amount of N <sub>2</sub> O consumed for CVD and other N <sub>2</sub> O-using processes fed into each abatement system used at the facility.  | <input type="checkbox"/> Uptime of each abatement system used at the facility connected to process tools in the fab.   |
|   | <input type="checkbox"/> The total time each abatement system is in operational mode and fluorinated GHGs or N <sub>2</sub> O are flowing through the connected process tools.                           |
|   | <input type="checkbox"/> The total time fluorinated GHGs or N <sub>2</sub> O are flowing through process tools connected to each abatement system.   |

*For more information, see the information sheet for Electronics Manufacturing at: <https://www.epa.gov/ghgreporting/subpart-i-information-sheet>.*

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