Estimating Fluorinated Gas from Industrial Processes and Product Used (IPPU) Sector

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Categories with F gases

Chemical Industry	
Others	Magnesium Production
Electronic Industry	
Product uses as substitutes to Ozone Depleting Substances	
Other Product manufacture and use	Electrical equipment SF6 and PFCS from other Product uses

Malaysia's Estimates

Category	HFCs	PFCs	SF
2C.Metal Production			
2C3: Aluminium Production		X	
2E Electronics Industry			
2E1Semiconductor	X	X	X
2E3: Photovoltaics	X	X	X
2F Product Uses as Substitutes for Ozone Depleting Substances			
2F1: Refrigeration and Air Conditioning			
2F1b: Mobile Air Conditioning			
2G Other Product Manufacture and Use			
2G1: Electrical Equipment			

Methodology

- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- 2. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories

Aluminium Production

- **Method**: Tier 1
- Technology used:
- **Activity Data**
  - Department of Mineral & Geoscience
    - Production figures
- **Emission Factor**: default based on type of technology used (Prebake)
  - For CF4 :0.4 kg CF4 /tonne Al
    For C2F6 :0.04 kg C2F6 /tonne Al.
- Alumina feeding into the electrolyte is computer controlled. This allows for constant alumina concentration and avoids excessive fluorocarbon emissions.

Electronic Industry

- Emissions are from silicon process production
- Semiconductor production
- PV production
- 5 semiconductor fabrication plants in Malaysia with a combined capacity of around 2.7 million wafers

F Gases

	Semiconductor Production	PV Production
CF_4	✔	✔
C_2F_6	✔	✔
CHF_3	✔	
C_3F_8	✔	
SF_6	✔	
NF_3	✔	

Semiconductor Production

Source	
Fraction of annual plant production capacity utilisation, fraction (default)	O.8 **Gm^2/year)**
Annual manufacturing design capacity	based on annual production

Photovoltaic (PV) Manufacturing

Source	
Fraction of annual plant production capacity utilisation, fraction	0.86
Fraction of PV manufacture that uses FCs, fraction	0.5
Annual manufacturing design capacity, Mm2 of substrate(glass) processed	Based on annual manufacture

Emissions of Fluorinated Substitutes for Ozone Depleting Substances

- Mobile air conditioning systems primary on road transport
- All new vehicles with air-conditioning fitted are CFC-free by 2001
- As the average life expectancy of vehicles is about 15 years, it is expected that by 2018 most vehicles, including truck and buses, that were equipped originally with CFC MACs will be retired
- HFC-134a will be replaced with HFO-1234yf by 2014

Source of emissions

- All new non-commercial vehicles assembled are HFC-134a fitted at factory,
- **Emission during charging (assembly)**
  - Losses during system assembly e.g. losses from using HFC as tracer gas for checking leak tightness, losses in relation to system development and testing etc.
- **Emission during use (operation)**
  - Emissions from stock of existing systems (small leakage, breakdowns, venting at service)
- **Emission released from scrapped systems (disposal)**
  - Venting of refrigerant at system disposal
- Average amount of refrigerant charges is based on the on the vehicle type and their assembled.

Activity data

- Tier 2 method (bottom-up approach)
- Emission rate during charging, k
- Amount of HFC accumulated
- Annual leakage rate, x
- Amount of HFC initially charged into new systems installed in year (t-n) ;where n is described as the average equipment lifetime in years
- Data source: MAA, Road Transport Department and local manufacturers

Other Product Manufacture and Use

- SF_6 is now the best insulator and has replaced flammable oil in many types of electrical equipment
- Revised 1996 IPCC guideline due to data limitation
- Activity data is amount of SF_6 supplied from gas suppliers
- **1% of the total charge of SF6 contained in the existing stock of equipment in year t**

QC

- Data gathering, inputs and handling checks
- Data documentation
- Calculation checks

QA

- Expert from GiZ

Improvement plan

- Tier 2 data and emission factors
  - Aluminum production
  - Electronic

- Thank you