







# Rio +20 declaration on the future we want – HFC phase down

We recognize that the phase-out of ozone-depleting substances is resulting in a rapid increase in the use and release of high global-warming potential **hydrofluorocarbons** to the environment. We support a gradual phase-down in the consumption and production of hydrofluorocarbons. (Para 222 final declaration)





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# Global issues sustainable refrigeration?



#### **Environmental aspects**

- Climate Change: Direct Emissions (10% (Developed) up to 70% (Developing), Indirect Emissions (30% to 90%)
- **Demand of non-renewable primary energy:** depends on energy production pattern (tCO2eq./kWh: Brazil: 0,4; EU: 0,34; China 1,1; US 0,54) and energy consumption during manufacturing, use, End of Life
- **Depletion of material resources**; Around 60 % of fluorspar is used for the production of fluorocarbons. Flourspar ranks No.10 on the EU list of the 14 most critical raw material supplies with high economic impact.
- Terrestrial ecotoxicity: Waste management, e.g. long term effects of local concentration of persistent wastes (TFA)



#### Social aspects

• **Equity issue:** right of access to electricity, application of refrigeration and comfort cooling. Approx. 2 billion people without access to reliable electricity supply

#### **Economic aspects**

- Financial issue: Growing imports deplete available foreign exchange
- Technology: Question of availability and supply, Safety, IPR disputes,
- Knowldege: Capacities to produce and manage use of alternatives





#### **Growth issues?**

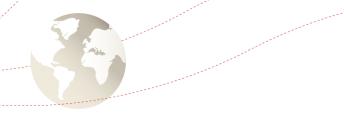


#### **HFC** – predominant future applications

- North -> Heating needs (Heat pumps)
- South -> Cooling needs (Air conditioning, commercial)

#### HFC – growth issue:

- 2050 > Developing countries become major consumer with a future share of over 70%
- A/C Consumption will increase by factor > 10 (IEA, 2010)
- Estimates of future HFC emissions range between 8 and 19% of the carbon emissions (Velders; Schwarz)
- To comply with 2° target GWP of refrigerants need to be <</li>
   20 (UBA, 2011)
- Sunk growth: global electrification & HP replacing heating in the North





### **Barriers and Policies?**



#### Main Barriers controlling emissions

- Exiting technology base
- Behaviour/Skills
- Applied framework

#### **Direct Emission control**

- Replace HCFC/HFC technology stock & production
- Leak control measures, skills to service alternatives
- Use bans, tax incentives, others

#### Indirect Emission control

- Energy supply and systems integration
- Consumer awareness
- Implementation of incentives for energy and 11.10.2012 operational controls



# **Energy Efficiency – rebound effects and other uncertainties in appliance policies**

- Mexican Households who replace their refrigerators with energyefficient models decrease their energy consumption considerably less
  than was predicted by the Worldbank: -132kWh vs -481kWh
  Even larger decreases were predicted for air-conditioners, who ended
  up increasing their electricity consumption: -1250kWh vs. +80 kWh \*
- In Japan, a survey on actual energy consumption of top runner refrigerators of Jyukankyo Institute (2006) monitored over 100 refrigerators and found that the ave. annual electricity consumption was 65 % larger than the Japan Industrial Standards rating of the units.
- Addressing energy efficiency by choice of refrigerant is not a practical global policy, requires different frame.

<sup>\*</sup> The economics of Household Energy Efficiency, Davis et al 2012





## Roadmap to sustainability?

### Roadmap to sustainability



- HFC controls immediately needed to meet 2° target, controls to go hand in hand with building skills and capacities, specifically in developing countries
- Qualitative vs. Quantitative analysis needed for policy design, behavioural aspects need to be reflected, especially when addressing emerging markets
- Human (engineering, skills) and renewable vs. depletable resources
- Need to replace fossil based energy production by renewable, effectiveness (decoupling) before efficiency, products and equipment need to facilitate transition to renewables
- Natural refrigerants offer the most precautionary environmental approach for a long term perspective

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## Thank you!



#### On behalf of



of the Federal Republic of Germany