



3rd international GIZ Proklima Expert's Day

Cooling – growth – climate change

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Jürgen Usinger

Juergen.usinger@proklima.net
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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)



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. Fluorspar 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,
- **Knowledge:** 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 < 20 (UBA, 2011)
- Sunk growth: global electrification & HP replacing heating in the North



Barriers and Policies?



Main Barriers controlling emissions

- Existing 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 operational controls



Energy Efficiency – rebound effects and other uncertainties in appliance policies

- Mexican Households who replace their refrigerators with energy-efficient 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.

* 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



Thank you!

BMZ



On behalf of
Federal Ministry
for Economic Cooperation
and Development

On behalf of



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany