



## General overview: Foams

Foam is much more than only direct emission abatement



GIZ Proklima  
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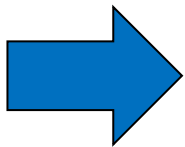


## Background

At the XIX meeting of the parties the decision was taken:

“To encourage Parties to promote the selection of alternatives to HCFCs that minimize environmental impacts, as well as meeting other health, safety and economic considerations” (Decision XIX/6)

Furthermore, to give priority to HCFC with higher ozone depleting potential (ODP).

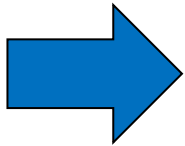


This has led to that nearly all the HPMP's project documents have prioritized the phase out of HCFC-141b in foams. A cost effective and high return in phase out of ODP.



## Foams: Status HCFC and HFC free

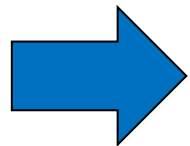
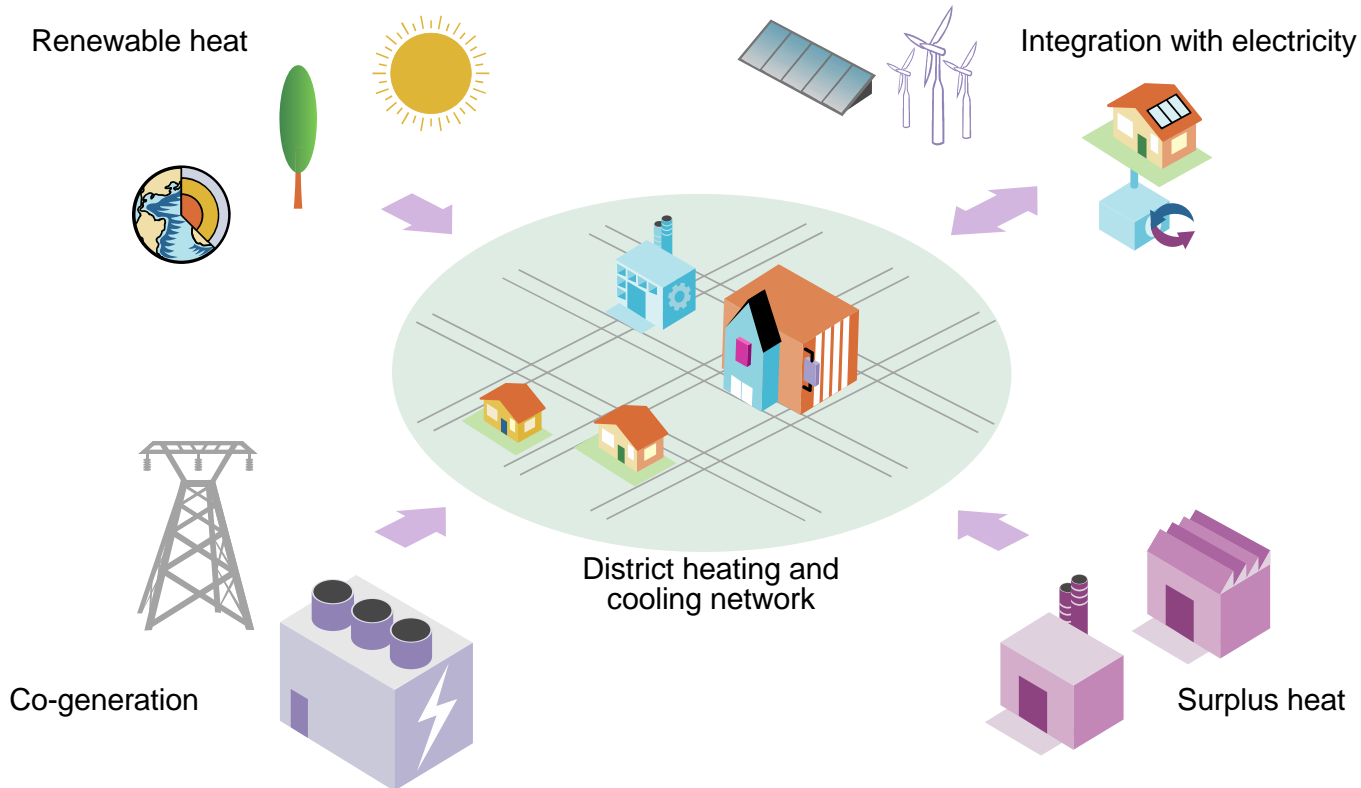
- Flexible foams: already converted, slabstock, discontinuous, moulded
- Integral foams: obvious conversion to water blown
- Remains the largest sector: Insulation or rigid foams:
  - Commercial and domestic refrigeration
  - Rigid foams for insulation, sandwich panels metal or flexible facing and XPS



Pentanes or waterblown are obvious alternatives following the tendency to low global warming potential (GWP) developments in developed (Art.2) countries



# Energy networks pressure an opportunity for foams

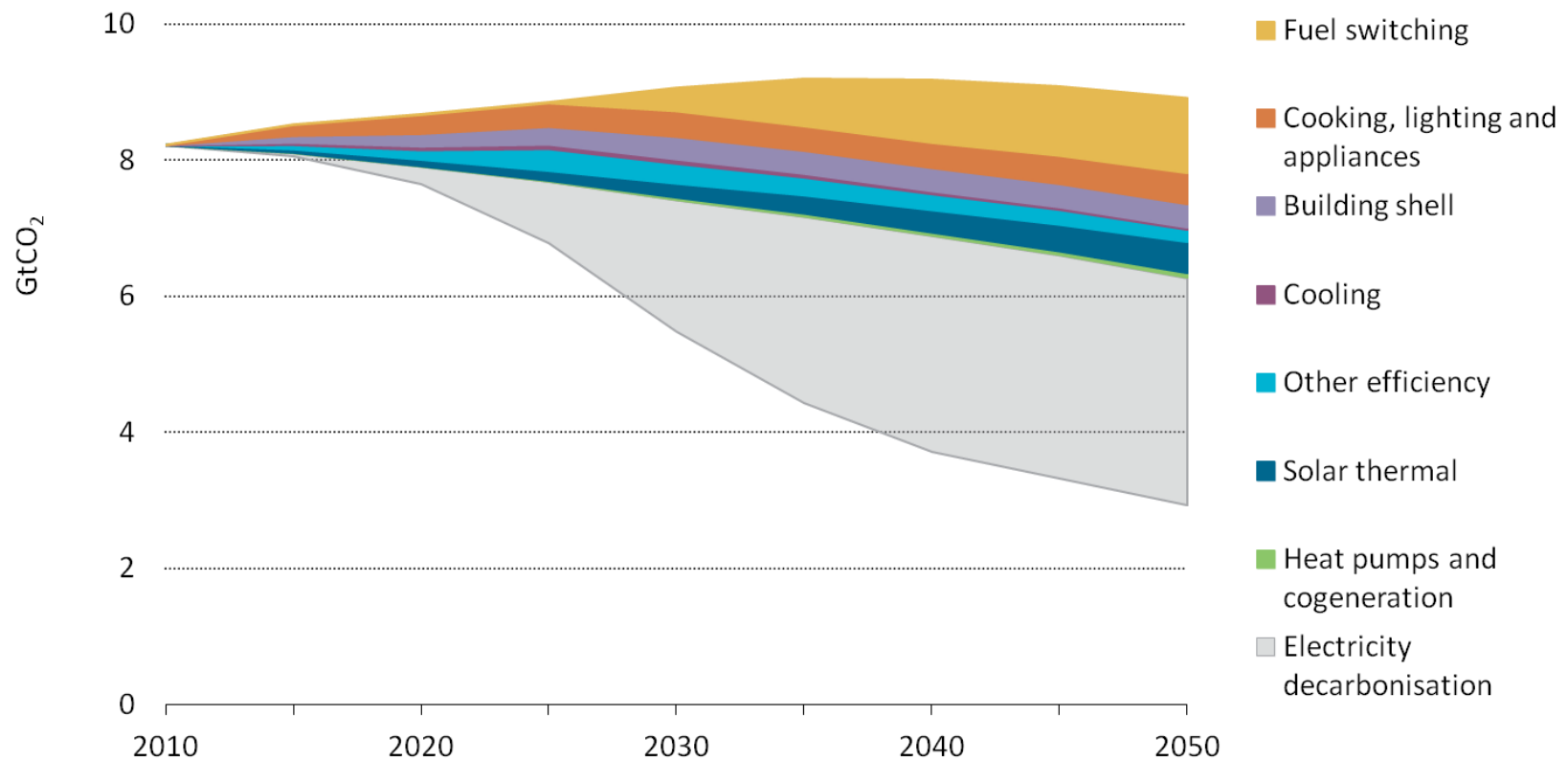


Heating and cooling account for 46% of global energy use.  
Their huge potential for cutting CO<sub>2</sub> emissions is often neglected.

International energy agency ETP 2012



## Improvements in the building shell and energy savings in electrical end-uses dominate total CO<sub>2</sub> reductions.

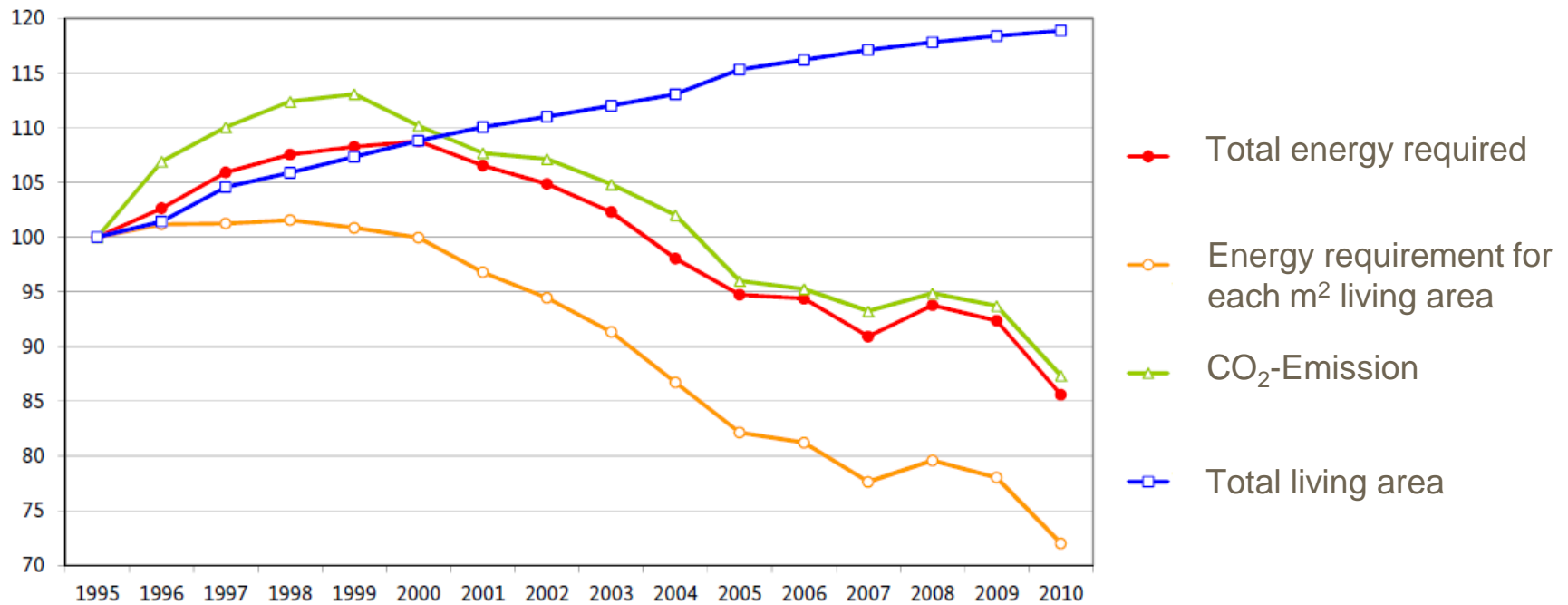


International energy agency ETP 2012



## Foams as insulation contribute to energy saving

Index 1995=100



Quelle: Statistisches Bundesamt: Tabellen zu den Umweltökonomischen Gesamtrechnungen - Teil 2: Vorbericht Energie; Berechnungen des BMVBS.

## Building energy demand development

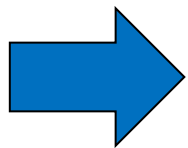


## Foam as insulation

40% energy is needed for heating and cooling in buildings of which 65% is private living area in Germany (2010).

Through adequate measures and legislation for energy efficiency improvement, mainly insulation\*, the energy consumption in 2010 was reduced by 28% with respect to 10 years before.

“Insulation is excellent to avoid energy shortage as well as reducing cooling needs”



Reduced cooling needs – Reduced refrigerant!

\*: as insulation materials not only foams have been used



## Foams and the relation to refrigerants

Energy demand  
decreases  
effectively with  
foam insulation

Lower energy  
demand results  
in downsizing  
cooling  
equipment

This favours the  
new natural  
refrigerants  
which are  
flammable

And opens the  
use to smaller  
living spaces for  
compliance with  
the EN 378





## Some facts why PU is a good insulation material

Building industry uses reference values for  $\lambda$  (Thermal conductivity), U- or R-values.

When buying insulation material the properties are provided with a certification. If not, max. values have to be taken.

These values are conservative and obtainable without particular effort for the foam industry.

|  | $\lambda$<br>(mW/m.K) | $\lambda$<br>(mW/m.K) |
|--|-----------------------|-----------------------|
|  | Verified              | Non Verified          |
| <b>XPS</b>   |                       |                       |
| cell content heatconductive relevant                   | 28-36                 | 43                    |
| cell content air                                       | 34-38                 | 46                    |
| <b>Polyurethane (PUR and PIR) cell content Pentane</b> |                       |                       |
| cell content Pentan                                    |                       |                       |
| diffusion closed                                       | 22-27                 | 32                    |
| diffusion open   | 26-33                 | 37                    |
| <b>Wall material (bare)</b>                            |                       |                       |
| Sand lime brick  |                       | 800                   |
| Cement brick   |                       | 1000                  |
| energy efficient brick                                 |                       | 440                   |

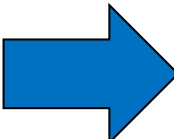
Swiss Ministry of Energy standard SIA D0170



## PU as insulation

Base building materials (bricks) have insulation properties which are considerably worse. Therefore a straightforward calculation\* of the energy required to maintain the temperature inside a 5x5x2,5m independent room already provides an impression of the potential.

| Temperature difference<br>°C | Power required (KW) to maintain temperature difference<br>w.o floor |         |          |                     | Energy saving (KW) |      |
|------------------------------|---|---------|----------|---------------------|--------------------|------|
|                              | Brick wall  | PU Wall | Brick+PU | Only roof insulated | Max.               | Min. |
| 10                           | 2.2   | 0.33    | 0.29     | 1.6                 | 1.9                | 0.6  |
| 15                           | 3.3   | 0.50    | 0.43     | 2.3                 | 2.9                | 1.0  |
| 20                           | 4.4   | 0.66    | 0.57     | 3.1                 | 3.8                | 1.3  |
| 30                           | 6.6   | 0.99    | 0.86     | 4.7                 | 5.7                | 1.9  |
| 40                           | 8.8   | 1.32    | 1.15     | 6.2                 | 7.7                | 2.6  |



With proper insulation, hefty downsizing of air conditioner or heating system is possible!

\*: energy efficient brick 15 cm, PU 5 cm, steady state



## End of life: wrong blowing agent → high costs for the community in the future

By law in Europe and starting in the US, refrigerators are collected and recycled by specialized companies in order to eliminate emissions of CFCs, HCFCs and high-GWP HFCs.

Refrigerant extraction is easy (vacuum pump and storage). For the foam blowing agent this requires plants of ca. 5 million Euro besides a levy on manufacturers and consumers\*.

For foams used in construction, incineration or recycling is applied.

Recycling however cannot be applied when foams contain HCFCs and high-GWP HFCs (too costly due to emissions).

\*: GIZ Proklima, introduction of a comprehensive refrigerator recycling program in Brazil

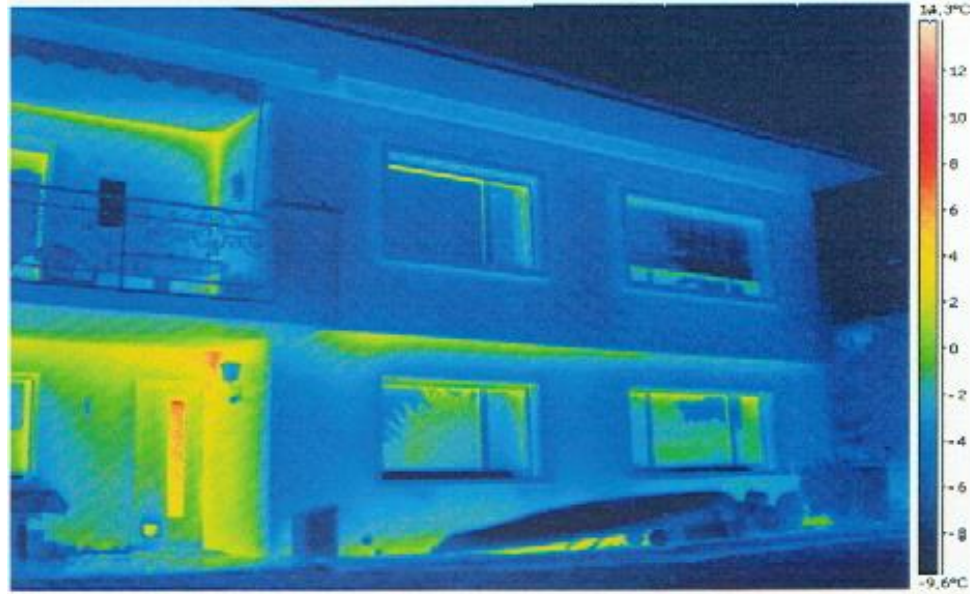


## Summary – Insulation foams more than only ODP reduction

- Insulation is the most effective energy consumption reduction measure
- Energy consumption in private housing has to be considered.
- Conversion of foams to non-HCFCs has a positive effect on:
  - Indirect emissions: Energy demand
  - Cooling and heating needs
  - Direct emissions of ODS and high-GWP substances



Thank you  
for your  
attention



Blue is cool

Thermographic Image, -5°C outside temperature

On behalf of



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety

of the Federal Republic of Germany