




UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Bosnia and Herzegovina

**Ministry of Foreign Trade and Economic Relations
Sarajevo, Bosnia and Herzegovina, 09-10 jul. 2019**

**WORKSHOP ON KIGALI AMENDMENT,
ALTERNATIVE TECHNOLOGIES, ENERGY EFFICIENCY
IN COOLING SECTOR AND SAFETY STANDARDS**

**Experiences in EU F gas implementation
and overview of best practices**

- 
- **Regulation EN 517/2014**
 - **(Leak detection, Training, Reporting)**
 - **Phase down**
 - **Price**

 - **CUSTOMERS!!!!!!**

Experiences in EU F gas implementation and overview of best practices

CURRENT USE OF FLUORINATED GREENHOUSE GASES

Situation in Europe (European Environment Agency (2018): Fluorinated greenhouse gases 2018. EEA Report No 21/2018)

Situation in Germany (Dr. Thalheim @ eurammon Schaffhausen)

SCENARIO FOR THE GERMAN MARKET TILL 2030

(Dr. Thalheim @ eurammon Schaffhausen, Unpublished study UBA and Ökorecherche 2019)

Introduction to the research project

Modeling of HFC quantities

Commercial refrigeration

Stationary air-conditioning

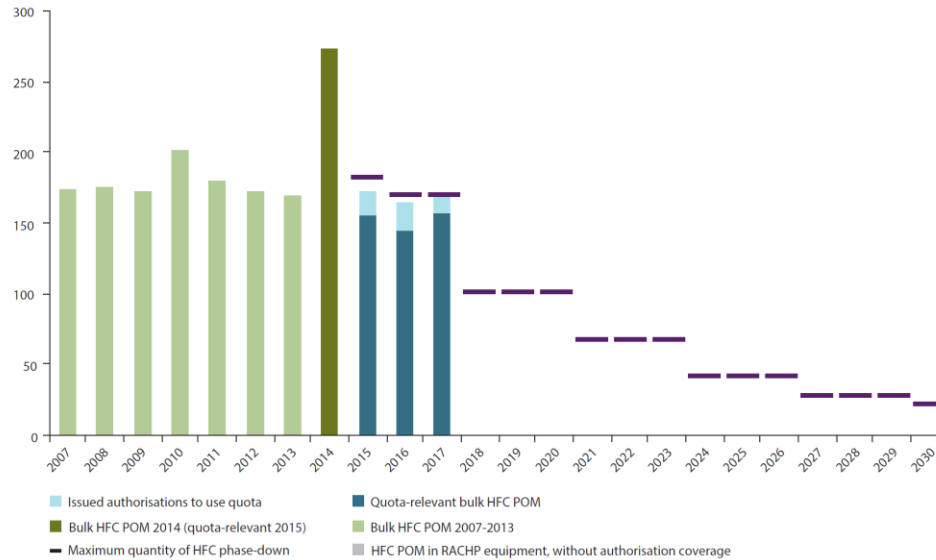
Market penetration rates of natural refrigerants projected for 2030

SUMMARY AND CONCLUSIONS

EU F gas implementation and overview

Figure ES.1 Progress of the EU HFC phase-down

Placing on the market of HFCs (MtCO₂e)

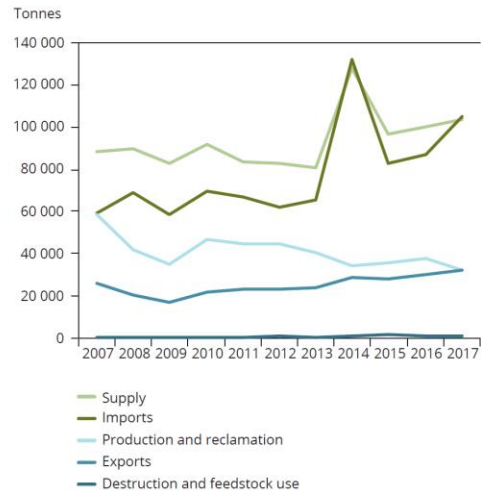


Notes: Mt, million tonnes.
 POM, placing on the market. Values from 2007 to 2013 are based on the reporting obligations of the old F-Gas Regulation ((EC) No 842/2006), and are therefore not fully comparable with data from 2014 onwards (based on the obligations of the new F-Gas Regulation ((EU) No 517/2014)). Similarly, the maximum quantities of the EU HFC phase-down may be recalculated for 2019 and are for indicative purposes only.

Sources: EC, 2011, 2014 and 2018; EEA, 2017 and 2018b.

EU F gas implementation and overview

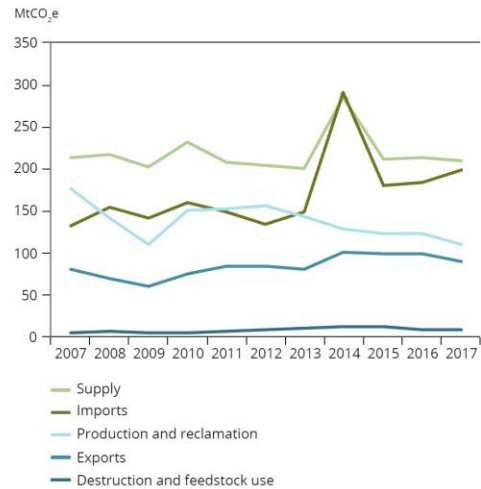
Figure ES.3 Supply, production, import, export and destruction of fluorinated gases in the EU



Notes: Annex II F-gases (unsaturated HFCs and HCFCs, hydrofluoroethers (HFEs) and alcohols, and 'other' perfluorinated compounds) and HFCs, PFCs and SF₆ in products and equipment were not subject to reporting for the period 2007-2013. Data presented for import and supply between 2007 and 2013 are thus limited to bulk import and bulk supply. Export is limited to bulk export for the whole time series.

Sources: EC, 2011 and 2014; EEA, 2017 and 2018b.

Figure ES.4 Supply, production, import, export and destruction of fluorinated gases in the EU

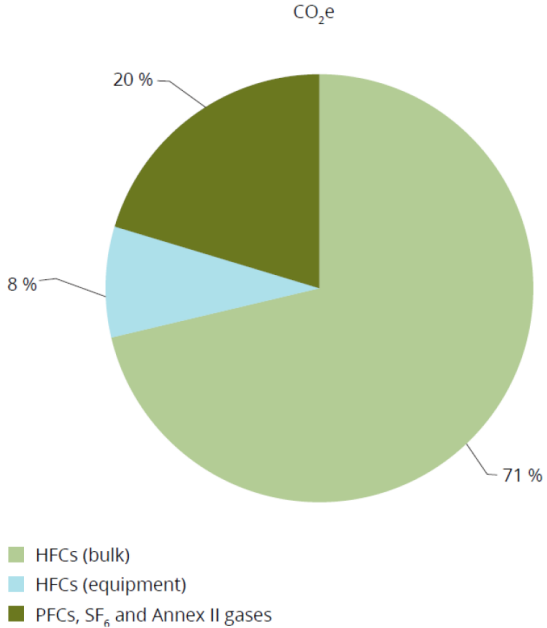


Notes: Annex II F-gases (unsaturated HFCs and HCFCs, HFEs and alcohols, and 'other' perfluorinated compounds) and HFCs, PFCs and SF₆ in products and equipment were not subject to reporting for the period 2007-2013. Data presented for import and supply between 2007 and 2013 are thus limited to bulk import and bulk supply. Export is limited to bulk export for the whole time series.

Sources: EC, 2011 and 2014; EEA, 2017 and 2018b.

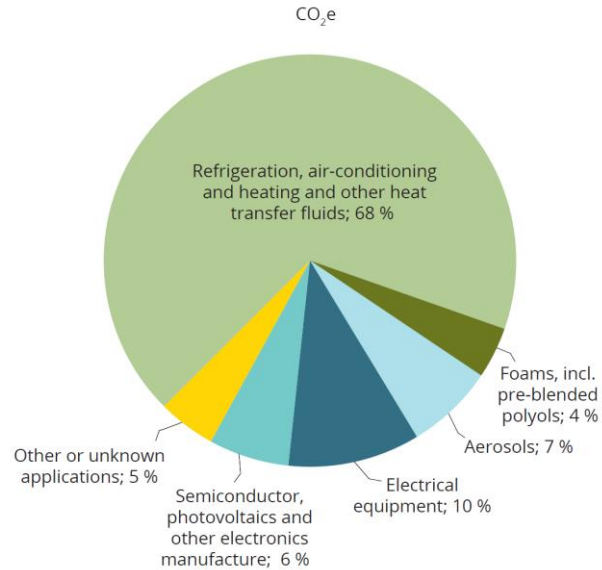
EU F gas implementation and overview

2017 EU total supply by types and groups of fluorinated gases (% CO₂e)



EU F gas implementation and overview

Figure 4.8 2017 EU supply by intended applications (% CO₂e)

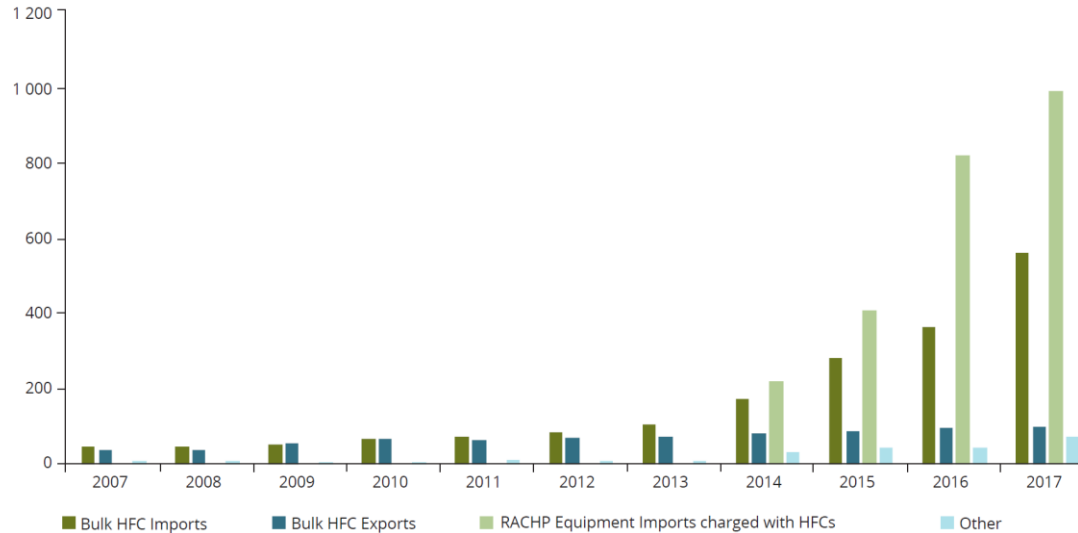


Source: EEA, 2018b.

EU F gas implementation and overview

Figure 2.2 Reported activities, 2007-2017

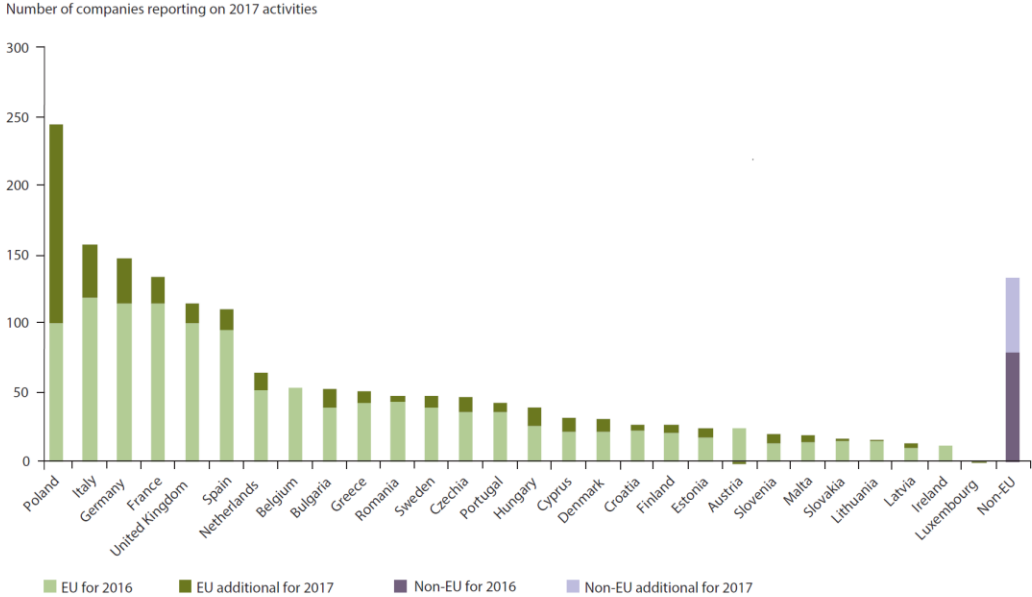
Number of reporting companies



Sources: EC, 2011 and 2014; EEA, 2017 and 2018b.

EU F gas implementation and overview

Figure 2.1 Reporting companies and new registrations in 2018 by Member State

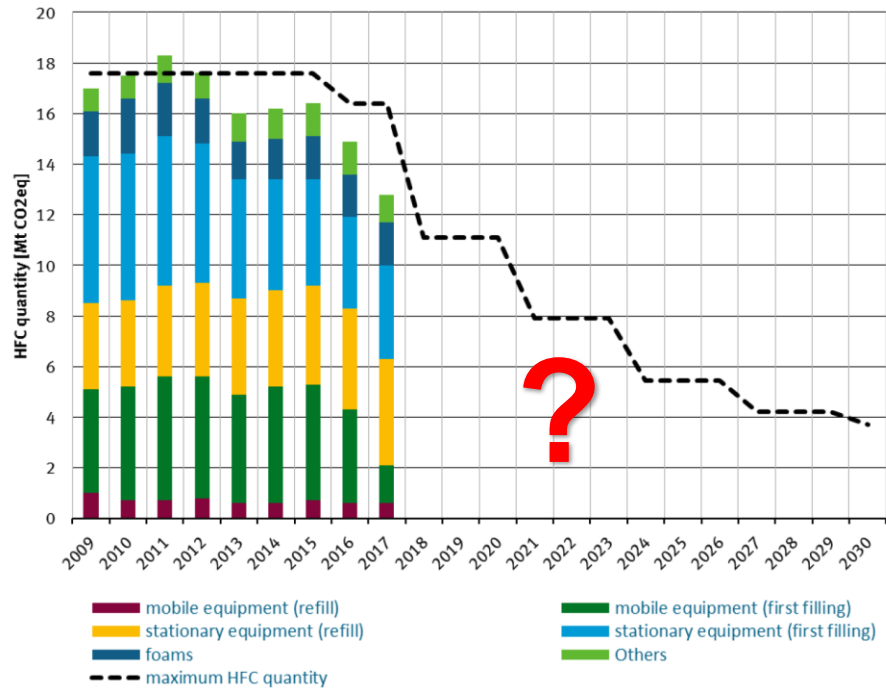


Notes: Nil reports not included.
 Non-EU countries: British Virgin Islands, China, Gibraltar, Hong Kong, Japan, Korea, Malaysia, Monaco, Norway, Serbia, Switzerland, Taiwan and the United States.

Source: EEA, 2018b.

Situation in Germany

Current HFC use in Germany



- Current implementation of the F-gas Regulation in Germany?
- Progress of using alternatives?
- Will there be problems in the coming years?
- Need for national measures?

UBA elaboration, Dr. Thalheim @ eurammon Schaffhausen 2019

Scenario for the German market till 2030

Aim and Questions

REALITY CHECK

- status of implementation of the F-gas Regulation in Germany?
- current use of HFC alternatives in the refrigeration and air-conditioning application sectors in Germany?

PROJECTIONS OF THE POTENTIAL MARKET PENETRATION OF HFC ALTERNATIVES

- Decrease in use of HFCs in line with phase-down?
- Increase in use of natural refrigerants?
- If not, which amounts of HFCs have to be saved additionally?
- Is there need for national measures?

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Scope

- current and future market penetration rates of refrigerants used in RACHP applications
- modeling of HFC quantities

Assumptions to be made

- sectoral growth
- life span
- emission factor
- charge
- technical innovation leading to further reductions of the HFC demand is constantly taking place

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Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Modeling of HFC quantities

SOLL SCENARIO – 2015-2030

- quantities available in Germany by applying the phase-down steps
- Baseline 2009 –2012 according to HFC quantities collected in the national GHG inventory

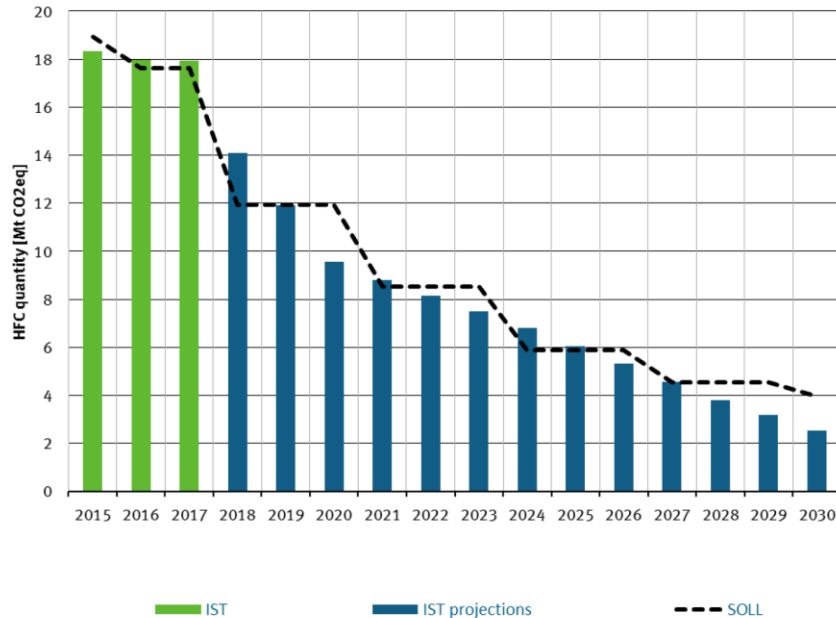
IST SCENARIO

REALITY CHECK 2015-2017:

- data from the national inventory on GHG emissions

PROJECTIONS 2018-2030:

- projected HFC quantities in refrigeration and air conditioning applications



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Gschrey, Osterheld, Kleinschmidt (2019) unpublished

Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Modeling of HFC quantities per sector

SOLL SCENARIO – 2015-2030

- quantities available by applying the phase-down steps per sector
- Baseline 2009 –2012 according to HFC quantities collected in the national GHG inventory

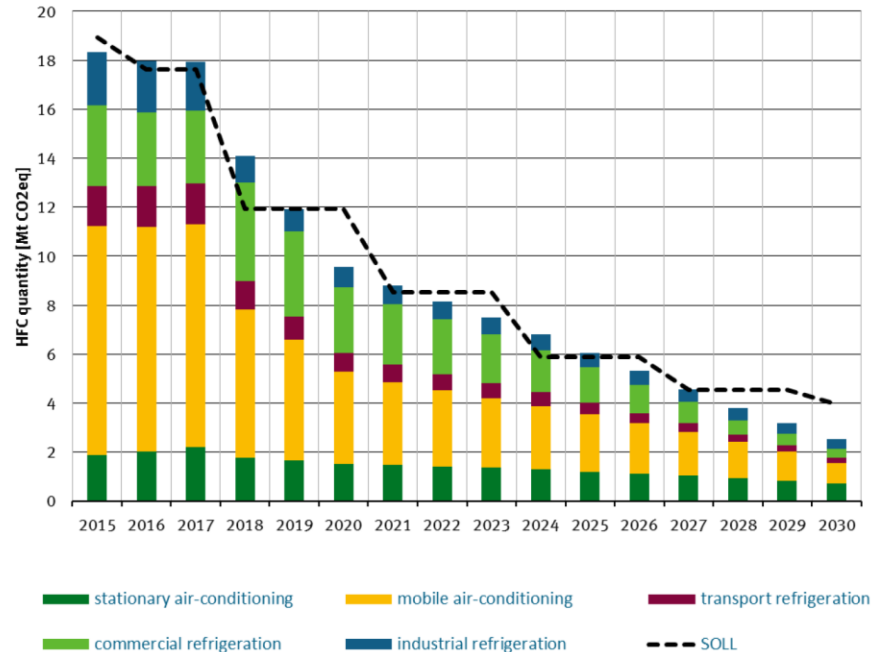
IST SCENARIO

REALITY CHECK 2015-2017:

- data from the national inventory on GHG emissions

PROJECTIONS 2018-2030:

- projected HFC quantities per sector

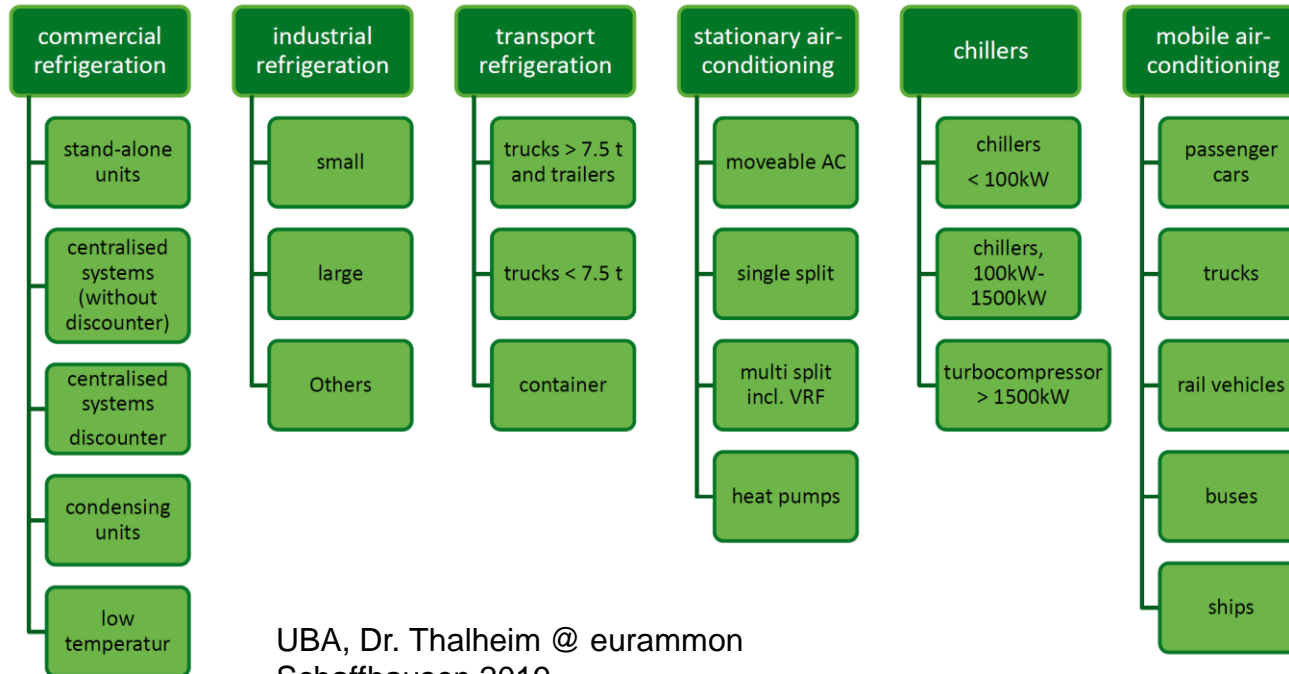


Gschrey, Osterheld, Kleinschmidt (2019) unpublished

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Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany.

Refrigeration and air conditioning applications in the model



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Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Market penetration rates in commercial refrigeration

sub-sector	refrigerant	market penetration rates in new products and equipment [%]				
		2015	2018	2020	2025	2030
Stand-alone units	R404A	19	10	0	0	0
	R407C	75	0	0	0	0
	R134a	6	40	25	0	0
	R455A/R454C	0	0	15	15	15
	R290	0	50	60	85	85

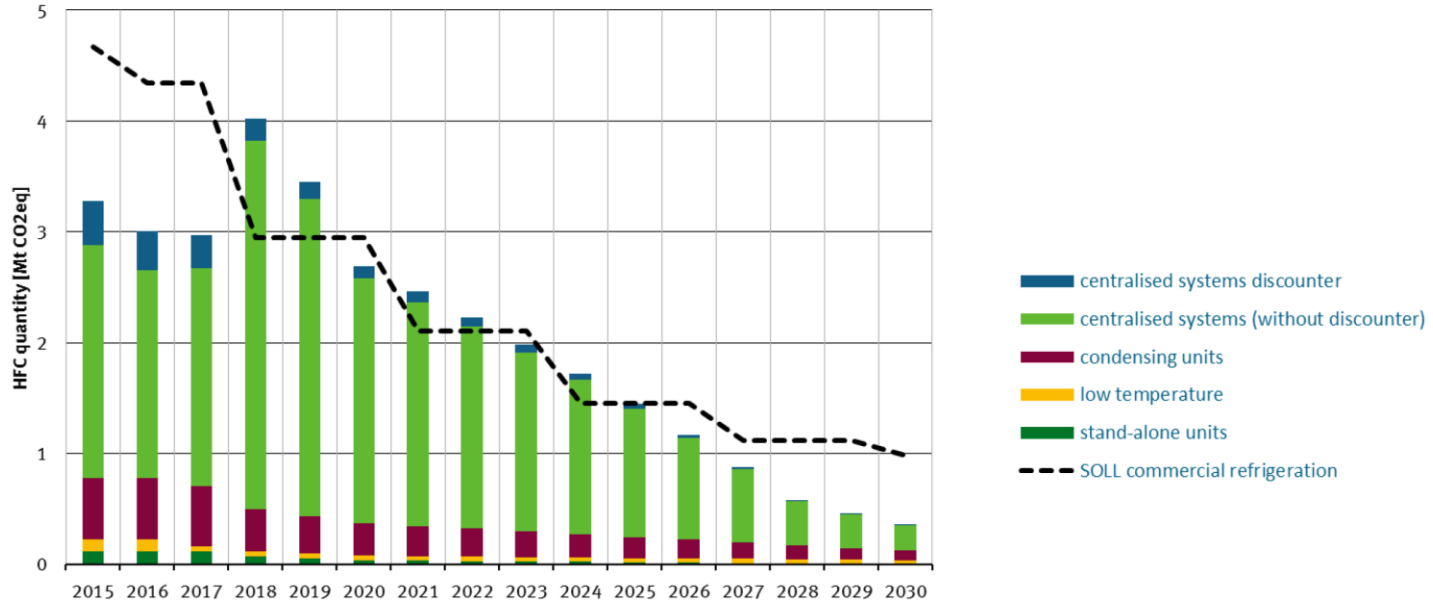
sub-sector	Refrigerant	market penetration rates in new products and equipment [%]				
		2015	2018	2020	2025	2030
centralised systems Discounter	R134a	80	30	5	0	0
	R290	4	22	32	38	40
	R744 (CO ₂) transcritical	12	40	55	55	60
	Below 40 kW: R410A	4	8	8	7	0

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Gschrey, Osterheld, Kleinschmidt (2019) unpublished

Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany.

Modeling of HFC quantities in commercial refrigeration



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Gschrey, Osterheld, Kleinschmidt (2019) unpublished

Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Market penetration rates in stationary air-conditioning

sub-sector	Refrigerant	market penetration rates in new products and equipment [%]				
		2015	2018	2020	2025	2030
single splits	R410A	70	75	10	0	0
	R407C	30	5	0	0	0
	R32	0	20	90	80	50
	R454C	0	0	0	10	25
	R290 direct	0	0	0	10	25

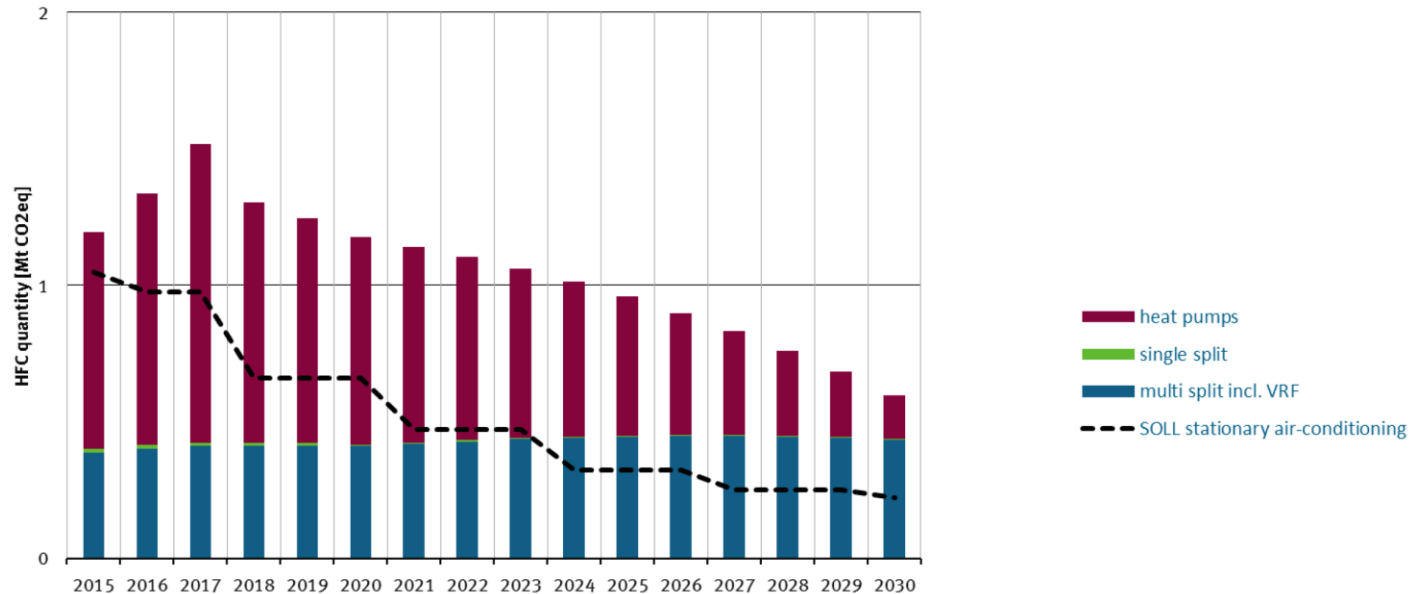
sub-sector	refrigerant	market penetration rates in new products and equipment [%]				
		2015	2018	2020	2025	2030
heat pumps	R410A	40	45	35	0	0
	R407C	54	40	20	0	0
	R134a	6	6	0	0	0
	R466A	0	0	0	2	2
	R32	0	< 1	20	30	12
	R513A	0	0	2	5	3
	R454C/R455A/R454B	0	0	12	35	50
	R290	0	7	10	25	30
	R744	0	< 1	< 1	3	3

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Gschrey, Osterheld, Kleinschmidt (2019) unpublished

Scenario for the Market Penetration with Natural Refrigerants tilt 2030 in Germany.

Modeling of HFC quantities in stationary air-conditioning

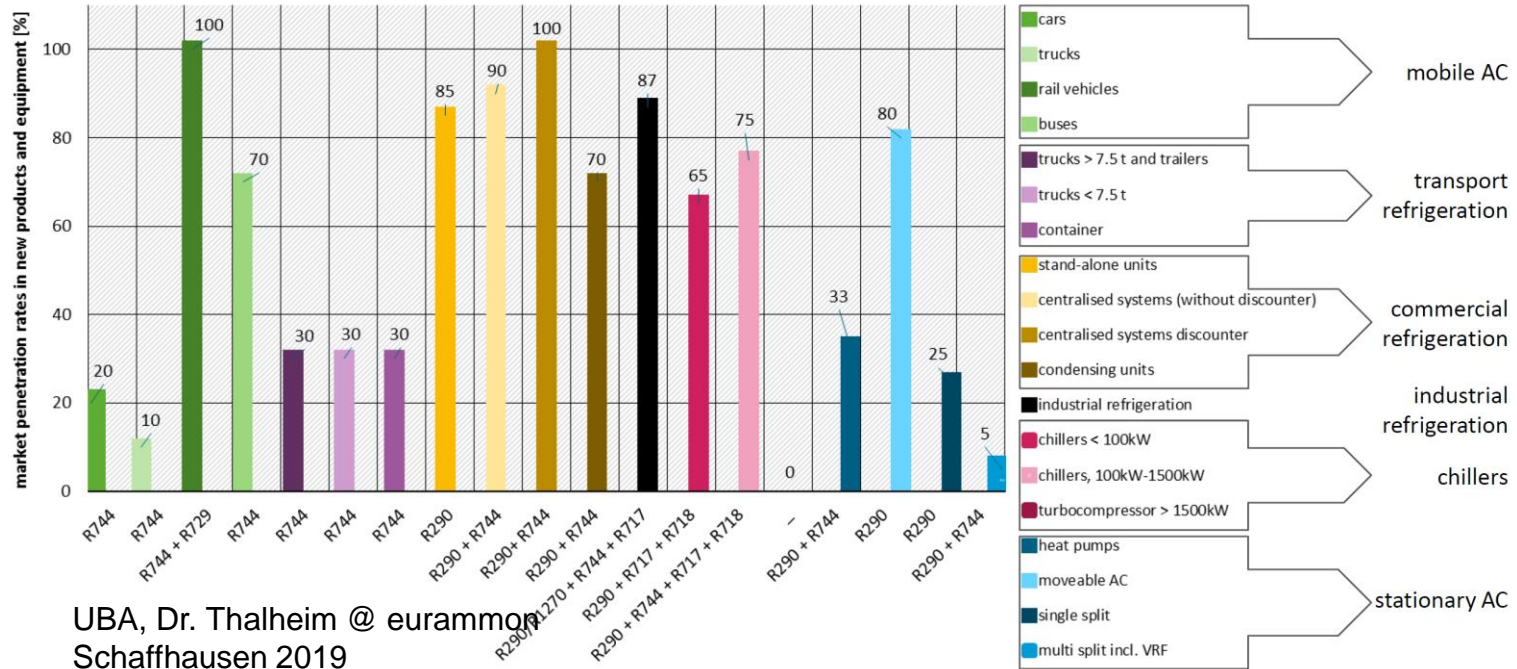


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Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Market penetration rates of natural refrigerants projected for 2030



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Summary and Conclusions

- HFC quantities decrease steadily according to the assumptions made
 - BUT: the reduction does not keep pace with the steps of the EU HFC phase down steps in the SOLL Scenario
- EU HFC phase down steps can only be reached with delay according to these modelling results

- situation varies between refrigeration and air conditioning applications
 - in industrial refrigeration a significant decrease of the HFC use is expected
 - centralised refrigeration systems in discounters and rail AC will use exclusively NatRefs in 2030
 - share of NatRefs in AC of passengers cars and trucks, the whole sector of transport refrigeration, heats pumps, single splits and multi splits incl. VRF will be below 35% in 2030
 - no NatRefs will be used for turbocompressors > 1500kW

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Summary and Conclusions

- market penetration of HFC alternatives has to increase faster
- still demand to inform about the F-gas Regulation and the phase-down of HFCs
- need for research and technical developments
- adjustments of norms and standards necessary

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THE BIG FIVE NATURAL REFRIGERANTS!



AIR



WATER



AMMONIA



HYDROCARBONS



CARBONDIOXID