German Environment Agency

Umwelt Bundesamt

eurammon Symposium "Future-proof solutions in cooling and heating applications"

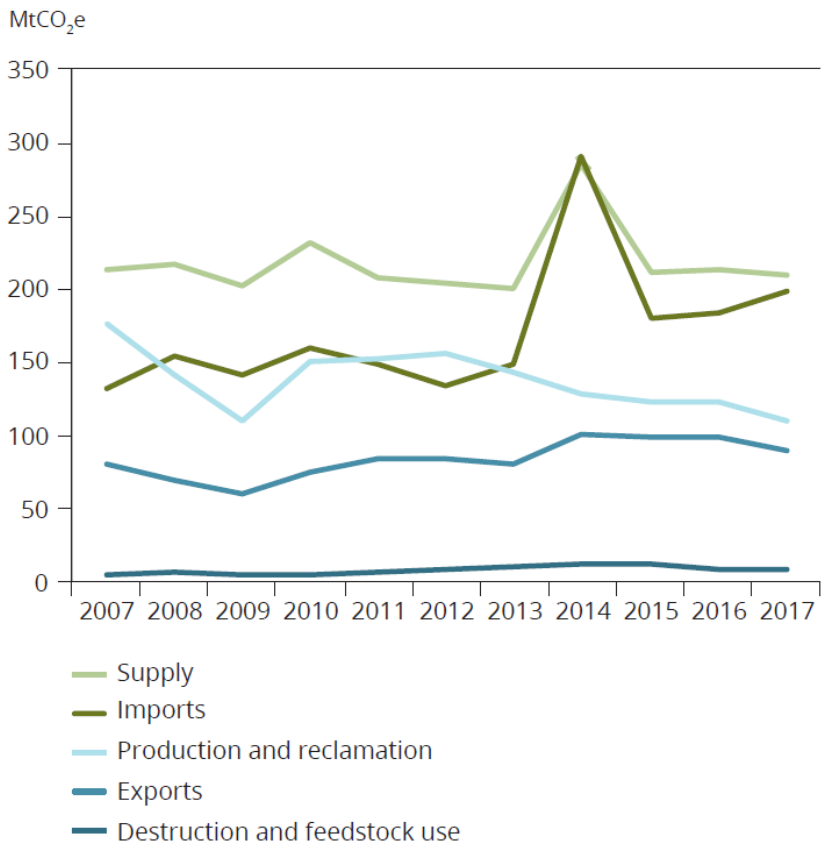
Scenario for the Market Penetration with Natural Refrigerants till 2030 in Germany

Diana Thalheim
Section III 1.4 / Substance-related Product Issues

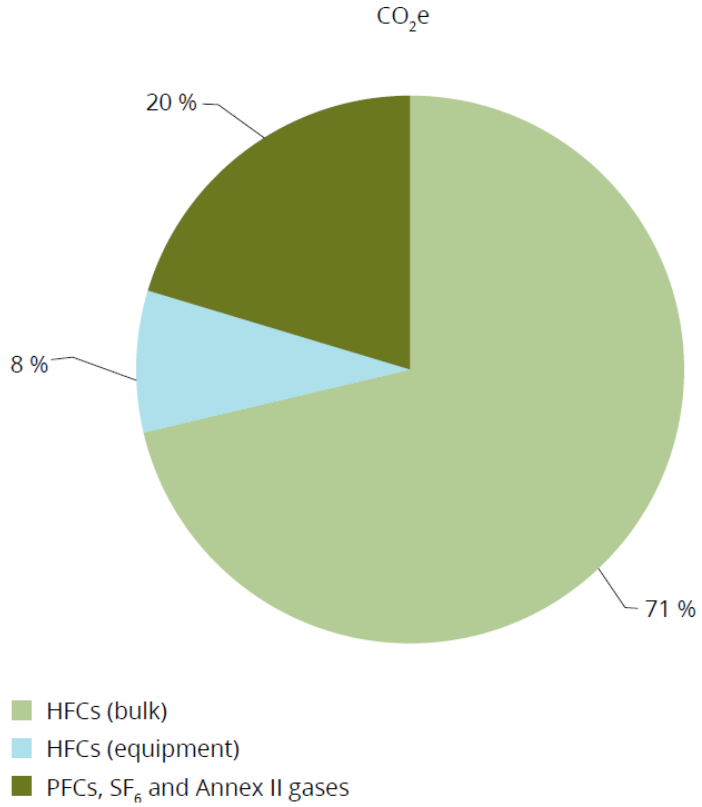
Agenda

Current use of fluorinated greenhouse gases in the EU

Supply, production, import, export and destruction of fluorinated gases in the EU

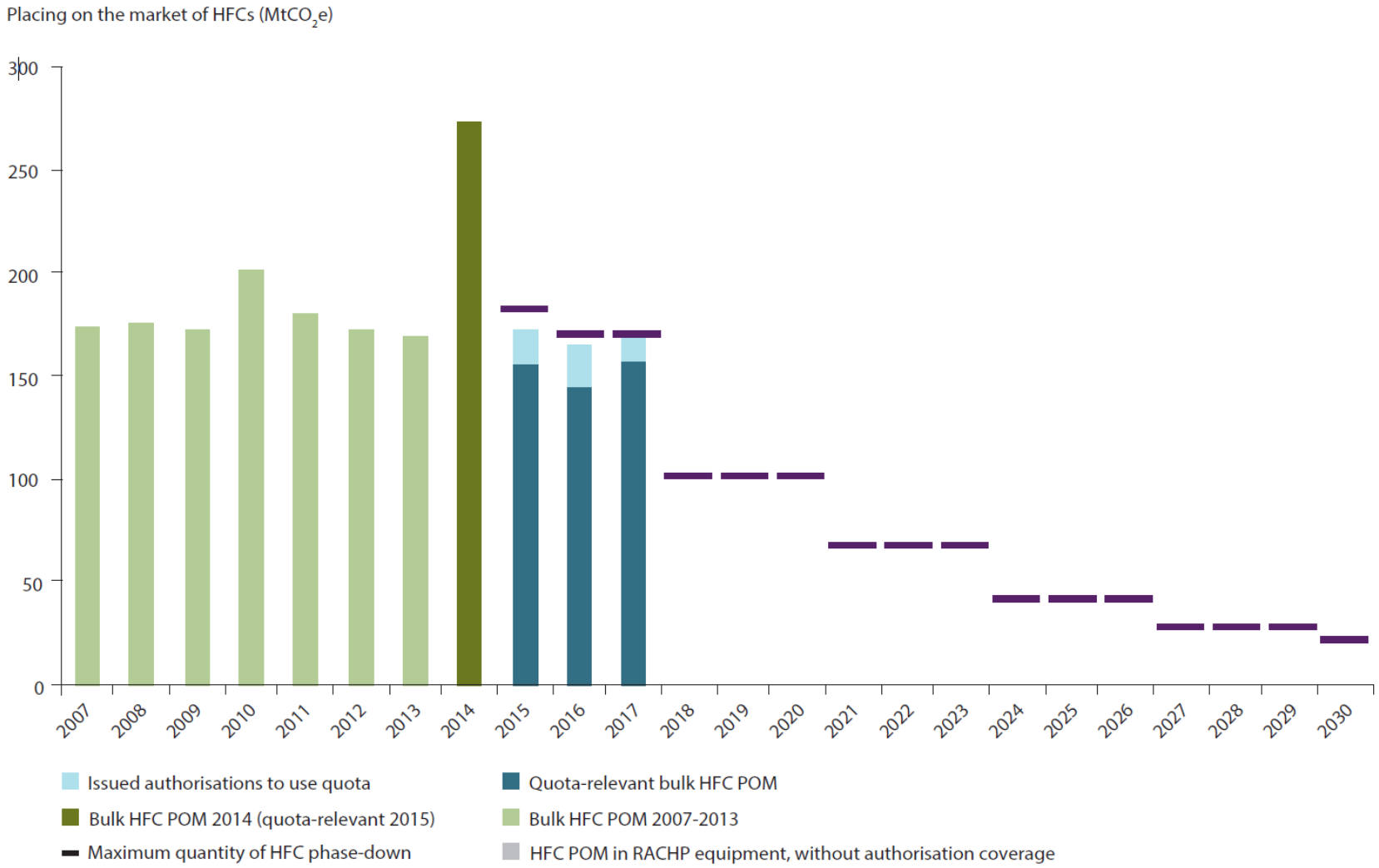


2017 EU total supply by types and groups of fluorinated gases (% CO_2eq)



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

Progress of the EU HFC phase-down



HFC quantity = 100%

✓ **2015: - 6%**

HFC quantity = 93%

✓ **2016: - 4%**

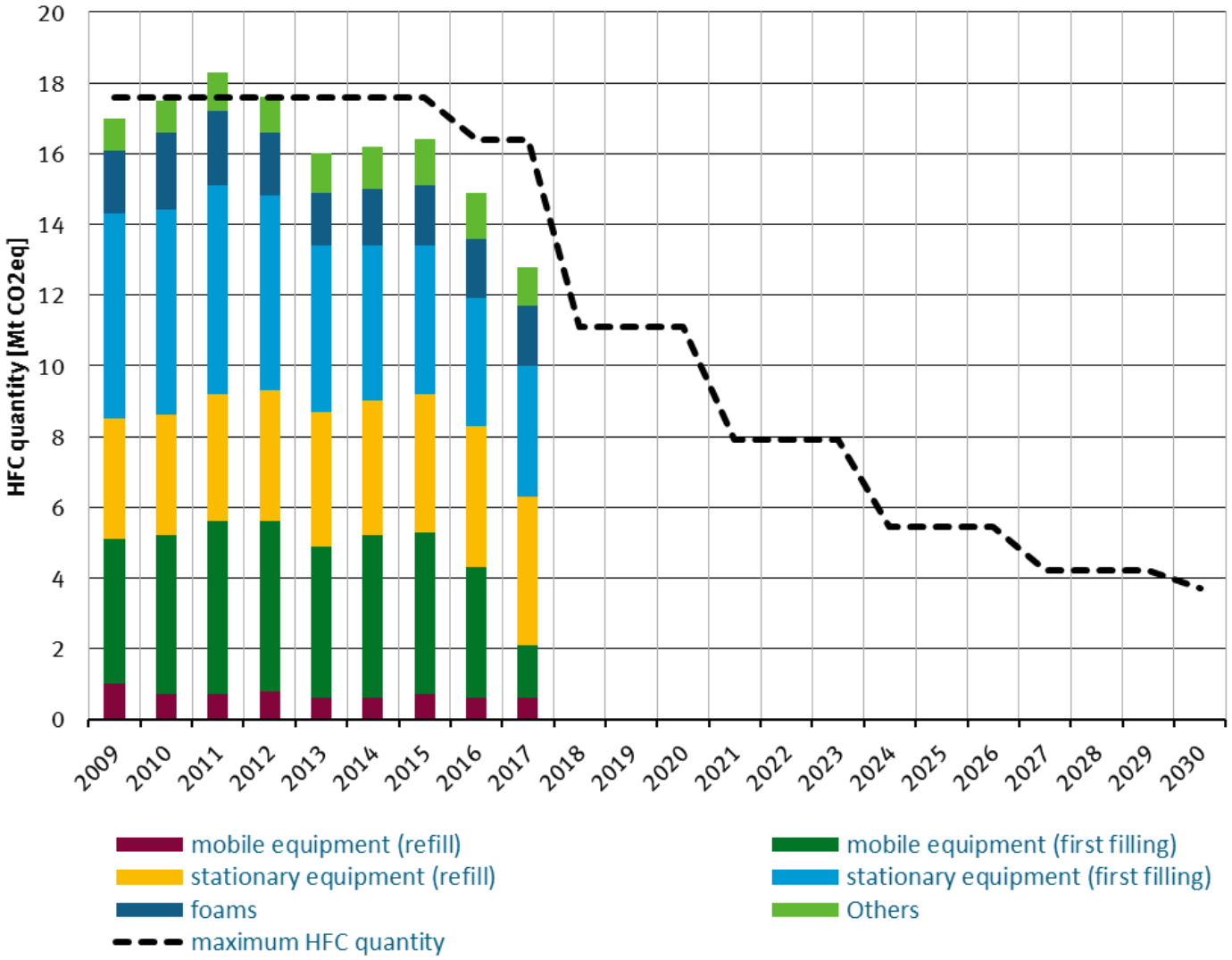
✓ **2017: - 0.4%**

HFC quantity = 63%

2018: ???

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

Current HFC use in Germany



Own elaboration, based on data according to UStatG

HFC quantity = 100%

✓ **2015: - 7%**

HFC quantity = 93%

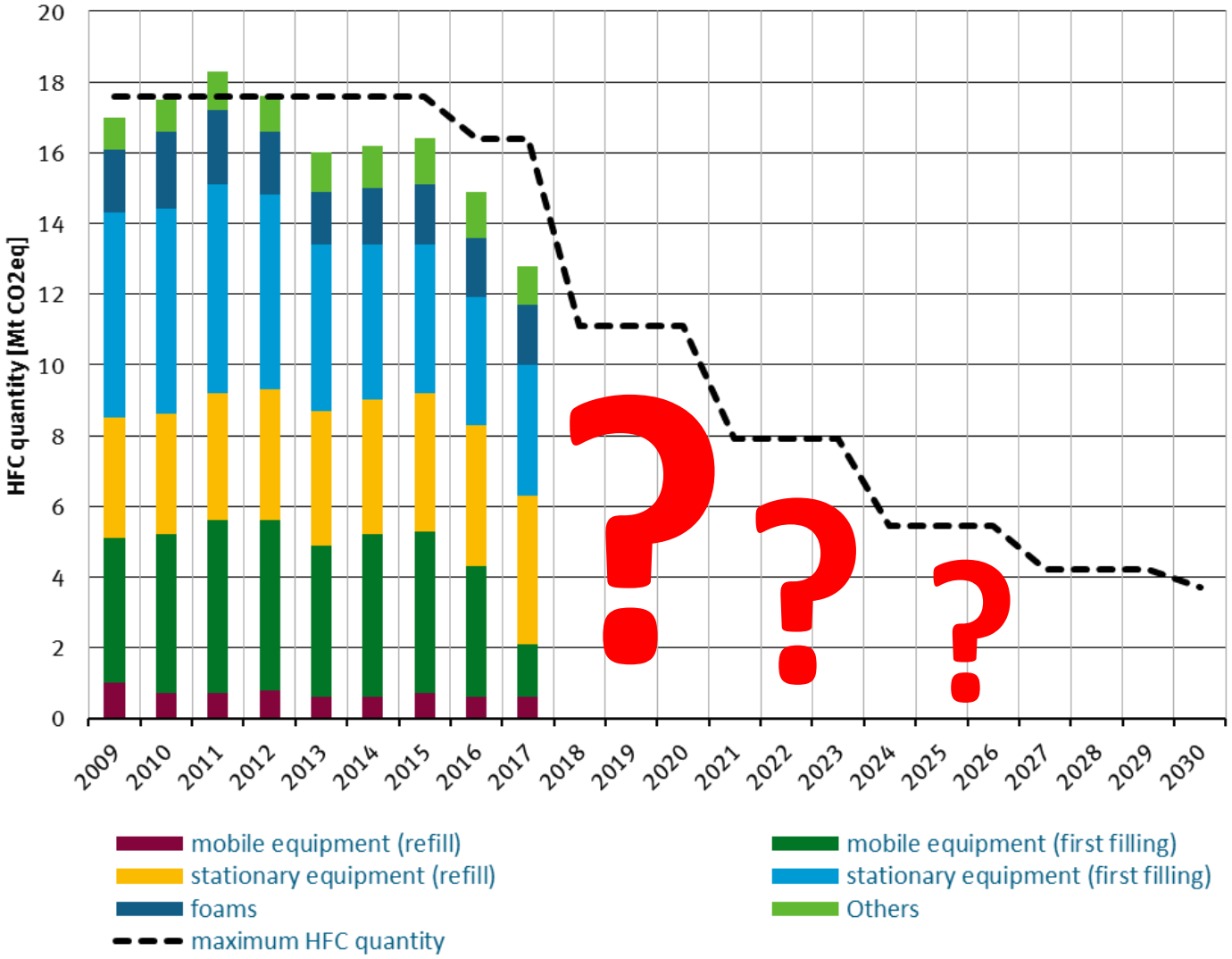
✓ **2016: - 9%**

✓ **2017: - 22%**

HFC quantity = 63%

2018: ???

What will the future look like?



Own elaboration, based on data according to UStatG

- **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?**

Scenario for the German market till 2030

RESEARCH PROJECT

„IMPLEMENTATION OF THE EU HFC PHASE DOWN IN GERMANY: REALITY CHECK AND PROJECTIONS"

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?

Contractor: Öko-Recherche GmbH

Runtime: September – November 2018

Base:

- National inventory for UNFCCC submission
- studies for the review of Regulation (EC) No 842/2006
  - report prepared for the European Commission*
  - former UBA research project**

Input from:

- literature research
- conferences and trade fairs
- expert consultations and meetings

* Schwarz et. al (2011): Preparatory study for a review of Regulation (EC) No. 842/2006 on certain fluorinated greenhouse gases.
** Gschrey et. al (2015): Maßnahmen zur Verbesserung der Marktdurchdringung klimafreundlicher Technologien ohne halogenierte Stoffe vor dem Hintergrund der Revision der Verordnung (EG) Nr. 842/2006. Climate Change 06/2015, Umweltbundesamt, Dessau-Roßlau

Scenario for the German market till 2030

RESEARCH PROJECT

„IMPLEMENTATION OF THE EU HFC PHASE DOWN IN GERMANY: REALITY CHECK AND PROJECTIONS"

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

Limitations:

- use of HFCs as foam blowing agents, propellants, solvents and fire protection agents are not included in the model
- HFC demand for the retrofit of existing refrigeration and air conditioning systems is also not accounted for
- trend of sectoral growth continued but differing development possible
- in fact no HFC quantities per sector
- in fact no HFC quantities per member state

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

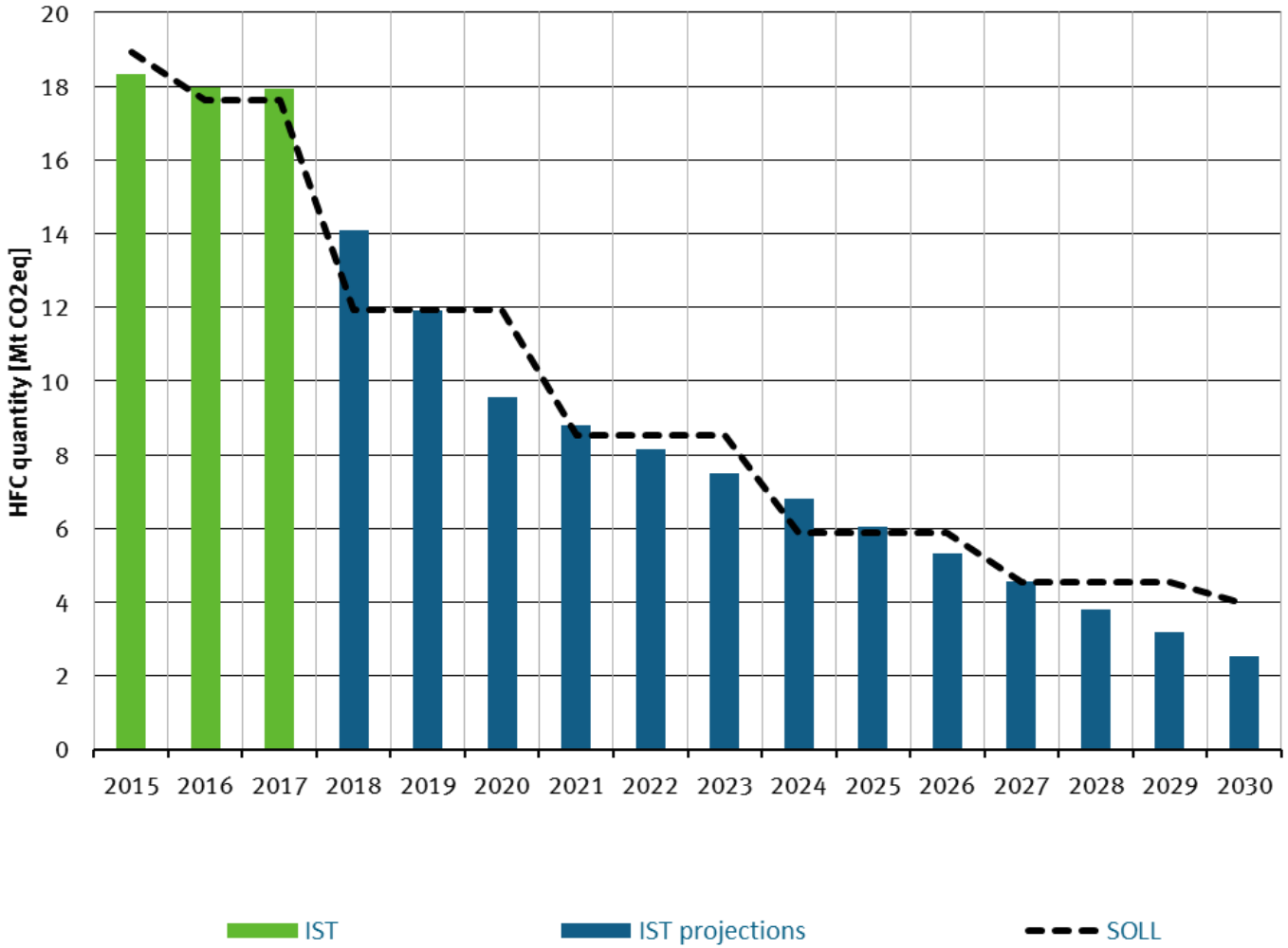
IST SCENARIO

REALITY CHECK 2015-2017:

- data from the national inventory on GHG emissions

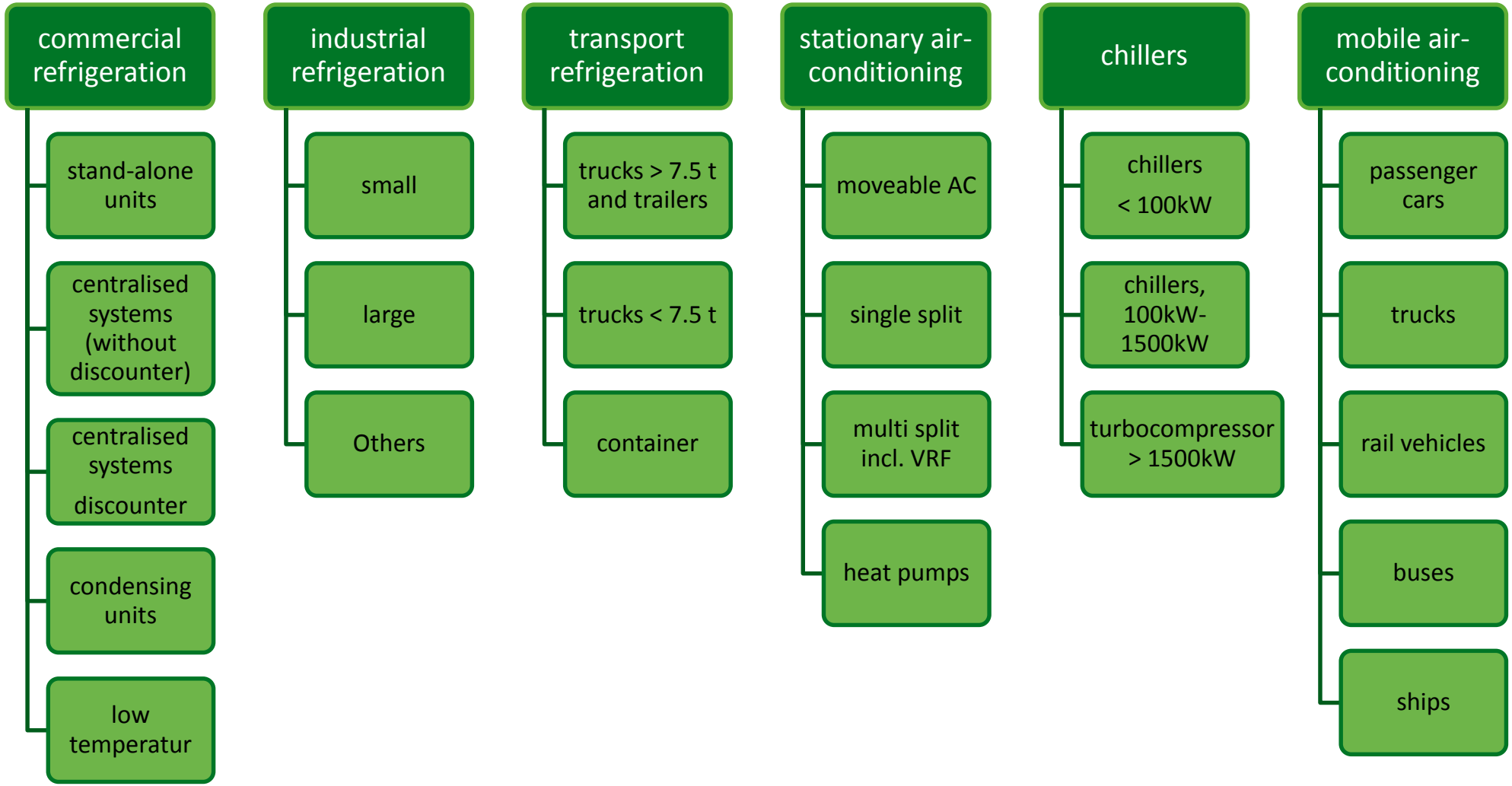
PROJECTIONS 2018-2030:

- projected HFC quantities in refrigeration and air conditioning applications



Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

Refrigeration and air conditioning applications in the model



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

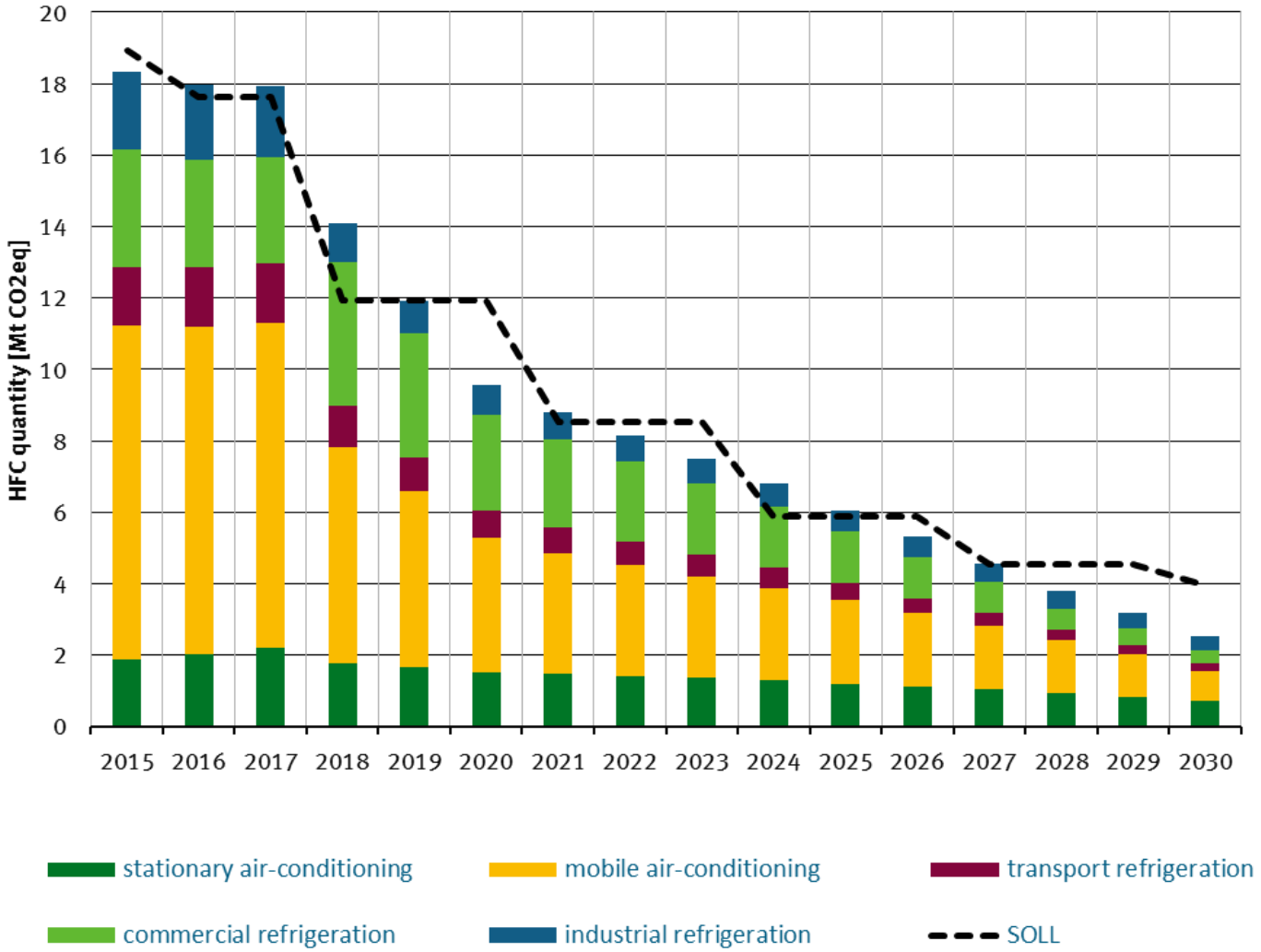
IST SCENARIO

REALITY CHECK 2015-2017:

- data from the national inventory on GHG emissions

PROJECTIONS 2018-2030:

- projected HFC quantities per sector



Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

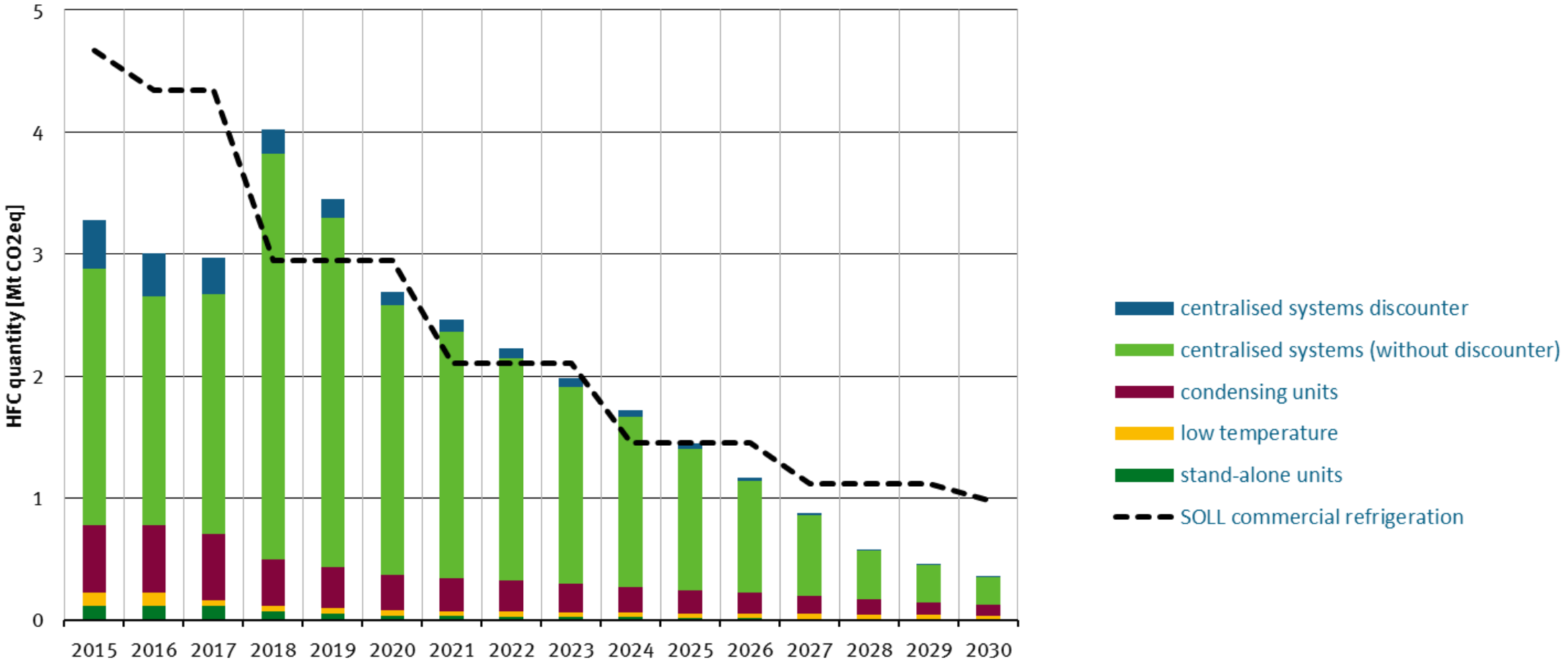
Market penetration rates in commercial refrigeration

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

Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

Modeling of HFC quantities in commercial refrigeration



Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

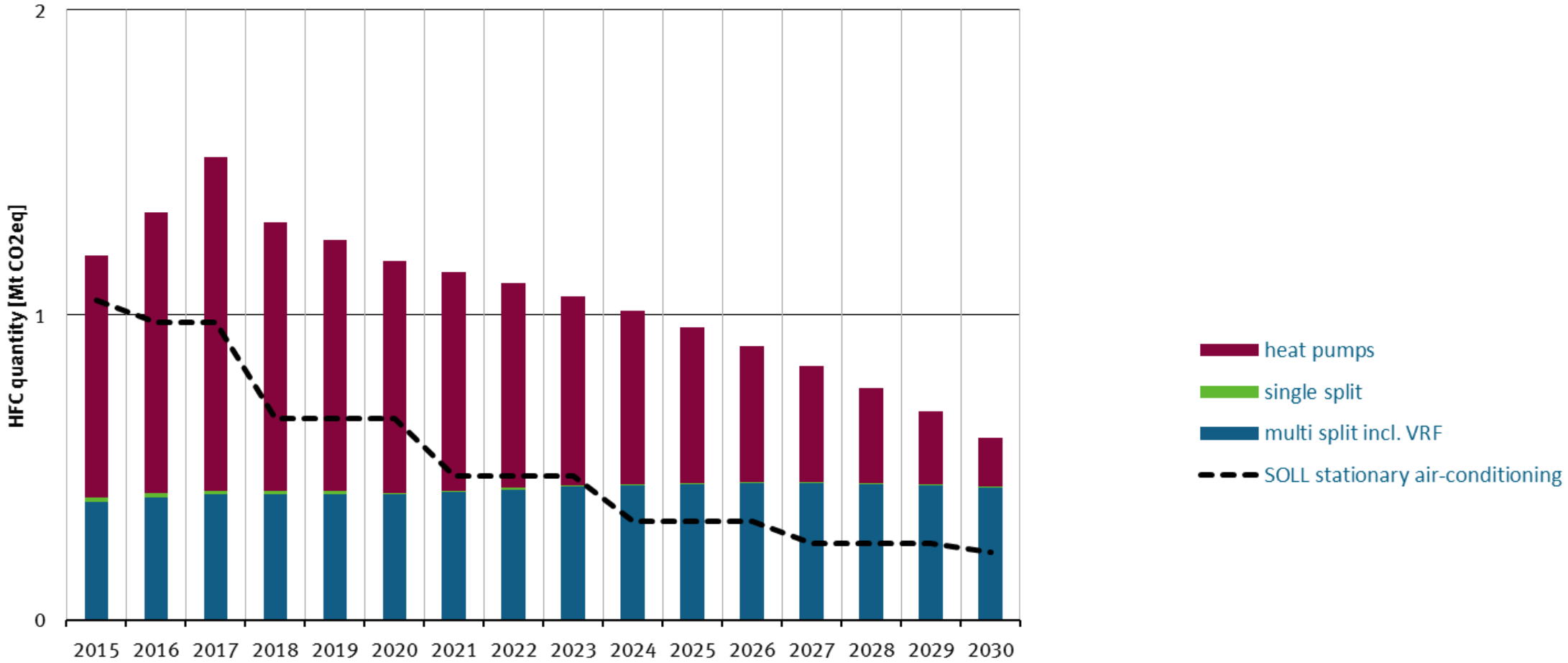
Market penetration rates in stationary air-conditioning

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

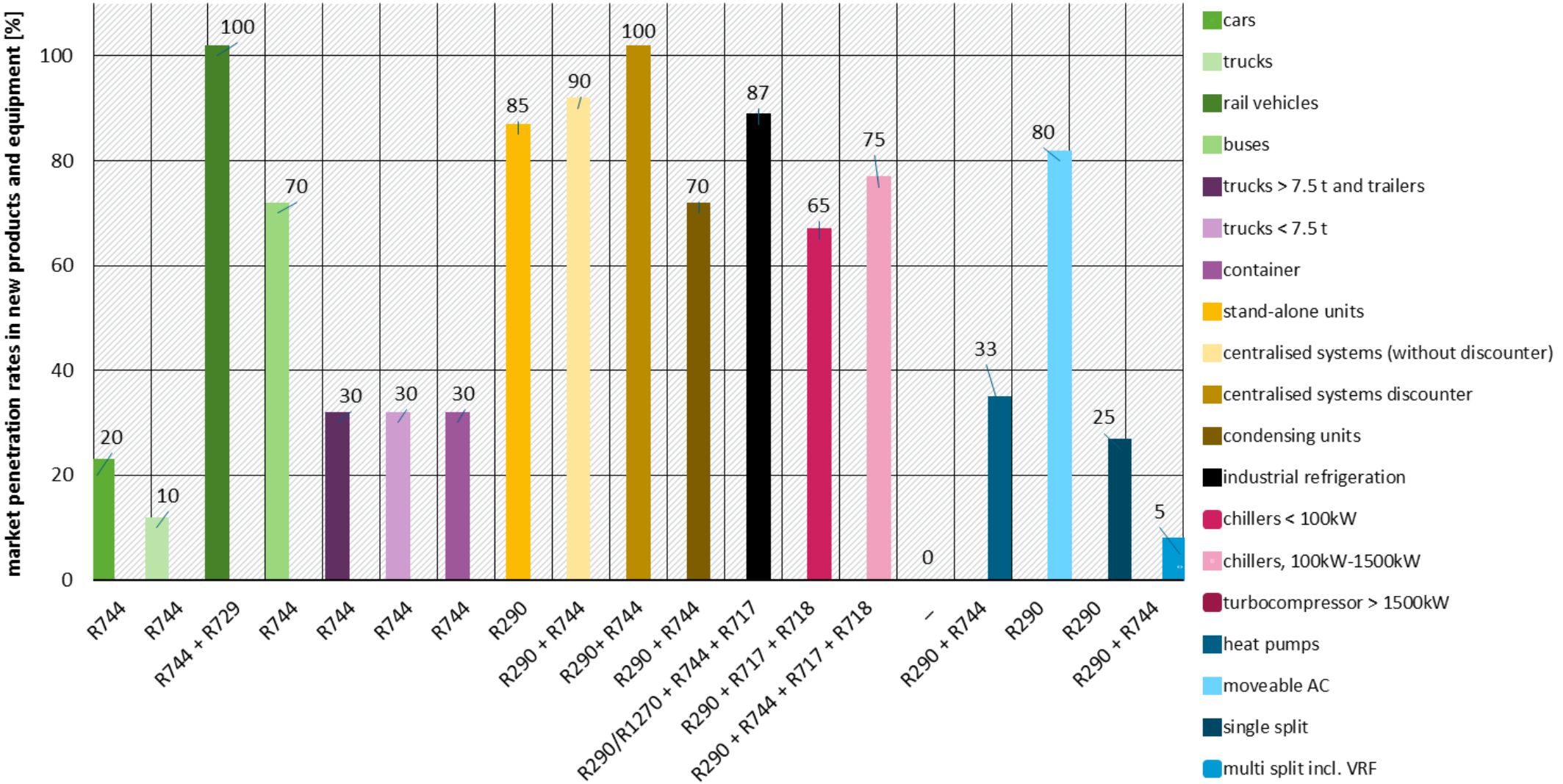
Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

Modeling of HFC quantities in stationary air-conditioning



Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

Market penetration rates of natural refrigerants projected for 2030



Own elaboration, based on data from: Gschrey, Osterheld, Kleinschmidt (*unpublished*): Implementierung des EU-HFKW-Phase-down in Deutschland - Realitätscheck und Projektion

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**

- **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**

Summary and Conclusions

- **Projections are only valid under the assumption that every MS and sector stick to its share**
  - Limitations: in fact no HFC quantities per sector
    in fact no HFC quantities per member state

- **Risk that some will exceed their share**
  - **Then everyone else has much more to do!**

  - **ONLY THOSE WHO ACTIVELY SWITCH TO NATURAL REFRIGERANTS ARE ON THE SAFE SIDE!**

What are UBA and BMU doing to support the transition to NatRefs?

- **RESEARCH PROJECTS**

- **FUNDING**

of stationary refrigeration and air conditioning as well as of mobile AC in buses and rail vehicles

Federal Office for Economic Affairs and Export Control

is responsible for applications

- **ECO LABELLING**

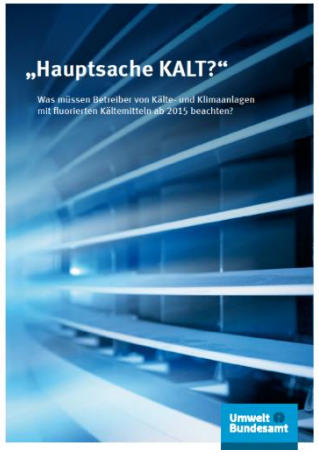
Climate-Friendly Grocery Stores in the Food Retail Sector

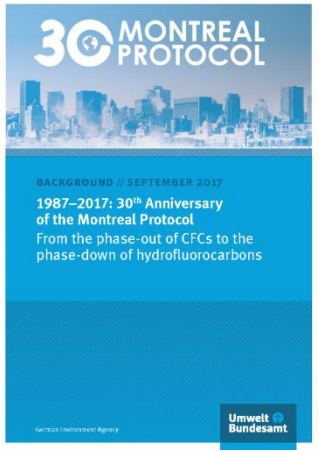
Stationary air conditioners

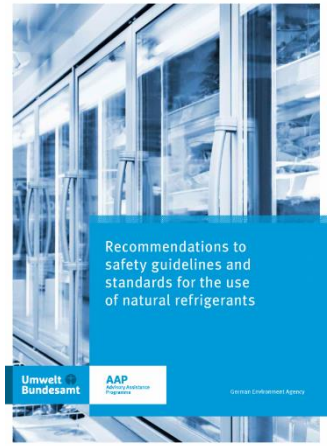
What are UBA and BMU doing to support the transition to NatRefs?

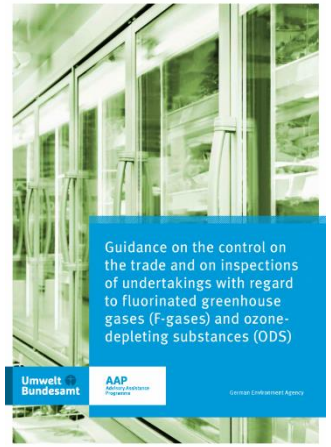
INFORMATION

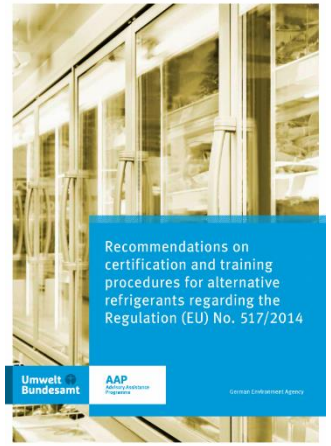
- **Publications**











- **Websites**

KLIMAFREUNDLICHE KÄLTE
Klima schützen, Kosten senken, Energie sparen.

https://www.kaeltemittel-info.de/

- **Events**

conference “Managing HFC phase down with natural refrigerants”

09.-10. June 2020

Berlin

Thank you for your attention

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https://www.umweltbundesamt.de/en/topics/economics-consumption/products/fluorinated-greenhouse-gases-fully-halogenated-cfcs/emissions/projections