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# The Kigali Amendment: What Does it Actually Do and Why Should I Care?

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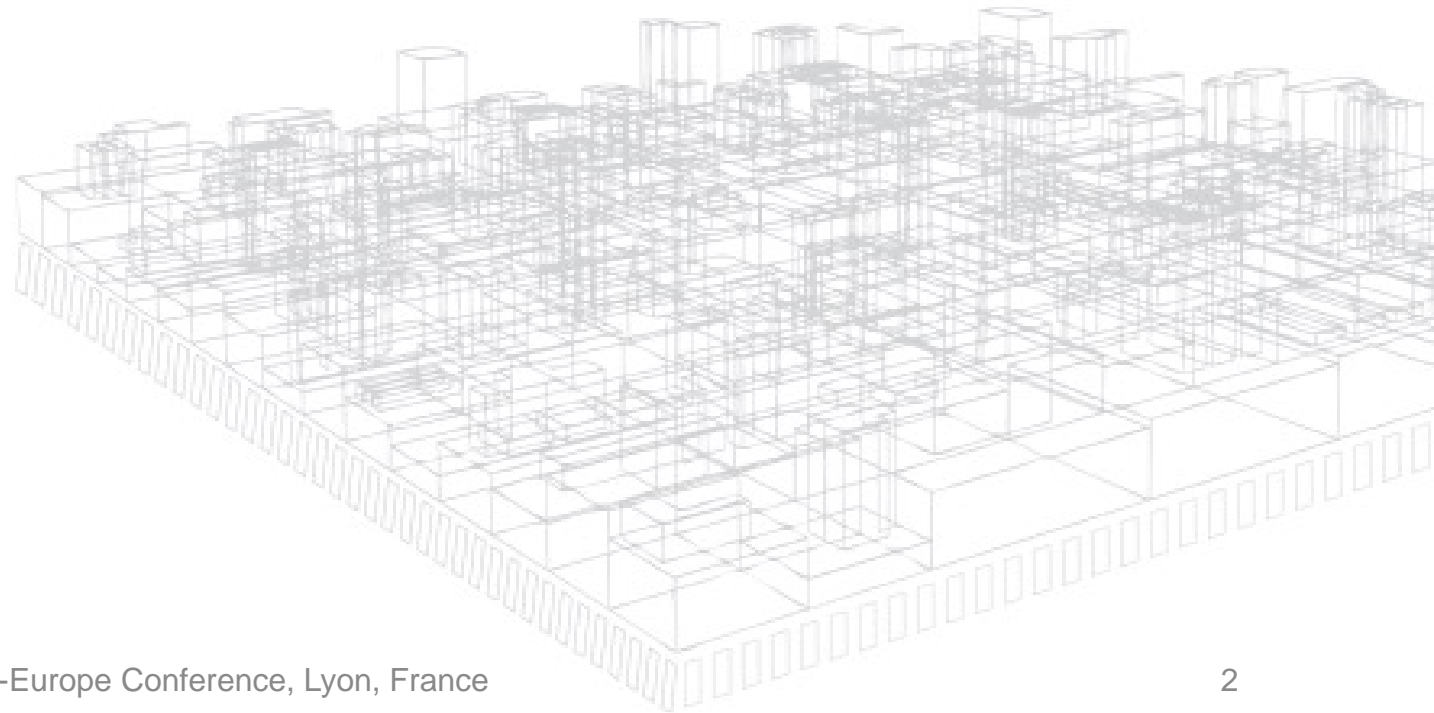
Air System Engineering & Technology (ASET) Conference-Europe

Lyon, France • L'Espace Tête d'Or • 20 February 2018

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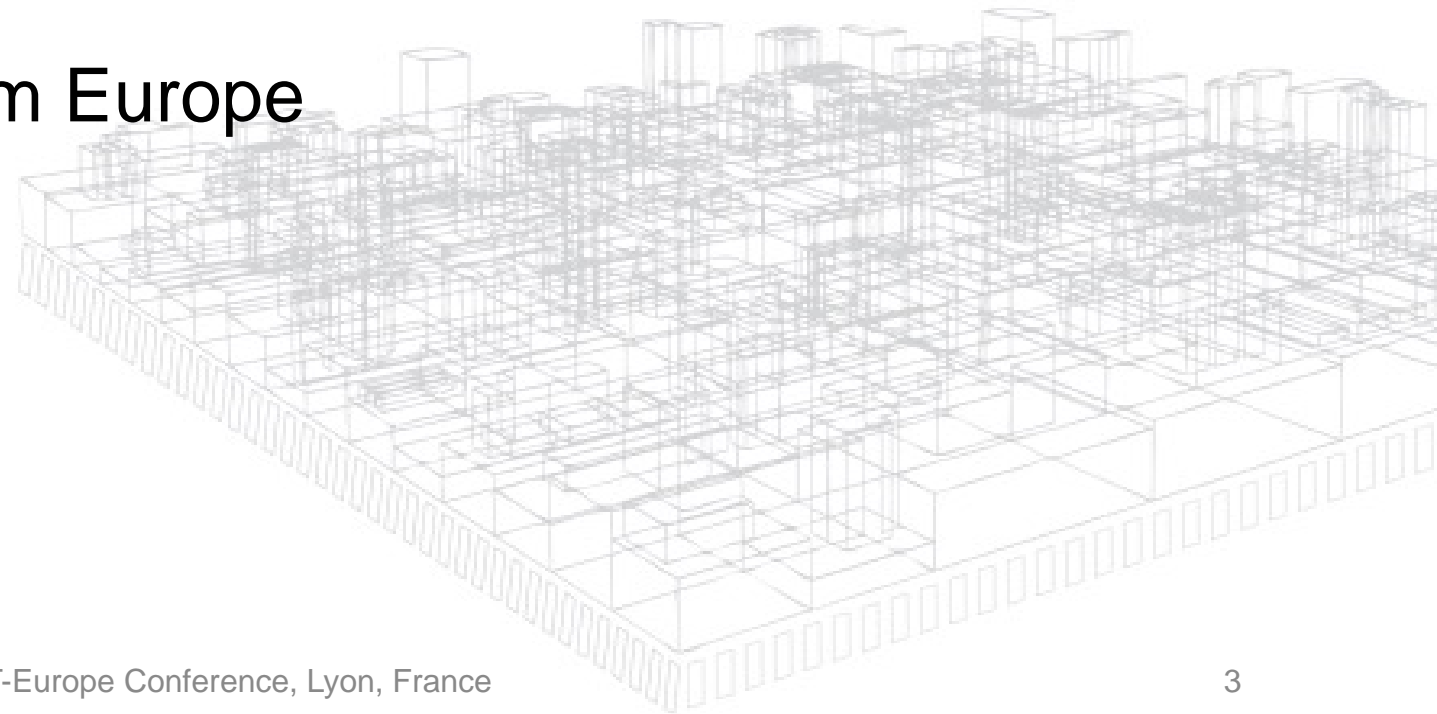
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# Outline

- Introduction to the Kigali Amendment
- Working principle of the phase-down
- Impact on business
- Some lessons learned from Europe
- Conclusions
- Q&A



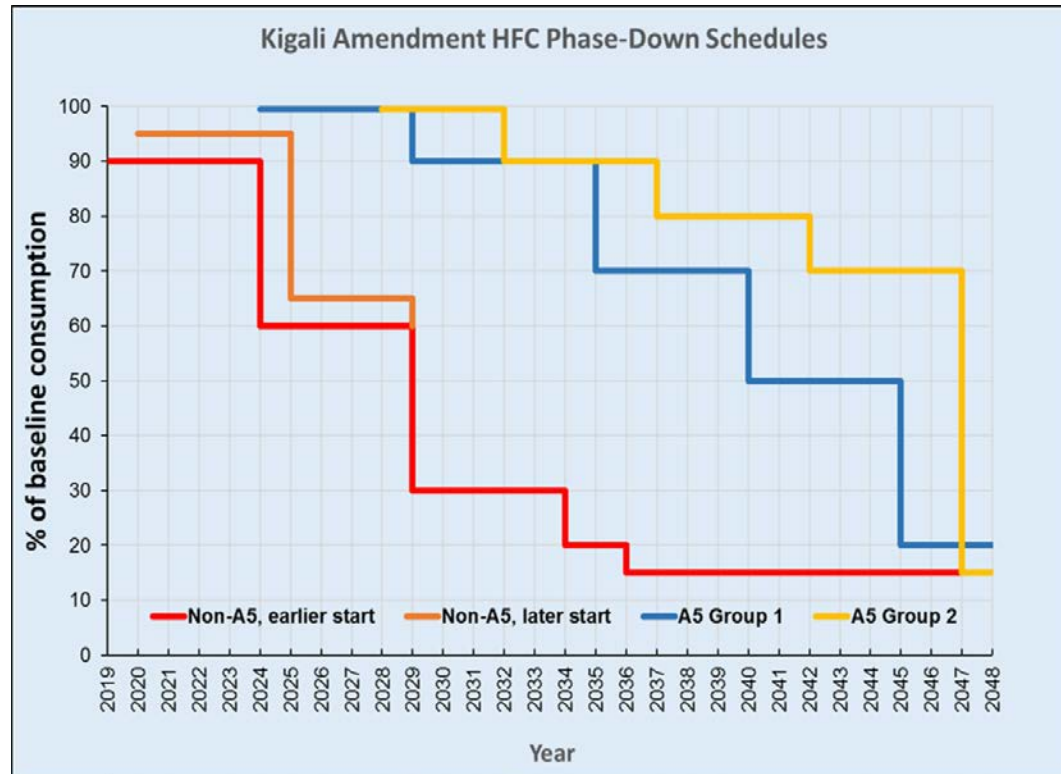


CLIMATE CHANGE IS A GLOBAL ISSUE  
OUR INDUSTRY IS A GLOBAL INDUSTRY

# What is the Kigali Amendment?

- Adopted by the 28th Meeting of Parties to the Montreal Protocol on 15 October 2016 in Kigali, Rwanda.
- It adds HFCs to the list of substances controlled under the Montreal Protocol.
- It will phase-down HFCs under the Montreal Protocol as their use is increasing rapidly as substitutes for ozone-depleting substances.
- According to UNEP, the HFC phase-down is expected to avoid up to 0.5°C of global temperature rise by 2100, while continuing to protect the ozone layer

# What does it look like?



- **Article 5 countries**

- **Group 1:** All those that are not Group 2

- **Group 2:** Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, UAE

- **Article 2 countries**

- **All developed countries**

- Different baseline calculation and initial phase-down steps for Belarus, the Russian Federation, Kazakhstan, Tajikistan and Uzbekistan

- **Technology review** in 2022 and every 5 years

- **Technology review** 4 to 5 years before 2028 to consider compliance deferral of 2 years for Art. 5 – Group 2 to address growth

# In detail

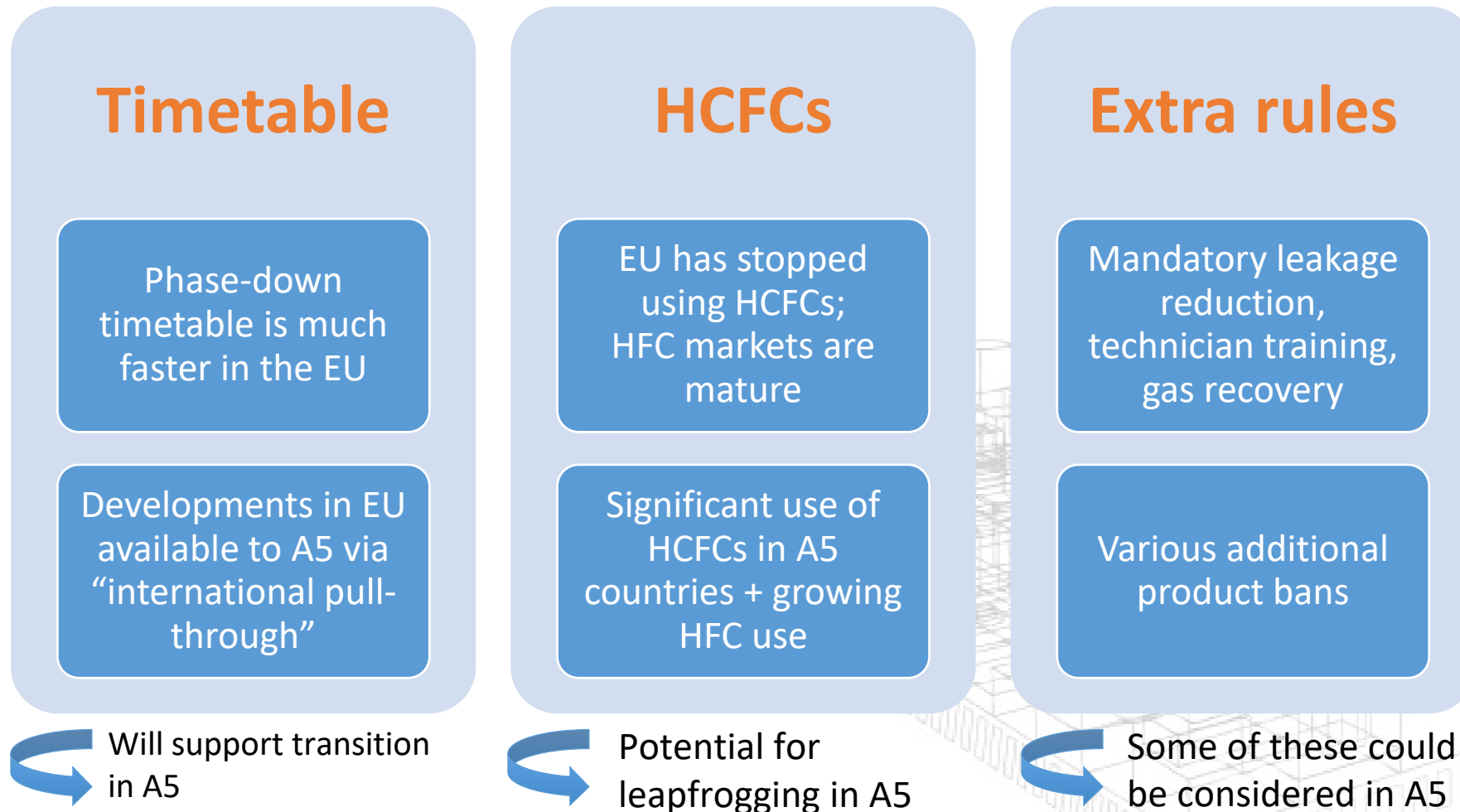
	Art. 5 – Group 1	Art. 5 – Group 2	Art. 2 – Main Group	Art. 2 – Others
<b>Baseline</b>	2020, 2021, 2022	2024, 2025, 2026	2011, 2012, 2013	2011, 2012, 2013
<b>Baseline Calculation</b>	<ul style="list-style-type: none"> <li>• Average prod./consumption of HFCs in 2020, 2021, 2022</li> <li>• Plus 65% of HCFC baseline prod./consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Average prod./consumption of HFCs in 2024, 2025, 2026</li> <li>• Plus 65% of HCFC baseline prod./consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Average prod./consumption of HFCs in 2011, 2012, 2013</li> <li>• Plus 15% of HCFC baseline prod./consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Average prod./consumption of HFCs in 2011, 2012, 2013</li> <li>• Plus 25% of HCFC baseline prod./consumption</li> </ul>
<b>Reduction Steps</b>	<ul style="list-style-type: none"> <li>• <b>Freeze: 2024</b></li> <li>• 2029: 10%</li> <li>• 2035: 30%</li> <li>• 2040: 50%</li> <li>• 2045: 80%</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Freeze: 2028</b></li> <li>• 2032: 10%</li> <li>• 2037: 20%</li> <li>• 2042: 30%</li> <li>• 2047: 85%</li> </ul>	<ul style="list-style-type: none"> <li>• No freeze</li> <li>• 2019: 10%</li> <li>• 2024: 40%</li> <li>• 2029: 70%</li> <li>• 2034: 80%</li> <li>• 2036: 85%</li> </ul>	<ul style="list-style-type: none"> <li>• No freeze</li> <li>• 2020: 5%</li> <li>• 2025: 35%</li> <li>• 2029: 70%</li> <li>• 2034: 80%</li> <li>• 2036: 85%</li> </ul>



**Article 5 Countries** have a „future baseline“ => The coming years will be crucial for them to establish the starting point for their phase-down steps

**High Ambient Temperature Exemption:** Allows for a delay in the HFC freeze date by an initial duration of 4 years if not suitable alternatives exist (multi-splits, ducted splits, ducted commercial packaged)

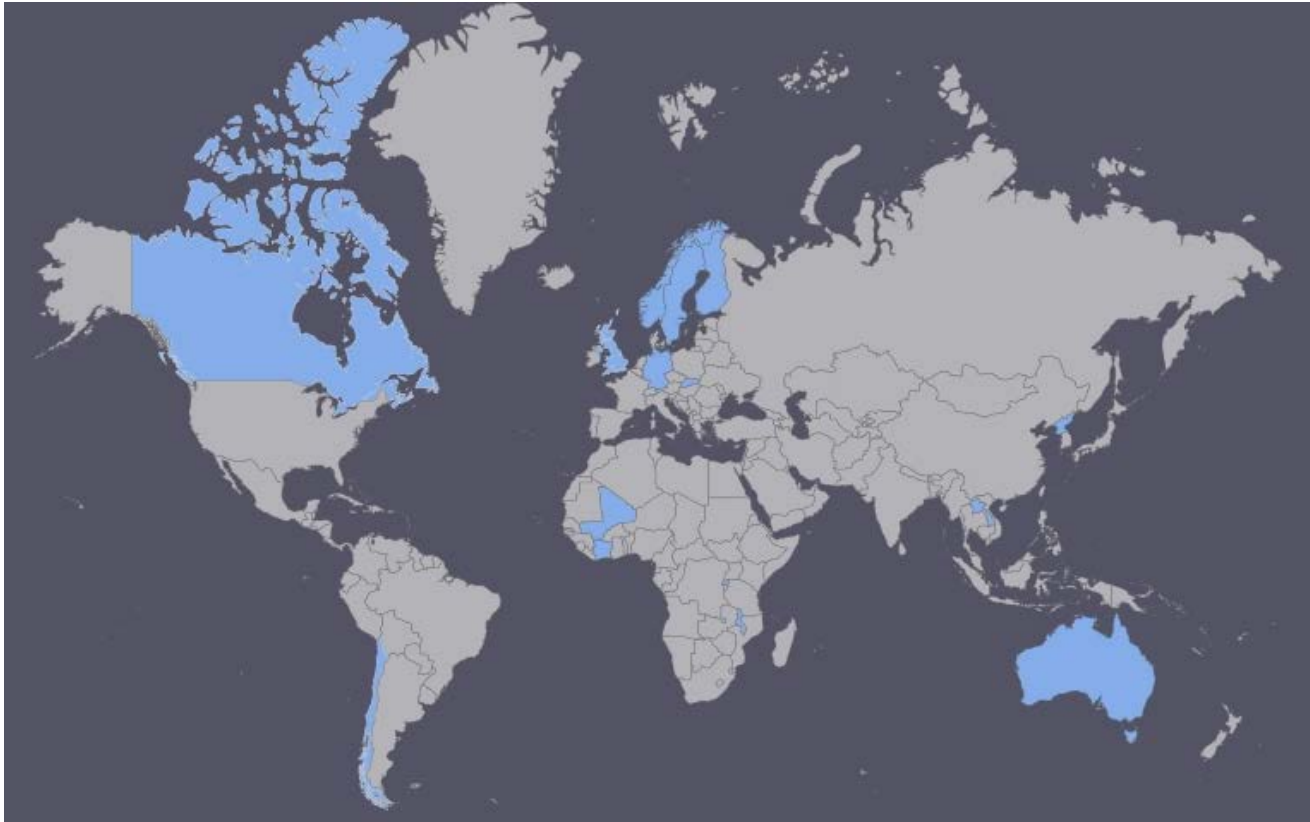
# Main differences between Art. 2 and Art. 5 countries





# When does it enter into force?

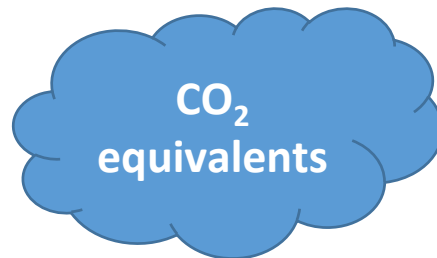
The Kigali Amendment will enter into force on **1 January 2019** as it has been ratified by **27 Parties**. The condition for entry into force was ratification by at least 20 Parties



- Australia
- Côte d'Ivoire
- Canada
- Chile
- Comoros
- Democratic People's Republic of Korea
- Ecuador
- Finland
- Germany
- Lao People's Democratic Republic
- Luxembourg
- Malawi
- Maldives
- Mali
- Marshall Islands
- Micronesia
- Netherlands
- Norway
- Palau
- Rwanda
- Slovakia
- Sweden
- Trinidad & Tobago
- Tuvalu
- United Kingdom

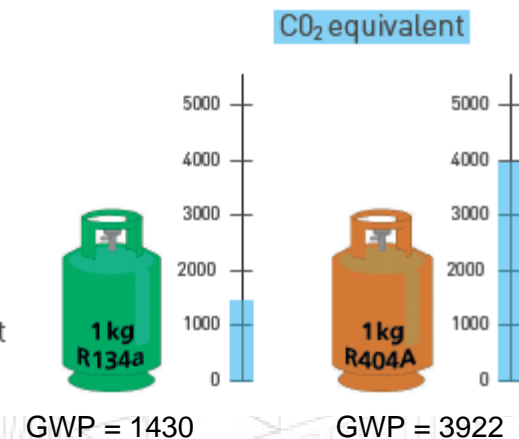
# How does the phase-down work?

- **The phase-down is based on CO<sub>2</sub>-equivalents**
- It does not ban specific refrigerants but impacts particularly those with a high GWP
- The amount of CO<sub>2</sub>-equivalents is calculated by multiplying kg x GWP
- The higher the GWP of a refrigerant, the higher the amount of CO<sub>2</sub>-equivalent it represents for a given quantity, and the more it will come under pressure by the phase-down reduction steps
- **There are several ways to ease the pressure of the phase-down steps:**
  1. Reduce the GWP of the refrigerant
  2. Reduce the refrigerant charge size of the equipment
  3. Reduce leakages
  4. Recover, recycle and reclaim refrigerants



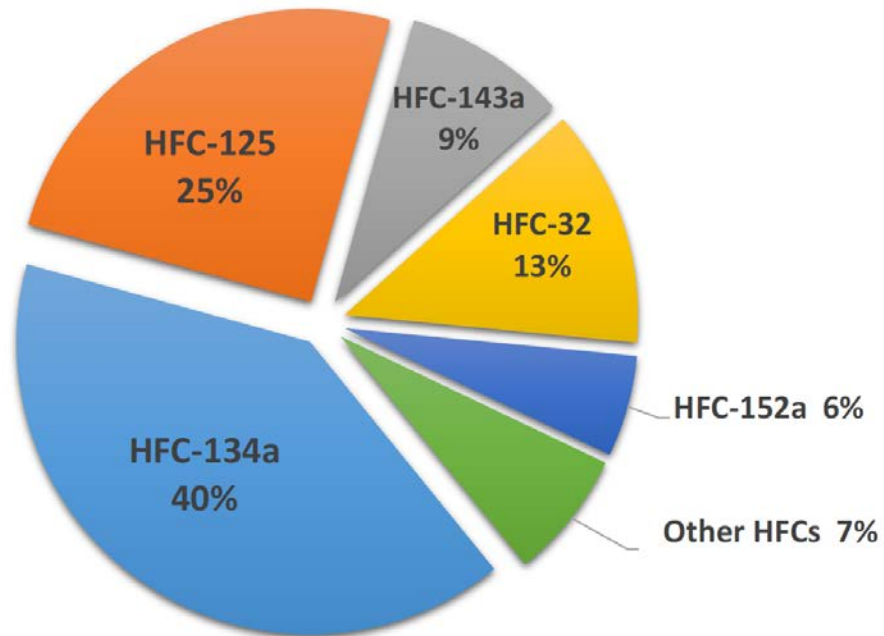
Example:

The higher the Global Warming Potential of an HFC, the higher the quantity of CO<sub>2</sub>-equivalent 1 kg of refrigerant represents.

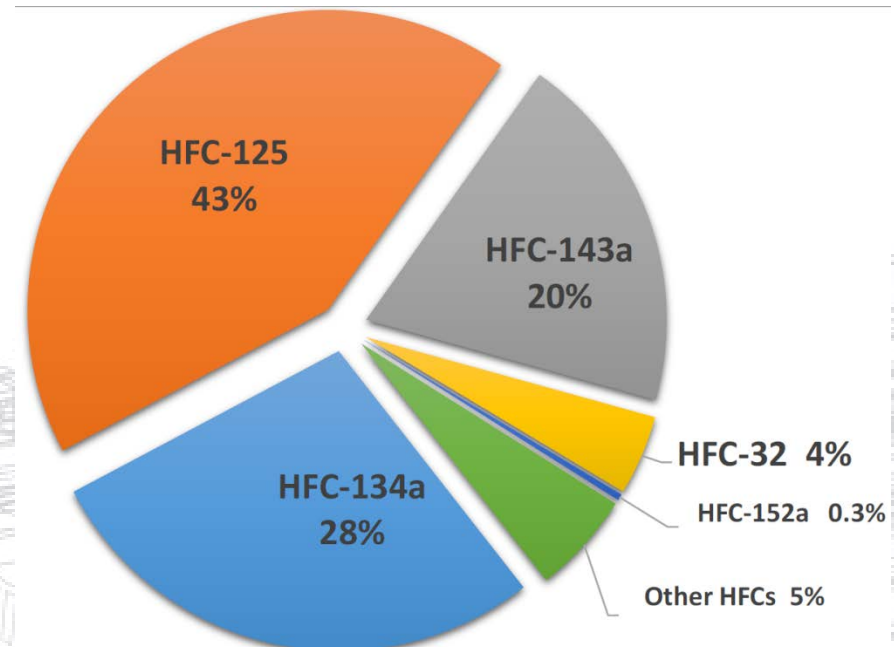


# How does it impact business? In terms of refrigerants used

Global HFC consumption in metric tonnes (2012)



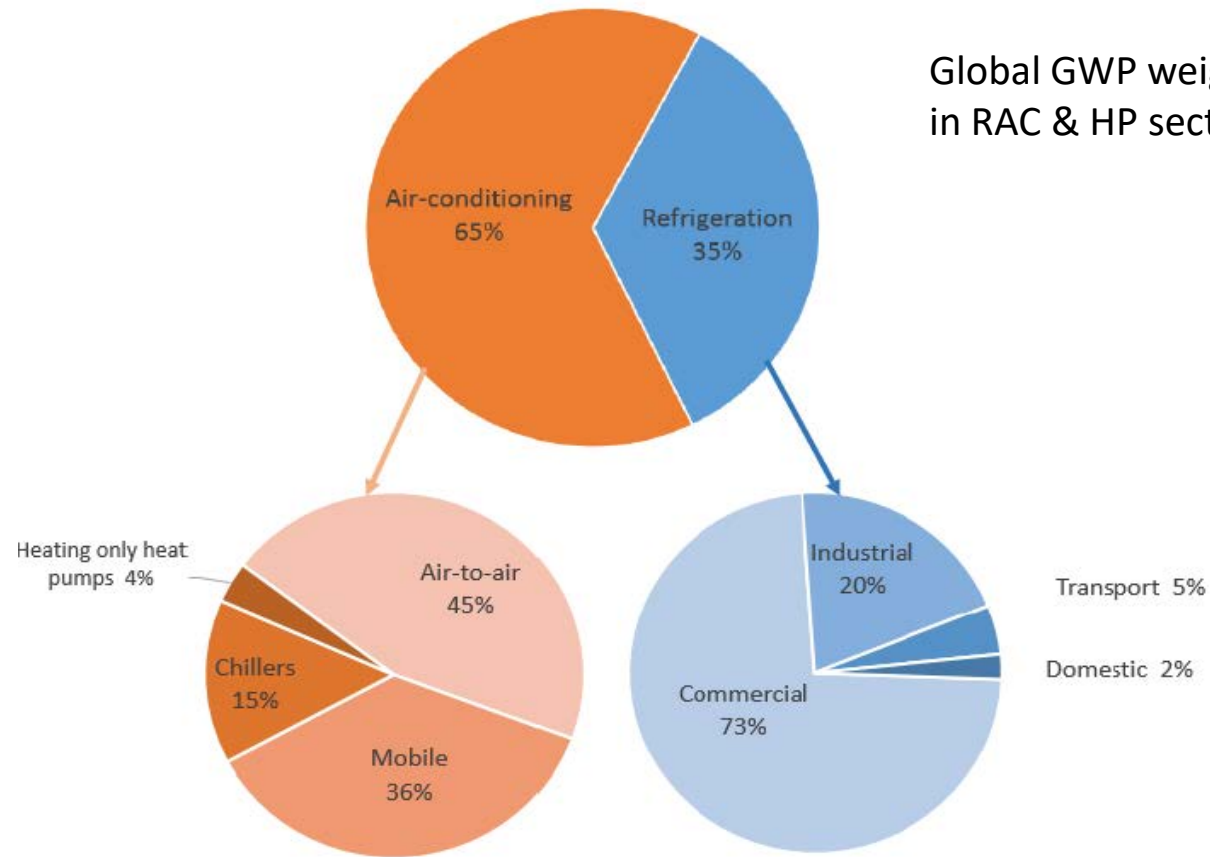
Global HFC consumption in tonnes of CO<sub>2</sub>-equivalent (2012)



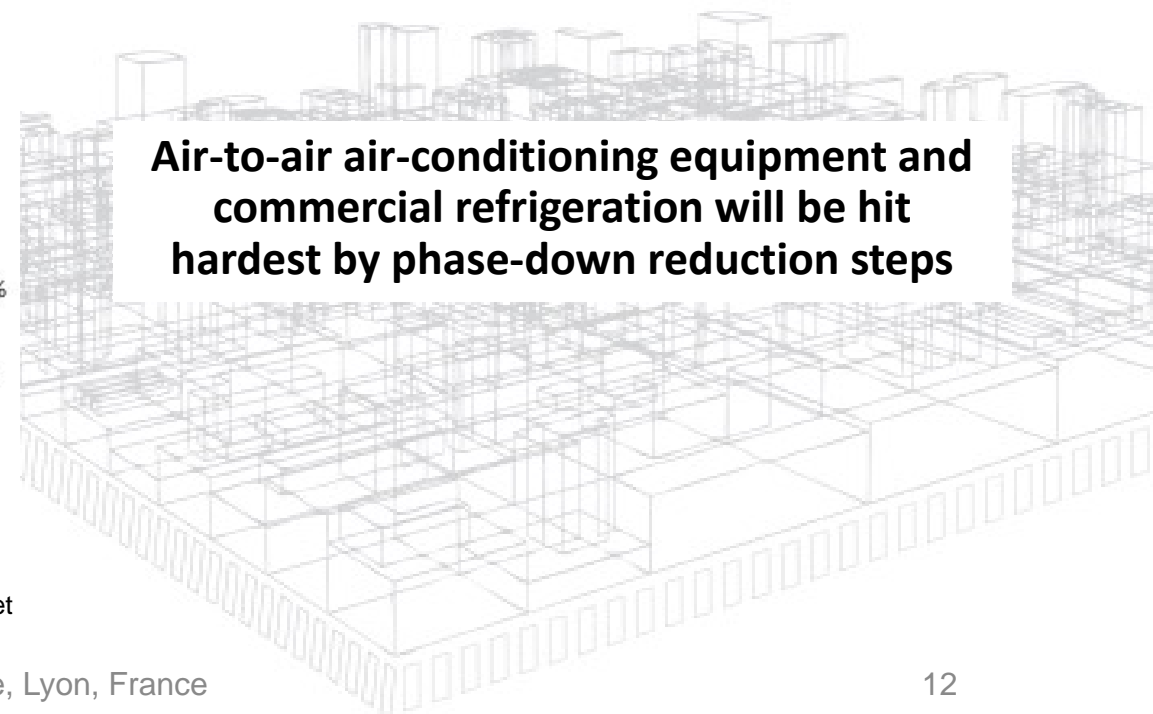
Source: Ozone Secretariat Technical Factsheet

- **3 dominant blends: R-404A, R-410A, R-407C, all of them containing the high GWP gas R-125**
- **The phase-down will hit products with high GWP hardest**

# How does it impact business? In terms of applications



Source: Ozone Secretariat Technical Factsheet



# What does it mean in practice? The European example

## The EU F-Gas Regulation

### Containment & Competence

Regular leak checks

Certification and training of installers

### Phase-Down

#### Consumption Reduction of HFCs

**Y 2020:**  
**-37%**

**Y 2030:**  
**-79%**

### GWP Limits

**2015:** GWP 150  
Fridges & Freezers

**2020:** GWP 150  
Moveable A/C

**2020:** GWP 2500  
New Stat. Refr.  
Equipment & service,  
maintenance

**2022:** GWP 150  
Multipack refrigeration  
systems >40kW (except  
cascades: GWP1500)

**2025:** GWP 750  
Single split a/c < 3kg

### Others

**2015:** Reporting obligations

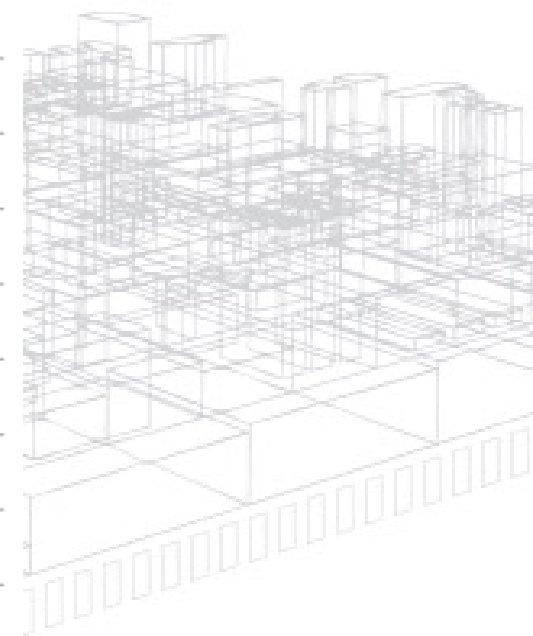
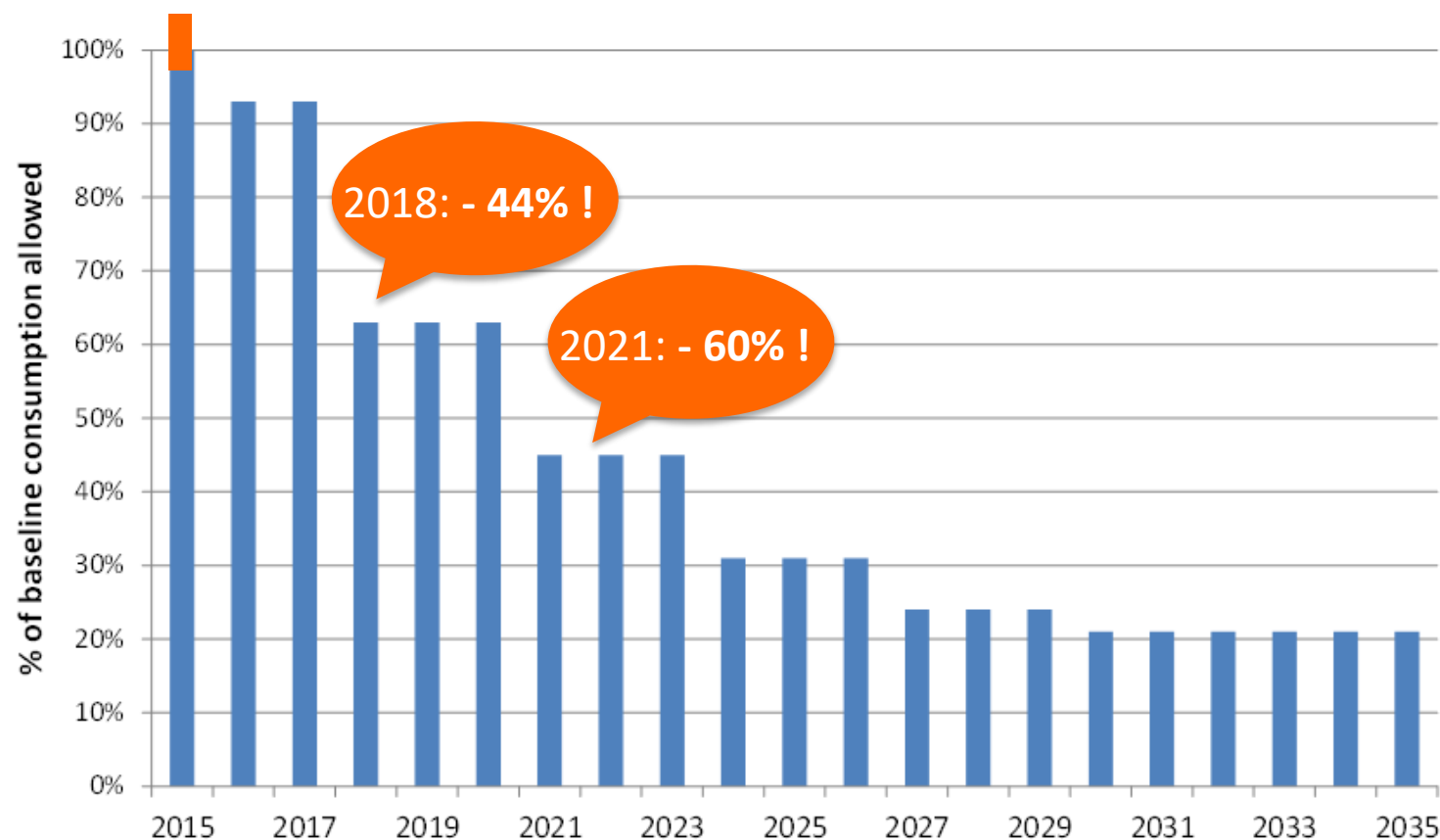
**2017:**  
Traceability for pre-charged equipment

**2015 – 2022:**  
various reports

# The biggest challenge?

An additional 22 MT CO<sub>2</sub> (12%)  
for precharged equipment  
expected

The HFC phase-down!

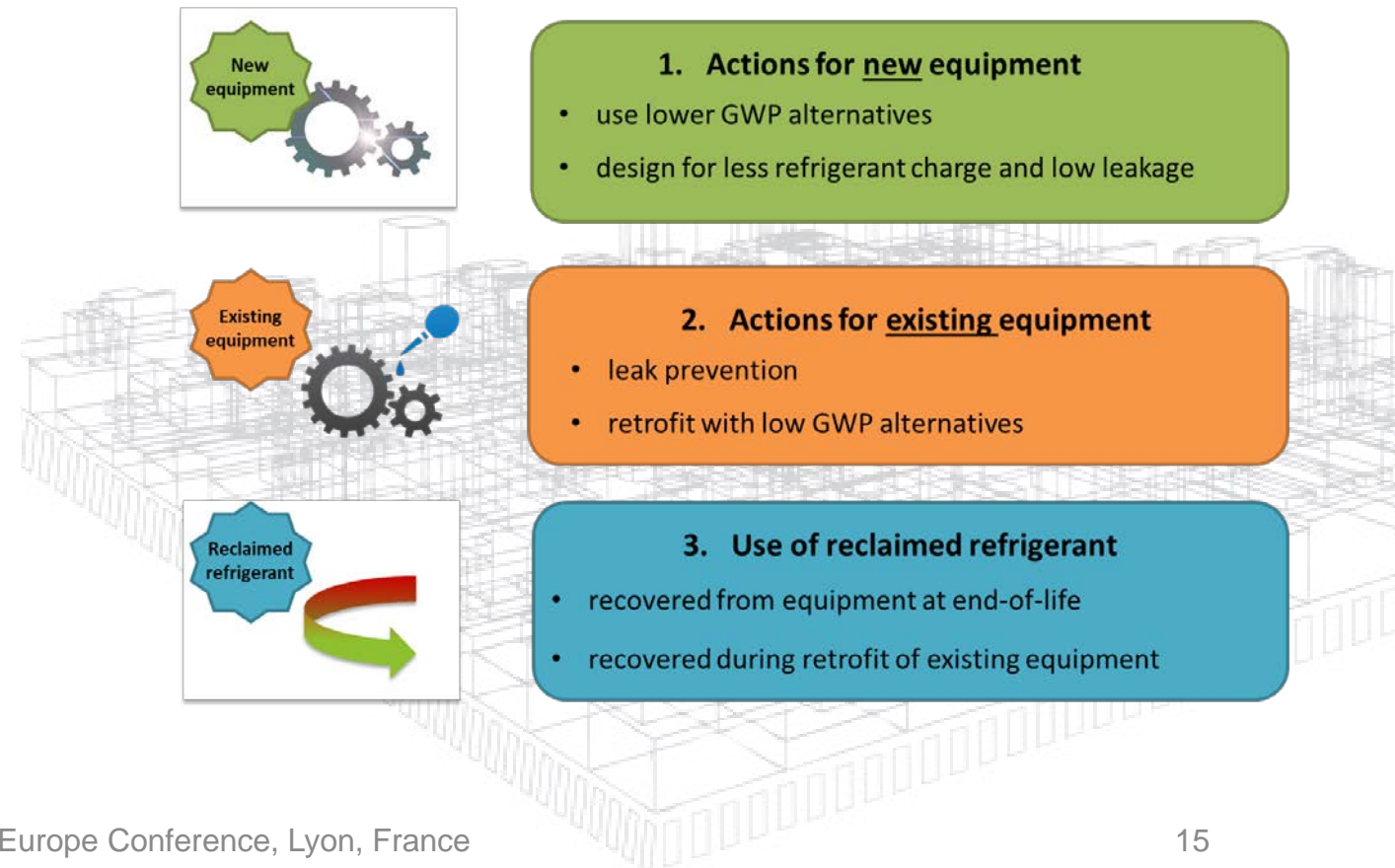


# Understanding the market: The role of the EPEE Gapometer

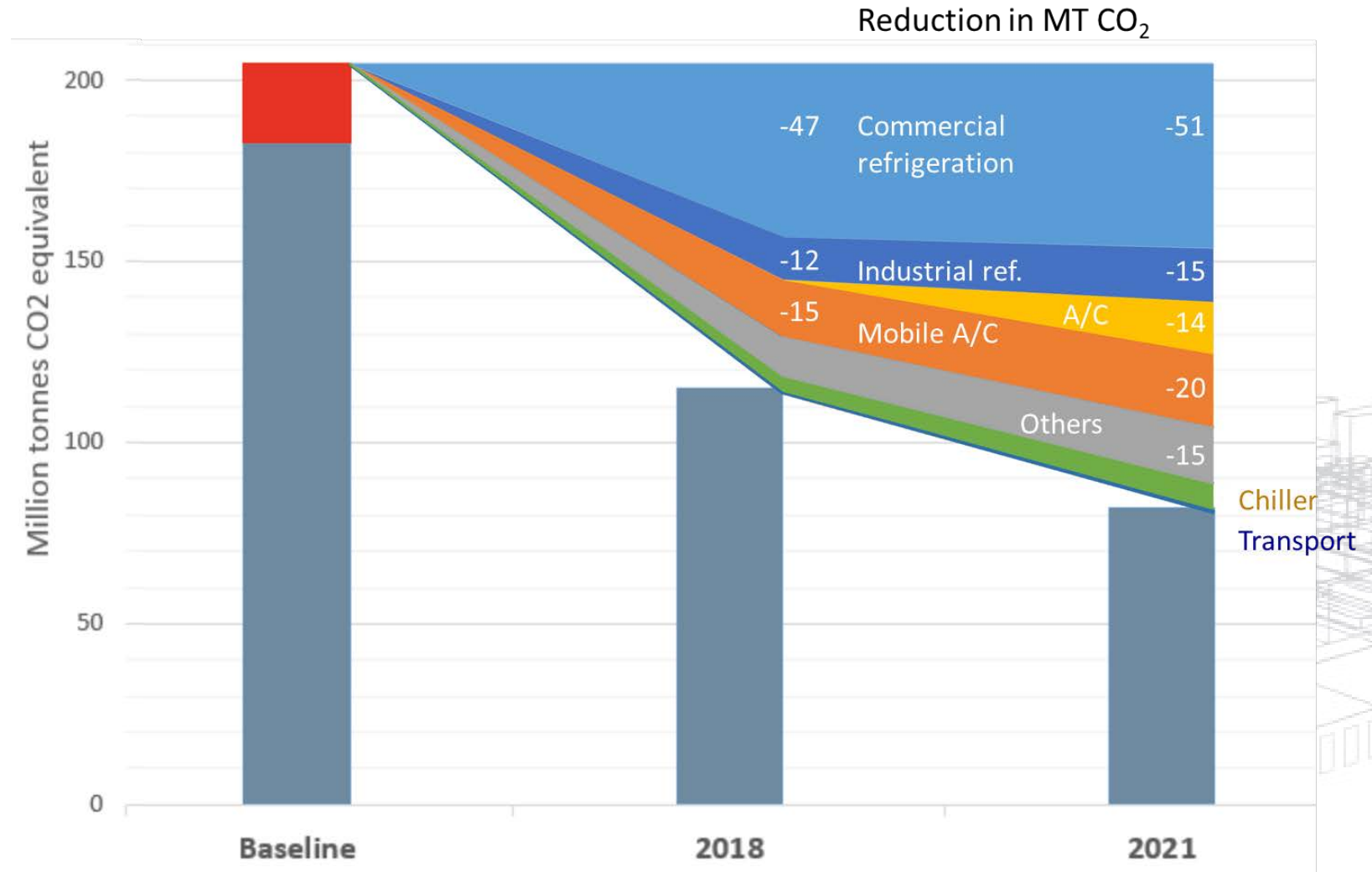
## What is the EPEE Gapometer?

- A Roadmap to show how the phase-down steps can be achieved
- A model to measure progress in the market & compare to the Roadmap requirements
- A tool to communicate key issues to policy makers and industry stakeholders

Key priorities identified by the EPEE Gapometer to achieve the HFC phase-down steps

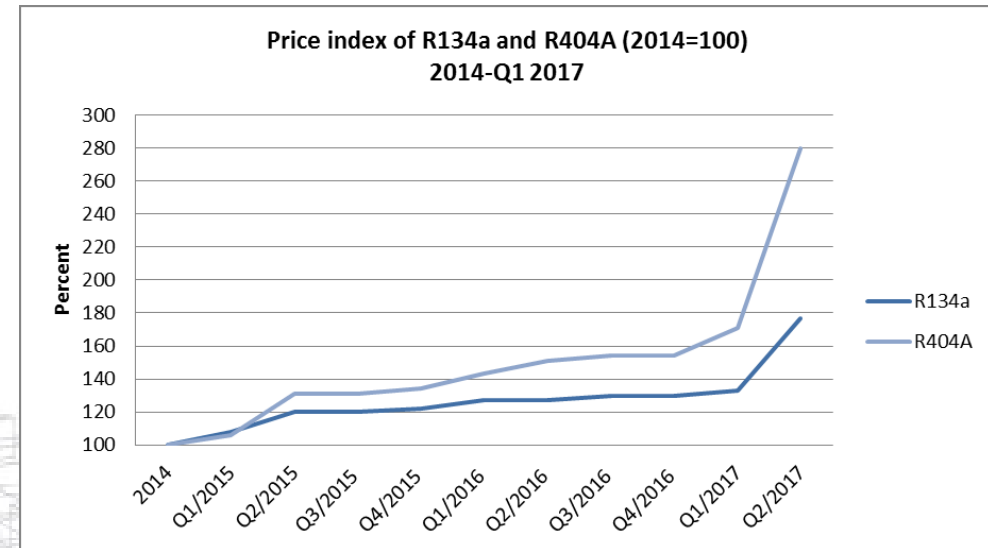
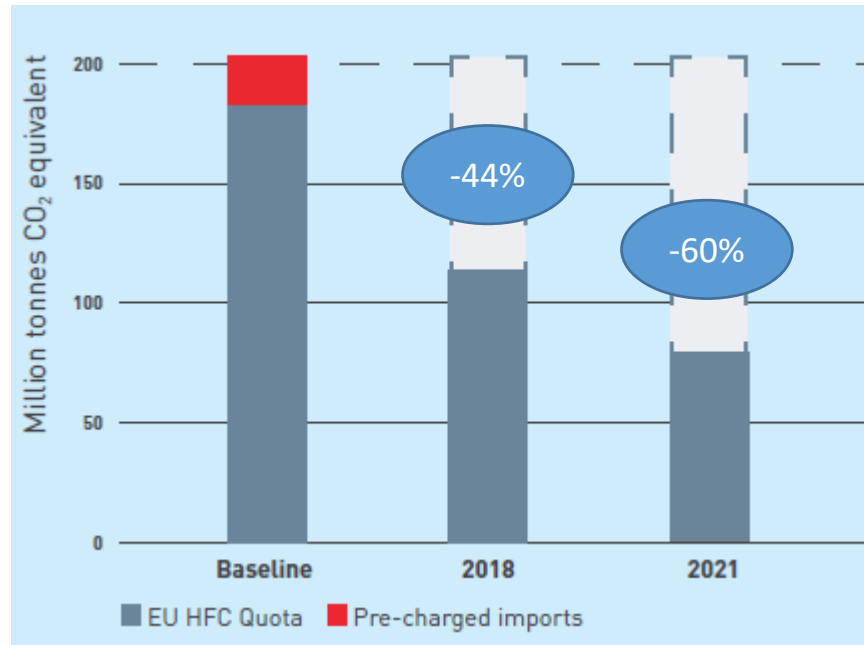


# Which market segments need to move first?





# First market experiences: refrigerant prices are skyrocketing!

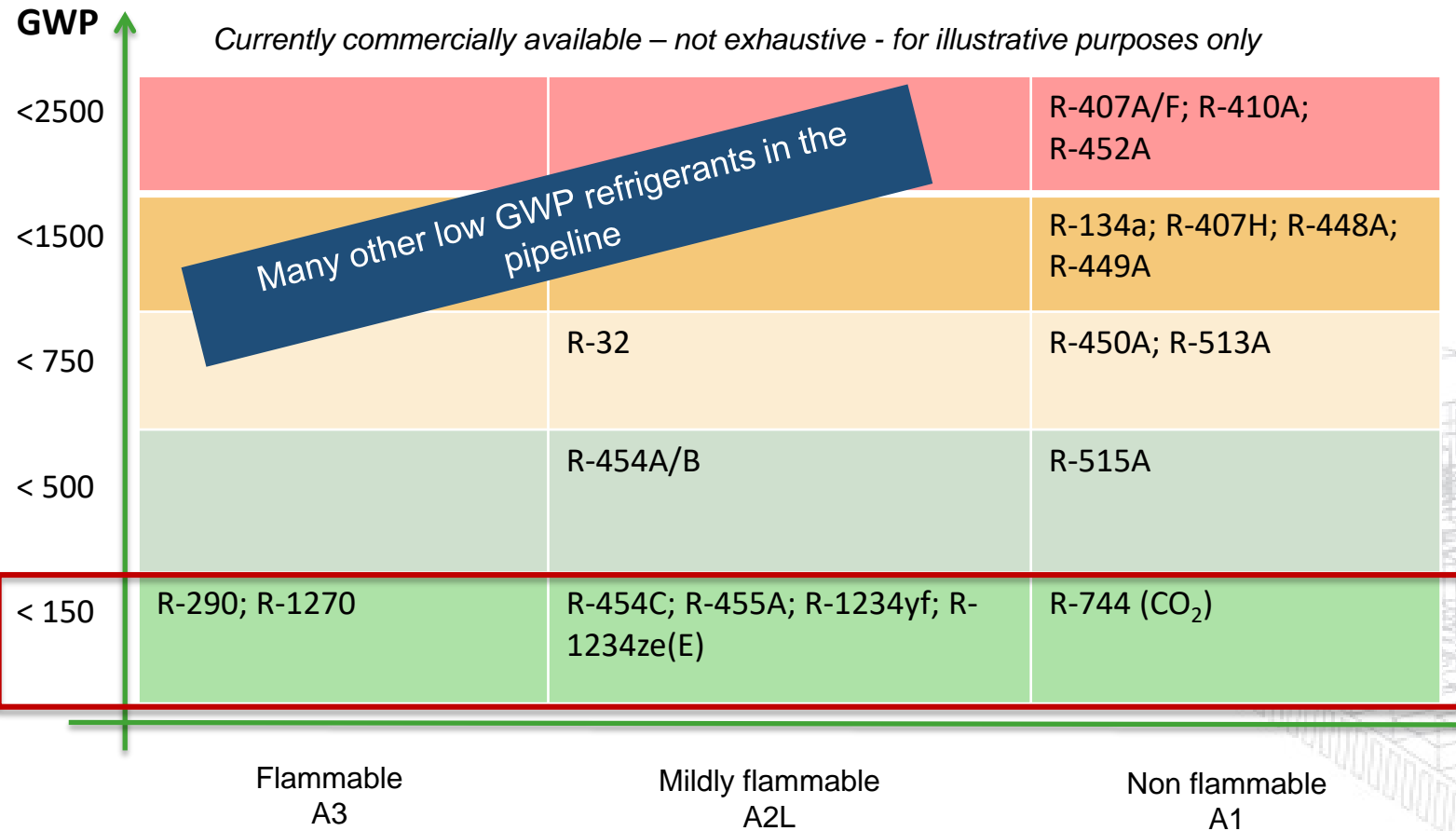


Source: Commission Oeko Recherche Pricing Study

- With the big cuts looming in 2018 and 2021, HFC prices have virtually started to explode, in particular for high GWP refrigerants such as R-404A, but also for others such as R-410A and even R-134a
- Many companies seem to be taken by surprise and are now struggling to cope with high prices and refrigerant scarcity, some of them even for survival

# What happened?

## *The uptake of lowGWP alternatives is too slow*

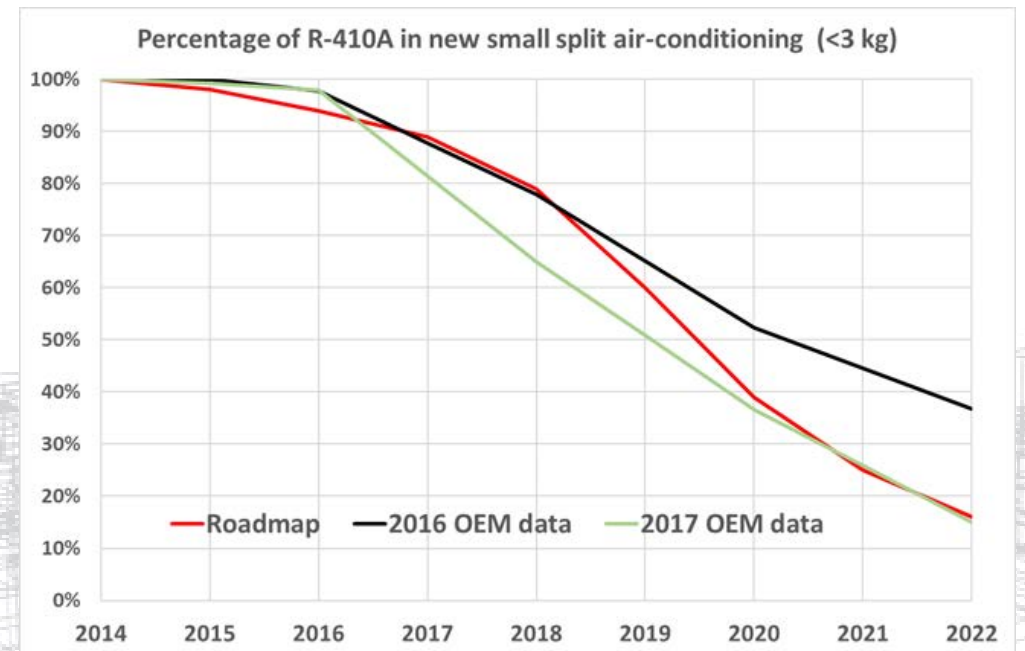


- **Most of the low GWP alternatives are mildly flammable or flammable**
  - ➔ Non adapted standards & building codes and lack of installer competence slow down the transition towards lower GWP refrigerants
- **Lack of awareness at installer and end-user level** and sometimes high refrigerant / equipment cost are also important hurdles
- **If one segment does not move fast enough, the others will suffer too!**

# But there are also positive developments


Several segments of the OEM market have already started to shift towards lower GWP alternatives. Typical trends include:

- R-32 in the stationary air-conditioning market, in particular small split a/c equipment < 3kg filling charge
- HFOs in the chiller market, such as R-1234ze/yf, R-1233zd and others
- CO<sub>2</sub> and hydrocarbons in the refrigeration market, in particular for larger centralised equipment (CO<sub>2</sub>) and for plug-in equipment (hydrocarbons)



Ex. of the Gapometer market survey

# Lessons learned from the Gapometer in Europe



**New equipment**

**End-users and OEMs must be encouraged to use lower GWP options**

Lower GWP refrigerants are already available but uptake is slower than expected

**More flammable refrigerants:**

Training and development of safety standards are urgent priorities

**Advisors / contractors:**

Must understand the need for lower GWP options and alternative configurations



**Existing equipment**


**Leakage reduction and R-404A retrofits**

Good progress by „best practice supermarkets“ but much more needs to be done.

Need of action also in industrial refrigeration, which is well behind supermarkets

**R-404A retrofits with GWP ~1400 possible:**

Maximising recovery and re-use of retrofitted R-404A is key to meet phase-down targets



**Reclaimed refrigerant**

**Reclaim of refrigerant makes an important contribution to HFC phase-down as they are not part of quota**

Higher refrigerant prices and shortages of high GWP HFCs will encourage reclaim

Contractors and end-users need to maximise recovery

Gas supply chain must provide supporting infrastructure

# Conclusions

- A **phase-down leaves flexibility** for industry but must not be considered as an excuse to wait until it's too late
- Companies need to develop **strategies and plan ahead** carefully to be prepared
- **First movers will have an advantage**
- Countries with phase-down schemes in place **will influence technology developments on a global level**
- Framework conditions such as **standards, building codes and installers' competence** are key for success
- **Communication** towards all concerned stakeholders (installers, specifiers, planners, OEMS, end-users) is vital to raise awareness about the phase-down and understanding about the necessity to act

# Questions?

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